

# Internal Capital Markets in Business Groups: Evidence from the Asian Financial Crisis

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## Abstract

This paper provides new evidence on the efficiency of capital allocation of business groups' internal capital markets, by comparing the investment behavior and the performance of Korean business group (*chaebol*) firms with non-*chaebol* Korean firms in the aftermath of the 1997 Asian financial crisis. We employ a difference-in-differences matching estimator to control for observable (and time-invariant unobservable) dimensions other than *chaebol* affiliation, and a battery of placebo and other related tests to evaluate alternative explanations such as selection of firms into *chaebol*, and demand effects that differentially affect *chaebol* and control firms. The results show that *chaebol* firms invest significantly more than control firms in the aftermath of the crisis. This pattern does not hold for normal periods, including a recession year. *Chaebol* firm post-crisis investment is positively associated with variables that proxy for the availability of internal capital markets, including industry diversification within *chaebol* and *chaebol* liquidity. *Chaebol* firms with greater investment opportunities increased investment the most in the aftermath of the crisis, a pattern that is not observed in the control group. Finally, we find that *chaebol* firms performed better than control firms in the aftermath of the crisis. *Chaebol* firm profitability increased relative to control firms in the years following the crisis. *Chaebol* firms also suffer a lower decline in market value than other similar firms at the onset of the Asian crisis. Overall, our results suggest that Korean *chaebol* used their internal capital markets to mitigate the negative effects of the Asian crisis on corporate investment.

Key words: G32, G34.

JEL classification: *Chaebol*, corporate investment, difference-in-differences matching estimator, family firms, capital reallocation.

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# 1 Introduction

The efficiency of resource allocation by conglomerates is an important research subject to financial economists. Conglomerates can form internal capital markets that can either enhance or degrade resource allocation. Alchian (1969), Weston (1970), Gertner et al. (1994), and Stein (1997) argue that internal capital markets improve capital allocation within conglomerates by avoiding information asymmetries between managers and outside investors, and by allocating scarce resources across divisions via ‘winner picking’. Recent evidence suggests that conglomerates’ internal capital markets allow these firms to save less cash than stand-alone firms (Duchin, 2010). On the other hand, Rajan et al. (2000), and Scharfstein and Stein (2000) assert that internal capital markets hinder investment efficiency because moral hazard and rent-seeking by corporate and division managers coupled with non-enforceable contracts create distortions in resource allocation.<sup>1</sup>

Most of the literature on internal capital markets focuses on multi-segment firms, which are common in the US. Another type of organization that shares many of the features of US-type conglomerates is a “business group” (a group of firms under common ownership). Business groups are prevalent around the world (Claessens et al. (2002), Faccio and Lang (2002)). Although business groups and multi-division firms are different in many respects (for instance, a business group is formed by legally independent firms while a US-type conglomerate is typically a single firm with multiple divisions), they both have internal markets that can allocate capital among member firms in the case of business groups, and among divisions in the case of conglomerates. Nevertheless, the literature on internal capital markets in business groups is relatively sparse.<sup>2</sup>

Studying resource allocation by business groups is important because there is an ongoing debate about whether business groups are beneficial or detrimental to firm performance and economic growth. Previous papers suggest that business groups may reduce firm performance (see, e.g., Claessens et al., 2002), perhaps because of tunneling incentives created by pyramidal ownership structures (Bertrand, Mehta, and Mullainathan, 2002). In particular, there are several papers that associate Korean business groups with largely negative firm-level outcomes (Bae, Kang, and Kim (2002), Ferris, Kim and Kitsabunnarat (2003), Joh (2003), Baek, Kang and Park (2004), and Baek, Kang, and Lee (2006)). In contrast, recent papers point out that some of the findings of this previous literature can be explained by selection of particular types of firms into pyramidal business groups, and may not be due to tunneling (see, e.g., Almeida et al. (2011) and Masulis, Pham and Zein (2011)). Khanna and Palepu (2000) and Khanna and Yafeh (2007) also present a more positive view of the role of business groups in emerging markets, arguing that business groups help overcome the lack of institutional and financial development in emerging economies. Consistent with this positive view of business groups,

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<sup>1</sup>See Stein (2003) and Maksimovic and Philips (2007) for surveys of this literature.

<sup>2</sup>Hoshi, Kashyap and Scharfstein (1991), and Gopalan, Nanda and Seru (2006) are important exceptions. We discuss the relationship between our paper and these other papers below.

Gopalan, Nanda and Seru (2006) find that intra-group loans in Indian business groups are used to support financially distressed firms in the group, rather than for tunneling purposes.<sup>3</sup>

In this paper, we study capital allocation in Korean business groups (Korean *chaebol*). In particular, we focus on an event which likely exacerbates the impact of *chaebol*'s internal capital markets on resource allocation – the Asian crisis of 1997. The 1997 Asian crisis was a truly unprecedented and unexpected event that greatly affected Asian economies. The Asian crisis made it very difficult for firms to raise external capital. As we show later, important sources of external finance (such as bank loans and bonds) became more costly or virtually impossible to access in the immediate aftermath of the crisis. In such an environment of extreme financial stress, Korean business groups' ability to reallocate resources internally across group firms can be particularly important. The crisis can also exacerbate managers' incentives to engage in tunneling and expropriation due to its impact on the expected rate of return on investment (Johnson et al., 2000). In this sense, the aftermath of the Asian financial crisis is an ideal laboratory to study both the bright and the dark sides of business groups' internal capital markets.

