

***Center for Economic Institutions***  
***Working Paper Series***

**CEI Working Paper Series, No. 2005-7**

***"The Very Dark Side of International Capital  
Markets: Evidence from Diversified Business  
Groups in Korea"***

Sangwoo Lee  
Kwangwoo Park  
Hyun-Han Shin



Institute of Economic Research  
Hitotsubashi University  
2-1 Naka, Kunitachi, Tokyo, 186-8603 JAPAN  
Tel: +81-42-580-8405  
Fax: +81-42-580-8333  
e-mail: [cei-info@ier.hit-u.ac.jp](mailto:cei-info@ier.hit-u.ac.jp)

# **The Very Dark Side of Internal Capital Markets: Evidence from Diversified Business Groups in Korea**

Sangwoo Lee, Kwangwoo Park, and Hyun-Han Shin\*

This Version: May 8, 2005

## **ABSTRACT**

This paper examines the capital allocation within Korean *chaebol* firms during the period from 1991 to 2000. We find strong evidence that, during the pre-Asian financial crisis period in the early 1990's, poorly performing firms with less investment opportunities invest more than well-performing firms with better growth opportunities. We also find the evidence of cross-subsidization among firms in the same *chaebol* group during the pre-crisis period. It appears that the existence of the "dark" side of internal capital markets explains most part of this striking phenomenon where "tunneling" practice has been common during the pre-crisis period. However, the inefficient capital allocation seems to disappear after the crisis as banks gain more power and market disciplines inefficient *chaebol* firms.

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\* Lee is at the University of Illinois at Urbana-Champaign; Park is at the Korea Advanced Institute of Science & Technology; and Shin is at the Yonsei University. E-mail addresses are [slee21@uiuc.edu](mailto:slee21@uiuc.edu), [kpark3@kgsu.kaist.ac.kr](mailto:kpark3@kgsu.kaist.ac.kr), and [hanshin@yonsei.ac.kr](mailto:hanshin@yonsei.ac.kr).

## **I. Introduction**

Evidence shows that corporate divisions or diversified firms in a conglomerate are not financially independent (see Lamont (1997) and Shin and Stulz (1998)). Accordingly, internal capital markets play a major role in allocating capital in diversified firms. Numerous studies have investigated the benefits and costs of internal capital markets within diversified firms during the past few years. Two competing views are broadly posited regarding the allocation of capital and managerial resources in diversified firms. One viewpoint suggests that internal capital markets can enhance value.<sup>1</sup> This “value-added” view claims that the headquarters of a business group allocate group resources most to its member firms with the most growth opportunities through the formation of an internal capital market, in which internally generated cash flows can be effectively pooled among member firms or different business divisions. Stein (1997), for example, argues that diversified firms can enhance efficiency because corporate headquarters engage in reallocation of funds across projects.

Another viewpoint argues that internal capital markets can hinder capital allocation efficiency.<sup>2</sup> For example, Johnson et al. (2000) use the term “tunneling” to refer to the practice that controlling shareholders transfer corporate assets and resources out of firms for their own benefits. This “tunneling” view predicts the resource transfer from a healthy member firm to a weaker one and claims that internal capital allocation tends to be inefficient. Given the mixed viewpoint, the issue of whether diversified firms allocate capital efficiently or poorly is still debatable, and offers the need for further investigation especially across different countries, industries, and periods.

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<sup>1</sup> For example, see Gertner, Scharfstein, and Stein (1994), Stein (1997), and Maksimovic and Phillips (2000).

<sup>2</sup> For example, see Meyer, Milgrom, and Robert (1992), Scharfstein (1998), Shin and Stulz (1998), Shin and Park (1999), Johnson et al. (2000), Rajan, Servaes, and Zingales (2000), and Scharfstein and Stein (2000).

This paper investigates the capital allocation within Korean large business groups (*chaebols*) during the period from 1991 to 2000. In particular, we examine whether capital expenditures of *chaebol* affiliated firms (here-in-after *chaebol* firms) can be justified by the investment prospect and depends on the cash flows of their own or of other firms in the same *chaebol* group. We then compare these results with those for non-*chaebol* firms. We use Korean *chaebol* firms because their internal fund operation is similar to US conglomerates that allocate funds according to each division's needs and corporate strategic planning. *Chaebol* firms are usually owned by a large shareholder or family, who can influence investment and financing decisions of the whole *chaebol* group. Concerning that *chaebols* are extremely well diversified, we should shed the light on the growing large body of literature on corporate diversification and internal capital markets. Furthermore, since our sample covers the financial crisis period (1997-1998), we can also compare the efficiency of capital allocation before the crisis with that after the crisis. To an extent that the post-crisis market disciplines inefficient firms, we expect that capital allocation becomes more efficient after the crisis than before the crisis.

First, we examine whether a firm's investment is related to the investment opportunities using Tobin's Q as a proxy for investment opportunities perceived by the market. We find *chaebol* firms' investment policy is not sensitive to future profitability of the investment throughout our sample period. On the other hand, investment by independent firms with more focused line of business is more responsive to good investment opportunities, especially after the financial crisis.

Second, we examine whether there is a relationship between investment and internal cash flows. We find a significantly negative relationship between a *chaebol* firm's investment and internal cash flows during the pre-crisis period, which implies that poorly performing firms were

even making greater investments. After the crisis, however, the *chaebol* firms became more sensitive to their own operating cash flows, turning the negative relationship into positive. We also find that non-*chaebol* firms' investment is independent (yet positive) of their own operating cash flows during the pre-crisis period, but became significantly sensitive (and more sensitive to *chaebol* firms) to their internal funds after the crisis. This finding tells us that both *chaebol* and non-*chaebol* firms are more financially constrained after the crisis than before the crisis. It is also consistent with the existing literature, which confirms that *chaebol* firms are less financially constrained than independent firms. Shin and Park (1999), for example, show that investment-cash flow sensitivity is significantly lower for *chaebol* firms than for other firms. Using Japanese firm data, Hoshi, Kashyap, and Sharfstein (1991) document that the liquidity of Japanese independent firms has a strong positive relationship with the investment expenditures, while the investment expenditures of Japanese *keiretsu* firms are less sensitive to cash flows.

Third, *chaebol* firms' negative relationship between investment and internal cash flows during the pre-crisis period cast reasonable doubt on possible cross-subsidization. So, following Shin and Park (1998), we also examine whether the investment of a *chaebol* firm is related to the financial condition of other firms in the same *chaebol* group. We find that a *chaebol* firm's investment decision is positively affected by the cash flows of other firms in the same *chaebol* group during the pre-crisis period. Our results during the pre-crisis period are consistent with the findings of Shin and Park (1998), and provide another evidence of cross-subsidization in diversified firms reported in Lamont (1997) and Shin and Stulz (1998). We further document that the cross-subsidization is mainly arranged by poorly performing firms, suggesting that there were wealth transfers from healthy member firms to weaker firms. Overall, these findings support the "tunneling" view by Johnson et al. (2000).

Finally, we report that the degree of inefficiency in capital allocation among *chaebol* firms has decreased after the financial crisis. During the post-crisis period, at least better performing firms are making greater investments although they are not much related to investment opportunities. And the cross-subsidization pattern has disappeared in our sample period after the financial crisis. This finding is consistent with the argument by Kim et al. (2004). They argue that main banks gain power by charging higher interest rates to their client firms after the onset of the financial crisis in Korea, and show evidence that the market continues to discipline Korean *chaebols*.

The issues addressed in our work are also related to a few empirical studies documenting the productivity of diversified firms of conglomerates. For example, Maksimovic and Philips (2002) compare productivity between the different segments within a conglomerate. They find that main divisions on average are more productive than peripheral divisions and that the sales growth of one division is closely related to its productivity and industry business cycle. On the other hand, Schoar (2002) shows evidence that although conglomerates are more productive than stand-alone firms at one time, dynamically, diversified firms experience net reduction in productivity. In a more recent paper, Villalonga (2004) find that conglomerate diversification continues to generate discounts, while related diversification is associated with premiums. The view posited in this line of research is broadly consistent with the argument in our empirical results.

This paper is organized as follows. In Section II, we describe characteristics of Korean firms with an emphasis on *chaebol* firms. The data used in our paper are discussed in Section III. Section IV presents empirical results, which document the existence of the dark side of internal

capital markets for *chaebol* firms during the pre-crisis period (but not after the crisis). Section V presents concluding remarks.

## II. Characteristics of Korean Firms

A *chaebol*, or a large business group in Korea, is a giant conglomerate or financial clique, and is unique to the Korean corporate sector and has recently attracted much attention in academia because of their role before and after the financial crisis in Korea.<sup>3</sup> Furthermore, the *chaebol* dominate the Korean economy. Krugman (1998) notes that the top 30 largest *chaebol* companies account for nearly 40% of total economic activity in Korea in 1996. As it is shown in the list of the top 30 *chaebols* in 1996 provided in Appendix 1, the largest business groups such as *Samsung*, *Hyundai*, LG, and SK have over 50 affiliated companies. The associated companies may include financial service firms offering a full range of financial services from credit card and insurance to securities underwriting and venture capital. The number of financial arms for each *chaebol* appears in the last column of Appendix 1. The top five *chaebol*, in particular, have a median number of 6 financial arms, while the median for top 30 *chaebol* is 2.

Yoo and Lee (1987) classify *chaebol* groups into three categories depending on the timing of their formation. *Chaebols* formed in the late 1950s, such as *Hyundai*, *Samsung*, and *Lucky-Goldstar* (LG), were established by the founder through government support such as disposal of government vested properties. *Chaebols* of the 1960s, such as *Hanjin*, *Korea Explosive*, *Hyosung*, *Sangyoung*, and *Dong-A*, were established as a result of foreign loans. Finally, *Chaebols* of the 1970s, such as *Daewoo*, *Sunkyong* (SK), *Lotte*, *Kolon*, and *Doosan*,

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<sup>3</sup> The *chaebol* system is similar to the Japanese *keiretsu* with regard to government sponsorship of a long-term main bank-firm relationship, but differs fundamentally in that Korean banks did not own corporate equity.

were formed during a period of economic boom and of unprecedented export growth. Throughout the post-Korean War period, the Government has sponsored the formation and growth of *chaebols*, to forward rapid economic growth and development.

The business activities of Korean *chaebol* firms are widely diversified. Yoo and Lee (1987) find that, among their sample firms in Korea, 72% of them have run more than two business departments under one umbrella. In *Samsung* group, for example, major manufacturing firms such as *Samsung Electronics*, *Samsung Heavy Industries*, and *Samsung Chemical* are connected with affiliated firms by providing raw materials and intermediate goods and services like *Samsung Electro Devices*, *Samsung Corning*, and *Samsung Electro-Mechanics*. This intra-group trade, accompanied by flexible credit terms, creates an internal capital markets through accounts receivable and accounts payable. Deloof (2001) points out that the existence of intra-group claims lessens the need for liquid reserves. The third column of Appendix 1 reports the ratio of intra-group sales in ratio to total sales for each *chaebol*. The average (median) of the intra-group sales to total sales ratio in 1996 is 17.9 (14.9) percent for the top 30 *chaebols* and 24.5 (19.2) percent for the top 5 *chaebols*.

Despite the size and diversification of the *chaebols*, most *chaebol* affiliated firms are still under the control of the founding family owner. *Chaebol* firms are linked by direct or indirect shareholdings, and the founder typically serves as a chairman of the core company within the *chaebol*. The controlling shareholder in a *chaebol* is usually the CEO and Chairman of the Board while the other members of the board are executives he/she has selected. There is evidence that the controlling shareholders (owners) of the *chaebol* have sought to maximize their influence by increasing the size of the firm and the group, even at the expense of



profitability of individual firms.<sup>4</sup> The benefits to controlling shareholders of large firms include social, political, and economic rewards that are proportional to the scale of operations firms. For example, if a *chaebol* acquires a new business division, the controlling shareholder of the *chaebol* can staff executive positions at the new business division with hand-picked subordinates.

Kook, Park, and Lee (1997) report evidence that the fifty largest *chaebols* focused on the firm growth rather than firm value. Choi, Park, and Kho (2000) find that individual non-*chaebol* firms also prefer growth in size to profitability. Ferris, Kim, and Kitsabunnarat (2003) also demonstrate the so-called "profit stabilization hypothesis" where contending Korean firms pursue enlargement rather than maximization of profits. Government economic development plans, which gave priority in financing to large firms in the export sector, through the provision of low loan rates and forbearance in rolling over bank loans, have given both *chaebol* and non-*chaebol* firms an added incentive to emphasize growth of sales over profit maximization.<sup>5</sup>

The financial system has traditionally been used as an instrument for the Korean Government's economic development policy tools. The government intervened heavily in the banking system to channel credit to desired industries. Moreno (1998) notes that banks were not free to use standard business criteria in evaluating and monitoring projects. Most commercial banks were nationalized in the early 1960s, and the government influenced the allocation of credit both directly through the appointment of bank management and credit controls, and indirectly through various regulations and incentives. Although a privatization

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<sup>4</sup> Choi, Park, and Kho (2000) point out that this structure creates a conflict between the interests of the controlling shareholder and the other shareholders of *chaebol* affiliated firms, since projects that advance the interests of the group might be pursued at the expense of particular firm shareholders.

<sup>5</sup> Most commercial banks were under government control in Korea. An example of one of the few commercial banks free from government control is Shinhan Bank, established by Korean Japanese investors in 1982.

program started in the early 1980s resulted in widely dispersed ownership of many commercial banks, government continued to exercise de facto control of most banks through the late 1990s and competition in the banking system continued to be limited.<sup>6</sup> The result was a tightly controlled government-administered financial system characterized by a chronic excess demand for credit, even by profitable and viable firms. Borensztein and Lee (2000) provide evidence of inefficient credit allocations among Korean manufacturing sectors for the period from 1970 to 1996 by comparing performance of firms and their ability to obtain credit. Furthermore, there is the pervasive expectation that troubled borrowers and lenders would benefit from government bailouts, thus aggravating inherent adverse selection and moral hazard in the market for credit.

In summary, Korean *chaebol* firms are nurtured by the government, highly diversified, dominate the economy, controlled by a founding family, and draw more credit from banks than non-*chaebol* firms in which *chaebol*'s relatively poor profit opportunities would not justify.

### **III. Data**

We use a unique data set provided by Seoul-based Korea Information Service (KIS) for all industrial firms listed in Korea Stock Exchange (KSE) and KOSDAQ stock market from 1991 to 2000.<sup>7</sup> KIS is the leading provider of credit related information and services for financial and commercial business transactions among corporations and consumer individuals in Korea. Most

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<sup>6</sup> A number of researchers, including Berg (1999), Furman and Stiglitz (1998), and Radelet and Sachs (1998), argue that the combination of strong government and weak financial institutions exacerbated adverse selection and moral hazard in credit allocation in the period leading up to the financial crisis in 1997.

<sup>7</sup> KOSDAQ stock market is the Korean version of the NASDAQ market where a large number of fast-growing young technology firms are listed. Interestingly, the bubble burst in KOSDAQ market around the same time it did in early 2000.

previous studies on Korean firms employ PACAP database, but PACAP Korea database provides only limited information on accounting and stock prices. For example, research and development (R&D) expenditures and account receivables from affiliated firms are not available from PACAP database for Korea. Unlike the PACAP database, our data from KIS contains comprehensive financial information for each KSE and KOSDAQ firm. The company profile and financial information data are compiled from financial statements, business reports, and audit reports that every company is mandated to produce on an annual basis.

To keep track of how *chaebol* groups have allocated their resources across their affiliated firms over time, we first identify whether each firm is affiliated with *chaebol* at one point of time. Once each firm is classified as *chaebol* or non-*chaebol*, we then examine the time-series pattern of the capital allocation practices for each category of firms. For the definition of *chaebol*, we use the Korea Fair Trade Commission (KFTC)'s annual report and Financial Supervisory Commission's 1996 guideline.<sup>8</sup> The KFTC designates the top 30 business groups in terms of asset and we define these 30 groups as *chaebols* in this paper. We select total of 6878 firm-year observations between 1991 and 2000. Among the 6878 observations in our sample, 843 firm-years are classified as *chaebol* firm observations and the remainder of 6035 firm-years as non-*chaebol* observations.

The summary statistics of capital expenditure (normalized by sales) are reported in Table 1.<sup>9</sup> We use the year-end Korean Consumer Price Index to deflate total assets in 2000 Korean won. Capital expenditure is the changes in the sum of fixed assets and depreciation divided by net sales. We find that *chaebol* firms spend more on capital expenditures than non-*chaebol* firms.

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<sup>8</sup> KFTC legitimately defines a business group as "a group of companies, more than 30 percent of whose shares are owned by some individuals or by companies controlled by those individuals" The KFTC identifies business groups and announces them every year.

<sup>9</sup> Scharfstein (1998), suggesting that firms show more degree of freedom in allocating assets across divisions than they have in allocating sales, uses sales as his normalization.

This may suggest that *chaebol* firms invest in less lucrative projects, supporting the view of over-investment hypothesis in Korea by Shin and Park (1999). Panel A of Table 1 shows that the mean and median capital expenditures for the whole sample period are 4.5 percent and 2.1 percent of sales respectively. While the mean and median investments for non-*chaebol* firms are 4.1 percent and 2.0 percent of sales respectively (panel B), the mean and median capital expenditures for *chaebol* firms are 7.7 percent and 3.5 percent of sales respectively (panel C). In order to investigate whether this result is affected by the Asian Financial Crisis, we also examine the capital expenditures of *chaebol* and non-*chaebol* firms year by year for the sample period. Pre- and post-crisis analyses of investments present results consistent with the analysis of the whole sample period: Capital expenditures of *chaebol* firms are greater than those of non-*chaebol* firms. However, both *chaebol* and non-*chaebol* firms spend less on capital expenditures after the crisis of 1997 than before the crisis.

We present important financial differences between *chaebol* and non-*chaebol* firms in Table 2. We first find that *chaebol* firms are significantly larger than non-*chaebol* firms in size. The average (median) size of total assets of *chaebol* firms is almost 4 (9) times larger than that of non-*chaebol* firms. This is hardly surprising, however, given the managerial objectives of growth and diversifying efforts widespread among *chaebol* firms in the Korean economy. The firm's market to book ratio is used to measure Tobin's  $Q$  representing the growth opportunities of firms. The market-to-book ratios are higher for non-*chaebol* firms than *chaebol* firms, suggesting that the growth opportunity is higher for non-*chaebol* firms than *chaebol* firms. We also find that *chaebol*-affiliated firms have significantly lower cash flows than non-*chaebol* firms. Weinstein and Yafeh (1998) argue that Japanese main bank client firms show poor performance partly due

to main banks' risk aversion and main banks' rent extractions. We further offer an inefficient over-investment problem as a possible reason for poor performance by *chaebol*-affiliated firms.

In Table 2, we see that capital expenditures of *chaebol* firms are also greater than those of non-*chaebol* firms when we normalize them by net assets, not by sales as we did in Table 1. Consistent with the result for cash ratio, *chaebol* firms hold less working capital as a substitute of cash. We can have negative working capital because it is defined as current assets minus current liabilities minus cash. The leverage is significantly higher for *chaebol* firms than for non-*chaebol* firms. However, the ratio of bank loans to total debt is lower for *chaebol* firms than for non-*chaebol* firms. R&D investment is also slightly lower for *chaebol* firms than for non-*chaebol* firms.

The last three rows of Table 2 present the summary statistics of cash holdings normalized by net assets, compensating balance normalized by the average bank loan, and non-bond interest expenses normalized by average bank loan. We can also find that there is a significant difference in the ratio of compensating balance to average bank loan between *chaebol* firms and non-*chaebol* firms. The median compensating balance ratio for *chaebol* firms is 10.6%, while that for non-*chaebol* firms is 24.8%. This indicates that for non-*chaebol* firms, they might be forced to place as much as a quarter of their outstanding bank credit. Finally, the last row in Table 2 shows that the median non-bond interest expenses to bank loan ratios for *chaebol* firms and non-*chaebol* firms are close to each other. This is consistent with the notion that the nominal borrowing rates for firms in Korea are similar regardless of the credit worthiness due to regulatory arrangement.

In summary, the descriptive statistics in Table 2 document that *chaebol* firms are on average significantly larger than non-*chaebol* firms, but are more levered, less liquid, and valued less than non-*chaebol* firms by the market. *Chaebol* firms seem to have less growth opportunities

than non-*chaebol* firms in spite of a higher level of capital expenditures, while these are consistent with the low level of the R&D intensity.

#### **IV. Empirical Results**

Table 3 reports the results of regressions to see whether diversified firms allocate capital efficiently or inefficiently and whether the inefficient allocation exists in the pre-crisis period (but not in the post-crisis period). Our model builds on the previous studies by further exploring the issue of investment inefficiency. Rather than looking at the investment-cash flow sensitivity and its relationship with  $Q$  as in Shin and Stulz (1998), we *directly* relate investment to  $Q$  following the approach by Scharfstein (1998). The dependent variable,  $CAPXDEV$ , is the difference between diversified *chaebol* firm's capital expenditures (normalized by sales) and the median capital expenditures (also normalized by sales) of single segment firms in the same two-digit industry.

In order to see whether the capital expenditures are related to industry investment opportunities, we use  $IndustryQ$ , the median beginning-of-period  $Q$  of all single-segment firms in the same 2-digit SIC code.  $Q$  is defined as (firm's book value of total assets + market value of outstanding shares – book value of equity) / firm's book value of total assets. The investment equation also incorporates variables that are thought to boost investment activity. The investment of firms might be driven by availability of cash flow. More specifically, the investment of *chaebol* firms can be related not only to its own cash flow but also to the cash flow of other firms in the same *chaebol* group. Correspondingly, the other variables are:  $CFSDEV$ , the ratio of *chaebol* firms' cash-flow to sales less the industry median ratio of cash flow to sales for single-segment firms;  $Other\_CFSDEV$ , the median  $CFSDEV$  value of all other affiliated group. Cash-

flow is defined as operating income plus depreciation. We use median value instead of mean because mean value can be influenced by one mega large group firm. For example, since Samsung Electronics is much greater in sales than any other group firms, Samsung group's capital expenditure is more likely to be affected by Samsung Electronics' cash flow to sales ratio rather than those of any other firms in Samsung group. It should be noted, however, that we obtain similar results when mean values are used instead of medians. We include year dummy variables to account for macroeconomic effects as in Pinkowitz and Williamson (2001). To screen out outliers due to low values of sales, we winsorize both capital expenditure to sales ratio and cash-flow to sales ratio at its 1<sup>st</sup> and 99<sup>th</sup> percentiles.

Panel A of Table 3 provides the results during the whole sample period from 1992 to 2000.<sup>10</sup> The first column of Table 3 provides the results of regressing *CAPXDEV* on the median beginning-of-period *Q* of the single segment firms in the industry. The coefficients of *IndustryQ* are not statistically significant indicating that there is no significant relation between industry-adjusted capital expenditure and the industry investment opportunity measured as the industry-adjusted Tobin's *Q*. The inclusion of *CFSDEV* or *Other\_CFSDEV* has little effect on the coefficient of *IndustryQ*. The coefficients of *CFSDEV* or *Other\_CFSDEV* are also meager. The coefficient of *CFSDEV* is significant at the 0.10 level in only one regression model (Model 2).

In sub-sample periods (panels B to C), we do not see any notably different pattern on the coefficient of *IndustryQ*. On the other hand, the coefficient estimates of *CFSDEV* and *Other\_CFSDEV* show quite different patterns between pre-crisis period (panel B) and post-crisis period (panel C). Most notably, the coefficient of *CFSDEV* is negative and statistically significant in the pre-crisis period, but positive and significant in the post-crisis period. The

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<sup>10</sup> Our regression results start from 1992, not 1991, since the explanatory variables are measured at the beginning of the period.

apparent reversal in the coefficient shows that poorly performing *chaebol* firms are making greater capital investment during the pre-crisis period, but that at least after the crisis, better performing *chaebol* firms are making greater investments although those investments are not significantly related to industry investment opportunities. This is evidence that the pre-crisis investment by *chaebol* firms was inefficient and risky.

As discussed above, the investment of *chaebol* firms can be related to the cash flow from other firms in the same *chaebol* group, as well as their own cash flow. In order to control for the effect of other firms in the same *chaebol*, we added the variable *Other\_CFSDEV* in Model 3. The third column of panel B of Table 3 indicates that the coefficient of median cash flow to sales among other firms in the same *chaebol* group, *Other\_CFSDEV*, is positive and statistically significant during the pre-crisis period. These results are consistent with the findings of Shin and Park (1999) that a *chaebol* firm's investment decisions are affected by other firms' liquidity within the same *chaebol* group. However, the coefficients of *Other\_CFSDEV* are not significant after the crisis (third column of panel C of Table 3), suggesting that the inefficient capital allocation through cross-subsidies seemed to lessen after the crisis.

It might be expected from the "tunneling" view by Johnson et al. (2000) that the inefficient capital allocation may show up more strongly in poorly performing firms. Table 4 focuses on our tests by looking at the poorly performing firms and well-performing firms separately. In particular, we see whether there is any relation between a poorly performing firm's capital expenditure and the cash flow of well performing firms in the same *chaebol* group.

Part I of Table 4 applies our tests to those firms with superior operating performance. We select the firms whose industry-adjusted cash flow to sales is above median among the *chaebol* firms in our sample and examine their investment activity associated with investment



opportunities and cash flow. In Part I, we cannot find any significant relations between capital expenditures and (own or other) cash flows we documented in Table 3.

In part II of Table 4, panels D to F perform the same analysis for firms with below-median operating performance. Panel E of Table 4 suggests that the negative relation between capital expenditure and *IndustryQ* during the pre-crisis period (shown in panel B of Table 3) are mainly due to the poorly performing *chaebol* firms. More interestingly, the coefficients of *Other\_CFSDEV* are positive and significant only for poorly performing firms (not for well-performing firms) during the pre-crisis period (panels B and E), suggesting that the cross-subsidies were arranged mainly by poorly performing firms to undertake value-decreasing investments using funds from better performing firms.<sup>11</sup> These results provide strong evidence on the existence of the pre-crisis dark side of internal capital market.

Scharfstein (1998) points out the possibility that the relationship between industry-adjusted capital expenditure and *IndustryQ* can be negatively biased by construction. To address this potential problem, we use the variables without industry adjustment (*CAPXS*, *CFS* and *Other\_CFS*) and then estimate the relationship for *chaebol* firms and for non-*chaebol* firms separately following his approach. The dependent variable, *CAPXS*, is capital expenditures (normalized by sales) for diversified *chaebol* firms. *CFS* is the cash-flow to sales ratio, where cash-flow is the operating income plus depreciation. *Other\_CFS* is the median *CFS* value of all other affiliated group firms. The results are reported in Tables 5 and 6. The results for *chaebol* firms without industry adjustment in Table 5 show similar results to those in Table 3. The results for non-*chaebol* firms in Table 6 show sharp contrast to the results for *chaebol* firms in Table 5. For the full sample period in panel A of Table 6, we see that industry *Q* and cash flow are all significantly related to the ratio of capital expenditure to sales, and panel C shows that the effects

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<sup>11</sup> Note that the coefficients of *IndustryQ* are not significant in all panels of Table 4.

are mainly due to from the post-crisis period. It appears that non-*chaebol* firms have come to make efficient investment especially after the onset of financial crisis.

In Table 7, we perform the same experiments as we did in Table 4 with the new set of variables used in Table 5. We divide our *chaebol* sample into two groups: firms whose *CFS*, cash flow to sales ratio, is above median or firms with below median *CFS*. The results in Table 7 are also quite similar to those in Table 4. Part I of Table 7 shows the results for *chaebol* firms with above median *CFS*. During the pre-crisis period, there is no significant relationship between capital expenditure and cash flow (panel B). In contrast, part II of Table 7 shows that there is significant negative relationship between capital expenditure and cash flow for poorly performing firms during the pre-crisis period (second and third columns of panel E), but the coefficients of *CFS* are positive and significant after the financial crisis (second and third column of panel F). This reversal in the coefficients indicates that the inefficient capital allocation during the pre-crisis period was mainly due to the poorly performing firms, but the inefficiency disappears after the financial crisis. Surprisingly, for well-performing firms, we see the negative correlation between investment and their own cash flow after the crisis, even though the magnitude and significance level of the coefficient are much smaller than those of poorly performing firms during pre-crisis period.

In third column of panels B and E of Table 7, the coefficients of *Other\_CFS* are positive and significant for both well-performing and poorly performing firms, suggesting that both firms are involved in cross subsidies before financial crisis. However, the magnitude and statistical significance level of the coefficients are much higher for poorly performing firms than for well-performing firms. This is consistent with our earlier results that poorly performing firms are main actors in cross-subsidies during the pre-crisis period. Again, cross-subsidies disappear after

crisis (third column of panels C and F), which emphasizes that the dark side of internal capital markets existed during the pre-crisis period, but not in the post-crisis period.

In summary, as predicted, independent firms with more focused line of business are more responsive in investment to good investment opportunities, especially after the financial crisis. On the other hand, diversified *chaebol* firms make inefficient investment throughout in the 1990s. During some time in the pre-crisis, poorly performing *chaebol* firms were even making greater investments. Our empirical results are broadly consistent with the findings in Hoshi, Kashyap, and Sharfstein (1991) where the liquidity of Japanese independent firms has a strong positive relationship with the investment expenditures, while the investment expenditures of Japanese *keiretsu* firms are less sensitive to cash flows.

Our results are important since *chaebol* system provides unique evidence of the role of internal capital markets for diversified firms, which have global presence. First, the *chaebol* system has the structure of the existence for many diversified and focused firms under one business group. For example, as of the end of 2001, *Samsung Group* has over 40 affiliated firms ranging from electronics to financial services and entertainments. Some firms like *Samsung Electronics* are highly diversified firms, which typically have more than a dozen business units, while a group-affiliated firm like *Samsung Corning* is quite focusing on only manufacturing of glass for TV tubes and LCD monitors. Almost all group-affiliated firms, however, are connected to each other through trading of raw materials and intermediate goods and services. Also, the cash poor firms borrow from cash rich affiliated firms. This intra-group trade and borrowing, accompanied by flexible credit terms, effectively creates an internal capital market. This business environment is similar to Japanese Keiretsu system, but surprisingly different from the characteristics for Indian business group depicted in Khanna and Palepu (2000).

Secondly, however, unlike Japanese keiretsu, Korean business groups are highly centralized. Although each group exists as an independent legal entity, there is a central office for members of its main staff, which overviews and facilitates management of all group firms. This office can exist as a separate legal entity or as a unit the core-group firm and typically plays a role of a holding company of the business group. Thus, an individual firm in a *chaebol* is more like a division of a large multi-segment conglomerate in the U.S. Finally, through the nexus of complicated cross-shareholdings and pyramid ownership structure, the owner-managers typically have ultimately control over all firms within the business group. They may seek to exercise discretionary power to maximize their welfare during the firm decision-making process by expropriating minority shareholders. This gives us a particularly interesting hypothesis for mitigating agency problems with managerial ownership suggested by Scharfstein and Stein (2000). Owner-managers have a virtual ownership stake in most member firms within a *chaebol*, so we argue that “tunneling” hypothesis will be most applicable, a view consistent with the finding by Bae, Kang, and Kim (2002).

The list of our *chaebol* sample is fixed as of the fiscal year ending in 1996. One problem with this definition of *chaebol* is that the sample introduces the survivorship bias in capital allocation practices. That is, the apparent after-crisis improvements in efficiency may be driven by the business groups that kept *chaebol* status in 1996, but dropped out of the list after that. As a check on the robustness of our results, we replicate our regressions more conservatively using a new list of *chaebols*. More specifically, we define top 30 groups based on the asset size every year over the sample period, which allows different combination of business groups eligible for *chaebol* status year by year. Since more than half of the top 30 *chaebol* group firms in 1996 are dropped out after the financial crisis, our original sample period ends at year 2000. But with this new definition of

*chaebol*, our sample period extends to year 2003. The results are reported in Table 8 and are consistent with the main findings in Table 3. As expected, we find less pre-crisis cross-subsidization practices with the new list of *chaebols*, but we can still find the evidence of cross-subsidization when we use the sum of other group firms' cash flows instead of median. Overall, our results do not appear to be driven by the survivorship bias.

## V. Conclusion

Internal capital markets play a major role in allocating capital in diversified firms. The question of whether internal capital markets lead to inefficient capital allocation is still on debate and provides the needs for further empirical investigation across different countries, industries, and periods. In this paper, we provide strong evidence consistent with the existence of the dark side of internal capital markets using a sample of Korean *chaebol* firms during the period from 1991 to 2000. We also provide the evidence of how the efficiency of capital allocation has improved by comparing the results before the financial crisis and after the crisis.

Our main finding is that diversified *chaebol* firms make inefficient investment through the early 1990s before the financial crisis. We first document that *chaebol* firms' investment cannot be justified by good investment opportunities during the whole sample period. By contrast, investment of non-*chaebol* firms is more responsive to investment opportunities. We also find that the relationship between a *chaebol* firm's investment and its own cash flows is negative before the crisis. This finding suggests that poorly performing *chaebol* firms were even making greater investments during the pre-crisis period, and is consistent with the findings in Hoshi, Kashyap, and Sharfstein (1991), where the liquidity of Japanese independent firms has a strong positive relationship with the investment expenditures, while the investment expenditures of Japanese *keiretsu* firms are less sensitive to cash flows. The findings in our paper is also in

line with the arguments reported in Villalonga (2004) where conglomerate diversification continues to generate discounts, while related diversification is associated with premiums especially during the pre-crisis period.

We also find the evidence of cross-subsidization among *chaebol* firms during the pre-crisis period. That is, a *chaebol* firm's investment decision is positively affected by the cash flow of other firms in the same *chaebol* group. Further, the cross-subsidization has been mainly arranged by poorly performing firms, suggesting an inefficient wealth transfer.

Overall, our findings are consistent with the hypothesis addressed in Johnson et al. (2000) that there is a wealth transfer from well-performing group firms to poorly performing firms. This suggests that the existence of the dark side of internal capital markets in Korea before the Asian financial crisis. However, we find little evidence of inefficient capital allocation among *chaebol* firms after the crisis. During our post-crisis sample period from 1999 to 2000, we find a significantly positive relationship between a *chaebol* firm's investment and its own operating cash flows, and the phenomenon of cross-subsidization has substantially reduced. This after-crisis finding is consistent with the view that the discipline by the market is largely restraining the use of inefficient internal capital markets by the *chaebol* firms.

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**Appendix**  
**Pre-crisis Top 30 business groups (*chaebols*) in Korea**

This table shows a list of top 30 *chaebols* before the crisis as of the fiscal year ending in 1996. The table shows the main bank, the number of affiliated firms and the amounts of the internal trading that sell and buy goods and services to and from other affiliated firms during the fiscal year 1996. Hanil Bank and Commercial Bank of Korea merged in 2000 to form Hanvit Bank.

Ranking	Name of <i>Chaebol</i>	Main Bank	Number of affiliated firms	Internal sales / Sales (%) <sup>12</sup>	Number of affiliated financial arms
1	Hyundai	Korea Exchange	57	17.8	6
2	Samsung	Hanil	80	31.5	8
3	LuckyGoldstar(LG)	Korea First	49	18.8	7
4	Daewoo	Korea First	32	35.4	5
5	S.K	Korea First	46	19.2	2
6	Ssangyong	Cho Hung	25	35.5	5
7	Kia	Korea First	28	19.9	3
8	Hanjin	Hanil	24	5.7	2
9	Korea Explosive	Hanil	31	32.6	6
10	Lotte	Commercial	30	7.1	1
11	Kumho	Cho Hung	26	11.8	2
12	Halla	Korea Exchange	18	29.8	0
13	Doosan	Commercial	25	14.6	2
14	Dong-ah	Commercial	19	0.6	1
15	Daelim	Hanil	21	2.0	3
16	Hansol	Hanil	23	17.8	1
17	Kolon	Hanil	24	5.3	0
18	Jinro	Commercial	24	15.4	2
19	Dongkuk	Seoul	17	6.3	1
20	Kohap	Hanil	13	43.3	0
21	Dongbu	Seoul	34	9.0	8
22	Haitai	Cho Hung	15	5.5	4
23	Newcore	Korea First	18	0.0	5
24	Anam	Cho Hung	21	72.6	1
25	Tongyang	Hanil	24	9.8	0
26	Hannil	Hanil	7	1.0	0
27	Keopyung	Cho Hung	22	15.2	0
28	Miwon	Hanil	25	18.7	5
29	Hyosung	Hanil	18	10.2	0
30	Shinho	Korea First	25	9.3	1
Average (median)			27 (24)	17.4 (14.9)	2.7 (2)
Top 5 Average (Median)			53 (49)	24.5 (19.2)	5.6 (6)

<sup>12</sup> The figures are based on Chang and Hong (1998).

**Table 1. Summary statistics of capital expenditure to sales ratio**

Capital expenditure is the sum of changes in fixed assets and depreciation. The sample period is from 1991 to 2000. There are 6,878 firm-year observations: 6,035 non-*chaebol* firm-years and 843 *chaebol* firm-years.

## Panel A: Whole sample

Year	No. Observations	Mean	First Quartile	Median	Third Quartile
1991	475	0.092	0.009	0.040	0.101
1992	476	0.077	-0.003	0.025	0.077
1993	481	0.058	-0.004	0.018	0.070
1994	502	0.050	-0.001	0.017	0.056
1995	529	0.069	0.000	0.024	0.082
1996	723	0.065	-0.001	0.021	0.075
1997	816	0.046	0.003	0.032	0.091
1998	826	-0.012	-0.026	0.017	0.123
1999	937	-0.012	-0.025	0.009	0.073
2000	1113	0.070	-0.010	0.020	0.103
Total	6878	0.045	-0.005	0.021	0.085

Panel B: Non-*chaebol* firms

Year	No. Observations	Mean	First Quartile	Median	Third Quartile
1991	400	0.086	0.009	0.039	0.097
1992	401	0.074	-0.006	0.022	0.072
1993	406	0.055	-0.006	0.017	0.064
1994	424	0.045	-0.003	0.014	0.050
1995	449	0.058	-0.001	0.020	0.074
1996	635	0.053	-0.002	0.019	0.064
1997	727	0.037	0.001	0.028	0.087
1998	736	-0.020	-0.025	0.015	0.119
1999	843	-0.012	-0.023	0.009	0.072
2000	1014	0.080	-0.008	0.022	0.112
Total	6035	0.041	-0.006	0.020	0.082

Panel C: *Chaebol* firms

Year	No. Observations	Mean	First Quartile	Median	Third Quartile
1991	75	0.123	0.011	0.047	0.123
1992	75	0.089	0.006	0.045	0.117
1993	75	0.073	0.001	0.024	0.107
1994	78	0.080	0.008	0.035	0.074
1995	80	0.130	0.007	0.050	0.146
1996	88	0.155	0.018	0.058	0.165
1997	89	0.117	0.015	0.055	0.127
1998	90	0.057	-0.036	0.036	0.161
1999	94	-0.006	-0.035	-0.001	0.075
2000	99	-0.035	-0.031	0.001	0.032
Total	843	0.077	0.000	0.035	0.109

**Table 2. Descriptive statistics: *Chaebol* firms vs. *Non-Chaebol* firms**

Total assets are first normalized into year 2000 Korean Won using the year-end Korean Consumer Price Index, then translated into US dollars using Korean Won/ US Dollar exchange at the end of year 2000. Market to Book is defined as (book value of assets-book value of equity + market value of equity)/assets. Cash Flow is defined as (operating income plus depreciation) divided by net assets. Net working capital is defined as (current assets minus current liabilities minus cash) divided by net assets. Total leverage is defined as long-term plus short-term debt/total assets. Capital expenditures are defined as (changes in fixed asset plus depreciation) divided by net assets. Industry is defined as the same 2 digit of Standard Industry Code for Korea. R&D is R&D divided by net assets. When R&D is listed as missing, it is set to zero. Cash is the sum of cash on hand (#1100) and marketable securities (#1140). Net-assets are assets minus cash. Compensating balance is the sum of other deposits (#1134) and short-term financial instruments (#1220). If compensating balance is missing than compensating balance is equal to the cash (#1100). If compensating balance/average bank loan is greater than 10, we treat them as missing. Interest is interest expenses (#6110).

	All		Non- <i>chaebol</i>		<i>Chaebol</i>		Difference			
	Mean	Median	Mean	Median	Mean	Median	Mean	<i>t</i> -stat	Median	<i>p</i> -value
Total assets (in million USD)	447.6	91.6	306.9	75.9	1455.3	706.5	-1148.4	-14.07	-630.6	0.00
Market to book ratio	1.122	0.960	1.138	0.958	1.006	0.964	0.132	5.15	-0.006	0.48
Cash flow	0.062	0.065	0.062	0.066	0.057	0.059	0.006	2.17	0.007	0.00
Net working capital	-0.004	0.003	0.007	0.014	-0.082	-0.078	0.089	10.71	0.092	0.00
Leverage	0.676	0.650	0.663	0.631	0.768	0.757	-0.105	-9.99	-0.127	0.00
Bank loan / Debt	0.411	0.412	0.414	0.414	0.389	0.396	0.025	4.06	0.019	0.00
Capital expenditures	0.045	0.022	0.044	0.020	0.051	0.033	-0.007	-1.48	-0.013	0.00
R&D / Net assets	0.002	0.000	0.002	0.000	0.001	0.000	0.001	5.17	0.000	0.00
Cash / Net assets	0.120	0.073	0.128	0.078	0.067	0.044	0.060	17.82	0.035	0.00
Compensating balances / Average bank loan	0.528	0.224	0.570	0.248	0.233	0.106	0.337	14.37	0.143	0.00
Interest / Avg. bank loan	0.378	0.146	0.273	0.145	1.123	0.157	-0.851	-1.01	-0.012	0.00

**Table 3. Estimation of capital expenditure deviation (*CAPXDEV*) to industry *Q* and cash flow: All *chaebol* firms**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the *chaebol* firms' investment. The sample period is from 1992 to 2000. The pre-crisis subperiod is between 1992 and 1996, and the post-crisis subperiod is between 1999 and 2000. *t*-stats are in parentheses. Dependent Variable (*CAPXDEV*) is defined as capital expenditures/sales for diversified *chaebol* firms minus capital expenditures/sales for industry median for single segment firms. *IndustryQ* is the median beginning-of-period *Q* of all non-*chaebol* firms in the same 2-digit SIC code. *Q* is defined as (firm's book value of total assets + market value of outstanding shares – book value of equity) / firm's book value of total assets, and *CFSDEV* is the ratio of *chaebol* firm's cash-flow to sales less the industry median ratio of cash flow to sales for single-segment firms. Cash-flow is defined as segment operating income plus depreciation. *Other\_CFSDEV* is the median *CFSDEV* value of all other affiliated group firms. Significant at 1% (\*\*\*) , 5% (\*\*), and 10% (\*) levels.

Panel A: Full sample (1992-2000)			
	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.022 (0.47)	0.025 (0.52)	0.025 (0.51)
<i>CFSDEV</i>		0.265* (1.70)	0.232 (1.38)
<i>Other_CFSDEV</i>			0.173 (0.94)
Year Dummy	Yes	Yes	Yes
No. Obs	724	724	689
Adj- <i>R</i> <sup>2</sup>	0.0144	0.017	0.0144
Panel B: Pre-crisis sub-period (1992-1996)			
	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.128 (0.65)	0.064 (0.33)	0.106 (0.52)
<i>CFSDEV</i>		-1.198*** (-4.32)	-1.122*** (-3.88)
<i>Other_CFSDEV</i>			1.032*** (2.75)
Year Dummy	Yes	Yes	Yes
No. Obs	376	376	350
Adj- <i>R</i> <sup>2</sup>	-0.0075	0.0383	0.0590

**Table 3 - Continued**  
 Panel C: Post-crisis sub-period (1999-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.020 (0.24)	0.042 (0.52)	0.044 (0.54)
<i>CFSDEV</i>		2.300*** (3.35)	2.526*** (3.34)
<i>Other_CFSDEV</i>			-0.119 (-0.11)
Year Dummy	Yes	Yes	Yes
No. Obs	173	173	169
Adj- <i>R</i> <sup>2</sup>	-0.0037	0.0533	0.0510

**Table 4. Estimation of capital expenditure deviation (*CAPXDEV*) to industry *Q* and cash flow: *Chaebol* firms with superior and inferior operating performance**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the *chaebol* firms' investment. The sample period is from 1992 to 2000. The pre-crisis subperiod is between 1992 and 1996, and the post-crisis subperiod is between 1999 and 2000. *t*-stats are in parentheses. The statistics are provided for *chaebol* firms with superior (part I of the table) or inferior (part II) operating performance. Superior (Inferior) operating performance firms are *chaebol* firms with above-median (below-median) *CFSDEV*. Dependent Variable (*CAPXDEV*) is defined as capital expenditures/sales for diversified *chaebol* firms minus capital expenditures/sales for industry median for single segment firms. *IndustryQ* is the median beginning-of-period *Q* of all non-*chaebol* firms in the same 2-digit SIC code. *Q* is defined as (firm's book value of total assets + market value of outstanding shares – book value of equity) / firm's book value of total assets, and *CFSDEV* is the ratio of *chaebol* firm's cash-flow to sales less the industry median ratio of cash flow to sales for single-segment firms. Cash-flow is defined as segment operating income plus depreciation. *Other\_CFSDEV* is the median *CFSDEV* value of all other affiliated group firms. Significant at 1% (\*\*\*) , 5% (\*\*), and 10% (\*) levels.

Part I: *Chaebol* firms with superior operating performance

	Model 1	Model 2	Model 3
Panel A: Full sample (1992-2000)			
<i>IndustryQ</i>	-0.09 (-0.75)	-0.088 (-0.73)	-0.072 (-0.58)
<i>CFSDEV</i>		-0.25 (-1.03)	-0.259 (-1.05)
<i>Other_CFSDEV</i>			0.139 (0.61)
Year Dummy	Yes	Yes	Yes
No. Obs	365	365	351
Adj- <i>R</i> <sup>2</sup>	-0.0096	-0.0094	-0.0128
Panel B: Pre-crisis sub-period (1992-1996)			
	Model 1	Model 2	Model 3
<i>IndustryQ</i>	-0.139 (-0.77)	-0.142 (-0.78)	-0.105 (-0.53)
<i>CFSDEV</i>		-0.459 (-1.25)	-0.426 (-1.12)
<i>Other_CFSDEV</i>			0.246 (0.77)
Year Dummy	Yes	Yes	Yes
No. Obs	190	190	179
Adj- <i>R</i> <sup>2</sup>	-0.0094	-0.0063	-0.0980

**Table 4 – Continued**

Panel C: Post-crisis sub-period (1999-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.080 (0.52)	0.084 (0.54)	0.085 (0.53)
<i>CFSDEV</i>		-0.237 (-0.75)	-0.251 (-0.77)
<i>Other_CFSDEV</i>			0.011 (0.03)
Year Dummy	Yes	Yes	Yes
No. Obs	87	87	85
Adj- <i>R</i> <sup>2</sup>	-0.0201	-0.0255	-0.0383

Part II: *Chaebol* firms with inferior operating performance

Panel D: Full sample (1992-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.064 (0.97)	0.063 (0.96)	0.062 (0.91)
<i>CFSDEV</i>		0.294 (1.14)	0.300 (1.08)
<i>Other_CFSDEV</i>			0.133 (0.48)
Year Dummy	Yes	Yes	Yes
No. Obs	359	359	338
Adj- <i>R</i> <sup>2</sup>	0.0303	0.0311	0.0258



**Table 4 - Continued**

	Model 1	Model 2	Model 3
Panel E: Pre-crisis sub-period (1992-1996)			
<i>IndustryQ</i>	0.519 (1.48)	0.28 (0.81)	0.215 (0.59)
<i>CFSDEV</i>		-2.528*** (-3.86)	-2.222*** (-3.16)
<i>Other_CFSDEV</i>			1.662** (2.06)
Year Dummy	Yes	Yes	Yes
No. Obs	186	186	171
Adj- <i>R</i> <sup>2</sup>	0.0081	0.0793	0.0997
Panel F: Post-crisis sub-period (1999-2000)			
	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.056 (0.47)	0.050 (0.44)	0.049 (0.43)
<i>CFSDEV</i>		5.130*** (3.00)	6.572*** (3.31)
<i>Other_CFSDEV</i>			-0.871 (-0.47)
Year Dummy	Yes	Yes	Yes
No. Obs	86	86	84
Adj- <i>R</i> <sup>2</sup>	-0.0061	0.0823	0.0943

**Table 5. Estimation of capital expenditure (CAPXS) to industry Q and cash flow: All *chaebol* firms**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the *chaebol* firms' investment. The sample period is from 1992 to 2000. The pre-crisis subperiod is between 1992 and 1996, and the post-crisis subperiod is between 1999 and 2000. *t*-stats are in parentheses. Dependent Variable (CAPXS) is capital expenditures/sales for diversified *chaebol* firms, *IndustryQ* is the median beginning-of-period *Q* of all non-*chaebol* firms in the same 2-digit SIC code, and *CFS* is the cash-flow to sales ratio, where cash-flow is the operating income plus depreciation. *Other\_CFS* is the median *CFS* value of all other affiliated group firms. Significant at 1% (\*\*\*) , 5% (\*\*), and 10% (\*) levels.

	Model 1	Model 2	Model 3
Panel A: Full sample (1992-2000)			
<i>IndustryQ</i>	0.041 (0.88)	0.043 (0.93)	0.042 (0.90)
<i>CFS</i>		0.370** (2.36)	0.327* (1.90)
<i>Other_CFS</i>			0.144 (0.78)
Year Dummy	Yes	Yes	Yes
No. Obs	724	724	689
Adj- <i>R</i> <sup>2</sup>	0.0229	0.0291	0.0256
Panel B: Pre-crisis sub-period (1992-1996)			
	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.106 (0.56)	0.048 (0.26)	0.017 (0.09)
<i>CFS</i>		-0.960*** (-3.33)	-1.049*** (-3.53)
<i>Other_CFS</i>			1.772*** (4.85)
Year Dummy	Yes	Yes	Yes
No. Obs	376	376	350
Adj- <i>R</i> <sup>2</sup>	-0.0003	0.0263	0.0930

**Table 5 - Continued**  
 Panel C: Post-crisis sub-period (1999-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.039 (0.47)	0.055 (0.69)	0.053 (0.66)
<i>CFS</i>		2.954*** (3.87)	3.607*** (4.25)
<i>Other_CFS</i>			-1.594 (-1.44)
Year Dummy	Yes	Yes	Yes
No. Obs	173	173	169
Adj- <i>R</i> <sup>2</sup>	-0.0049	0.0716	0.0825

**Table 6. Estimation of capital expenditure (CAPXS) to industry Q and cash flow: All Non-Chaebol firms**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the non-chaebol firms' investment. The sample period is from 1992 to 2000. The pre-crisis subperiod is between 1992 and 1996, and the post-crisis subperiod is between 1999 and 2000. *t*-stats are in parentheses. Dependent Variable (CAPXS) is capital expenditures/sales for diversified chaebol firms, *IndustryQ* is the median beginning-of-period *Q* of all non-chaebol firms in the same 2-digit SIC code, and *CFS* is the cash-flow to sales ratio, where cash-flow is the operating income plus depreciation. *Other\_CFS* is the median *CFS* value of all other affiliated group firms Significant at 1% (\*\*\*), 5% (\*\*), and 10% (\*) levels.

Panel A: Full sample (1992-2000)		
	Model 1	Model 2
<i>IndustryQ</i>	0.040*** (5.49)	0.040*** (5.67)
<i>CFS</i>		0.234*** (19.64)
Year Dummy	Yes	Yes
No. Obs	5581	5581
Adj- <i>R</i> <sup>2</sup>	0.0065	0.0707
Panel B: Pre-crisis sub-period (1992-1996)		
	Model 1	Model 2
<i>IndustryQ</i>	0.116*** (3.68)	0.115*** (3.66)
<i>CFS</i>		0.033 (0.74)
Year Dummy	Yes	Yes
No. Obs	2301	2301
Adj- <i>R</i> <sup>2</sup>	0.0061	0.0059
Panel C: Post-crisis sub-period (1999-2000)		
	Model 1	Model 2
<i>IndustryQ</i>	0.038*** (4.04)	0.039*** (4.57)
<i>CFS</i>		0.416*** (21.17)
Year Dummy	Yes	Yes
No. Obs	1832	1832
Adj- <i>R</i> <sup>2</sup>	0.0100	0.2044

**Table 7. Estimation of capital expenditure (CAPXS) to industry Q and cash flow: Chaebol firms with superior and inferior operating performance**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the *chaebol* firms' investment. The sample period is from 1992 to 2000. The pre-crisis subperiod is between 1992 and 1996, and the post-crisis subperiod is between 1999 and 2000. *t*-stats are in parentheses. The statistics are provided for *chaebol* firms with superior (part I of the table) or inferior (part II) operating performance. Superior (Inferior) operating performance firms are *chaebol* firms with above-median (below-median) *CFS*. Dependent Variable (*CAPXS*) is capital expenditures/sales for diversified *chaebol* firms, *IndustryQ* is the median beginning-of-period *Q* of all non-*chaebol* firms in the same 2-digit SIC code, and *CFS* is the cash-flow to sales ratio, where cash-flow is the operating income plus depreciation. *Other\_CFS* is the median *CFS* value of all other affiliated group firms Significant at 1% (\*\*\*) , 5% (\*\*), and 10% (\*) levels.

Part I: *Chaebol* firms with superior operating performance

Panel A: Full sample (1992-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.001 (0.02)	0.000 (0.02)	0.000 (0.00)
<i>CFS</i>		-0.282 (-1.18)	-0.421* (-1.75)
<i>Other_CFS</i>			-0.026 (-0.15)
Year Dummy	Yes	Yes	Yes
No. Obs	362	362	351
Adj- <i>R</i> <sup>2</sup>	0.0146	0.0158	0.0152

Panel B: Pre-crisis sub-period (1992-1996)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.037 (0.21)	0.038 (0.21)	0.067 (0.35)
<i>CFS</i>		-0.007 (-0.02)	-0.124 (-0.36)
<i>Other_CFS</i>			0.626** (2.13)
Year Dummy	Yes	Yes	Yes
No. Obs	188	188	178
Adj- <i>R</i> <sup>2</sup>	-0.0233	-0.0289	-0.0084

**Table 7 – Continued**

Panel C: Post-crisis sub-period (1999-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	-0.003 (-0.09)	-0.004 (-0.14)	-0.004 (-0.12)
<i>CFS</i>		-0.768* (-1.71)	-0.792* (-1.67)
<i>Other_CFS</i>			0.069 (0.17)
Year Dummy	Yes	Yes	Yes
No. Obs	86	86	86
Adj-R <sup>2</sup>	-0.0240	-0.0010	-0.0129

Part II: *Chaebol* firms with inferior operating performance

Panel D: Full sample (1992-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.084 (1.07)	0.084 (1.08)	0.084 (1.04)
<i>CFS</i>		0.351 (1.35)	0.347 (1.22)
<i>Other_CFS</i>			0.132 (0.46)
Year Dummy	Yes	Yes	Yes
No. Obs	362	362	338
Adj-R <sup>2</sup>	0.0333	0.0355	0.0308

**Table 7 – Continued**

Panel E: Pre-crisis sub-period (1992-1996)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.198 (0.62)	-0.071 (-0.23)	-0.293 (-0.92)
<i>CFS</i>		-3.430*** (-4.46)	-3.276*** (-4.21)
<i>Other_CFS</i>			3.179*** (4.36)
Year Dummy	Yes	Yes	Yes
No. Obs	188	188	172
Adj- <i>R</i> <sup>2</sup>	0.006	0.0993	0.1926

Panel F: Post-crisis sub-period (1999-2000)

	Model 1	Model 2	Model 3
<i>IndustryQ</i>	0.082 (0.58)	0.087 (0.65)	0.088 (0.65)
<i>CFS</i>		5.612*** (3.38)	7.127*** (3.81)
<i>Other_CFS</i>			-2.655 (-1.29)
Year Dummy	Yes	Yes	Yes
No. Obs	87	87	83
Adj- <i>R</i> <sup>2</sup>	-0.0080	0.1033	0.1257

**Table 8. Estimation of capital expenditure deviation (*CAPXDEV*) to industry *Q* and cash flow: Annually updated *chaebol* firms**

This table presents results from the OLS regressions that estimate the impact of investment opportunities and cash flows (own or of other group firms) on the *chaebol* firms' investment. The top 30 *chaebol* groups are selected based on asset size every year during the sample period from 1991 to 2003. The pre-crisis subperiod is between 1991 and 1996, and the post-crisis subperiod is between 1999 and 2003. *t*-stats are in parentheses. Dependent Variable (*CAPXDEV*) is defined as capital expenditures/sales for diversified *chaebol* firms minus capital expenditures/sales for industry median for single segment firms. *IndustryQ* is the median beginning-of-period *Q* of all non-*chaebol* firms in the same 2-digit SIC code. *Q* is defined as (firm's book value of total assets + market value of outstanding shares – book value of equity) / firm's book value of total assets, and *CFSDEV* is the ratio of *chaebol* firm's cash-flow to sales less the industry median ratio of cash flow to sales for single-segment firms. Cash-flow is defined as segment operating income plus depreciation. *Other\_CFSDEV* is the median (Model 3) or sum (Model 4) of *CFSDEV* value of all other affiliated group firms. Significant at 1% (\*\*\*), 5% (\*\*), and 10% (\*) levels.

	Model 1	Model 2	Model 3	Model 4
Panel A: Full sample (1991-2003)				
<i>IndustryQ</i>	-0.004 (-0.28)	-0.011 (-0.69)	-0.008 (-0.52)	-0.009 (-0.56)
<i>CFSDEV</i>		0.03*** (2.38)	0.027* (1.78)	0.023 (1.60)
<i>Other_CFSDEV</i>			0.006 (0.22)	0.005 (0.85)
Year Dummy	Yes	Yes	Yes	Yes
No. Obs	1497	1497	1275	1311
Adj- <i>R</i> <sup>2</sup>	0.0535	0.0564	0.0509	0.0501
Panel B: Pre-crisis sub-period (1991-1996)				
	Model 1	Model 2	Model 3	Model 4
<i>IndustryQ</i>	-0.067 (-1.21)	-0.045 (-0.83)	-0.019 (-0.34)	-0.022 (-0.41)
<i>CFSDEV</i>		-0.163*** (-5.12)	-0.183*** (-5.43)	-0.176*** (-5.21)
<i>Other_CFSDEV</i>			0.068 (0.48)	0.030* (1.83)
Year Dummy	Yes	Yes	Yes	Yes
No. Obs	744	744	649	649
Adj- <i>R</i> <sup>2</sup>	0.0565	0.0877	0.083	0.0874



**Table 8 – Continued**  
 Panel C: Post-crisis sub-period (1999-2003)

	Model 1	Model 2	Model 3	Model 4
<i>IndustryQ</i>	0.012 (0.82)	0.000 (0.00)	-0.001 (-0.09)	-0.001 -0.09
<i>CFSDEV</i>		0.056*** (3.59)	0.065*** (3.59)	0.058*** (3.24)
<i>Other_CFSDEV</i>			0.015 (0.40)	0.003 (0.50)
Year Dummy	Yes	Yes	Yes	Yes
No. Obs	487	487	380	416
Adj- <i>R</i> <sup>2</sup>	-0.0063	0.018	0.0251	0.0163