We discuss our empirical methodology and identification strategy in detail in Section 2.3. In short, our empirical strategy is to compare changes in investment and other outcomes across *chaebol* and non-*chaebol* control firms, from the period prior to the end-of-1997 Asian crisis to the period following the crisis.<sup>4</sup> Since the Asian crisis was unexpected, it is unlikely that *chaebol* changed their structure in anticipation of the crisis. Still, there can be relevant differences across *chaebol* and non-*chaebol* firms that may affect their post-crisis behavior. In order to address this possibility, we choose a control group of non-*chaebol* firms via a matching procedure to minimize the impact of observable pre-crisis differences between *chaebol* and control firms. The difference-in-differences matching estimator also removes biases in post-crisis period comparisons between treated and control groups that could be the result of permanent (that is, time invariant) differences between the two groups. Finally, we conduct a battery of placebo and other related tests that allow us to rule out most alternative explanations that rely on endogenous selection of firms into *chaebol*, and demand effects that may differentially affect *chaebol* and control firms following the crisis.

Our empirical results are consistent with the active workings of internal capital markets in *chaebol*. Not surprisingly, we find that corporate investment declines in the aftermath of the crisis. *Chaebol* firms, for example, decrease annual investment from 10.4% of assets to 7.2% of assets on average. While this is a significant decline in investment, it is substantially lower than the decrease in investment for the sample of control firms. Control firms are indistinguishable from *chaebol* firms along several (pre-crisis) dimensions, including Tobin's Q, profitability, cash holdings, investment and leverage. Nevertheless, their investment declines significantly more, from 10.8% of assets pre-crisis, to only 2.1%

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<sup>3</sup>See also Morck, Wolfenzon and Yeung (2005) for a survey of theory and evidence on the bright and dark sides of business groups.

<sup>4</sup>We use either 1997 or 1996 as our baseline year, and examine outcomes as of 1998 and later.

of assets after the crisis. The difference-in-differences in investment rates across *chaebol* and control firms is large (5.6%), and highly statistically significant. The average treatment effect (ATT) estimated by the matching procedure is even higher (6.7%), suggesting that *chaebol* firms were able to invest significantly more than control firms in the aftermath of the financial crisis.<sup>5</sup>

In addition, we do not find differences in investment activities across *chaebol* and control firms over normal, non-crisis periods, and in a recession year that generated a decrease in the demand for investment but was not associated with financial turmoil (1992). We also attempt to rule out two alternative explanations for our results. First, *chaebol* may have had preferential access to external funds following the crisis due to their political links and important status in the Korean economy. However, we find no significant differences in proxies for equity and debt financing following the crisis across *chaebol* and non-*chaebol* firms. Second, we show that the results hold even for a sample of low leverage firms, thus providing evidence against the hypothesis that an increase in distress risk induced by the crisis may explain the differential investment response across groups. We also provide evidence that the lower decline in investment in *chaebol* firms is due to the operation of internal capital markets. First, there is a positive relationship between the investment of a *chaebol* firm and the cash flow of other *chaebol* member firms. Second, we uncover evidence that more diversified business groups experience lower reduction in investments than more focused groups, which is consistent with the idea that *chaebol* firms cross-subsidize each other in the aftermath of the Asian crisis. These *chaebol*-specific findings do not hold for pseudo-*chaebol* that we construct using the control firms.

*Chaebol*'s ability to sustain investment levels following the crisis does not prove that they allocate capital to efficient uses. It is also possible that they do not cut investment as much as they should (overinvestment), or that they allocate capital to the wrong firms (corporate socialism). In order to examine these hypothesis, we perform two complementary tests. First, we examine the relationship between investment and investment opportunities ( $Q$ ) for *chaebol* and control firms in the aftermath of the crisis. Second, we examine differences in firm performance across these two sets of firms in the years following the Asian crisis.

Our evidence suggests that the relationship between investment and  $Q$  in the aftermath of the crisis was much stronger among *chaebol* than for control firms. In fact, control firms with the highest  $Q$  observed the greatest declines in investment (relative to other firms in the same industry), suggesting that financial constraints may have tightened the most for high  $Q$  firms. However, high  $Q$  firms that belonged to *chaebol* invested significantly more than other industry firms, suggesting that *chaebol* actively engaged in "winner-picking". In other words, while stand-alone firms with high  $Q$  appeared to suffer the most with the crisis, similar *chaebol* firms were able to maintain their investment levels. The evidence also suggests that *chaebol* firms perform better than control firms in the aftermath of the

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<sup>5</sup>We perform a battery of tests to verify the robustness of these results in Section 3.2.3. Among others, we examine the possibilities that the results are driven by only one or a few *chaebol*, differential rates of bankruptcy across *chaebol* and control firms, and differential access to foreign ownership.

crisis. Their industry-adjusted cash flows are significantly higher than those of control firms, up to three years after the Asian crisis. These results suggest that *chaebol* structure mitigates underinvestment by reallocating capital towards efficient uses in the aftermath of the Asian crisis. The results support Khanna and Palepu's (2000) assertion that firms affiliated with diversified business groups can perform better than independent firms in emerging markets, because of business groups' ability to overcome market imperfections (imperfections that were likely magnified during the Asian crisis).

The positive role of *chaebol*' internal capital markets that we document in this paper contrasts with previous literature, which associates *chaebol* with largely negative outcomes. For example, Ferris, Kim and Kitsabunnarat (2003) find a negative correlation between Korean *chaebol* membership and Tobin's Q. Joh (2003) examines the effects of corporate governance on Korean firms before the Asian crisis, and finds evidence that firms affiliated with large business groups underperform relative to independent firms. The paper that is closest to ours is Baek, Kang and Park (2004) who focus on the effects of the Asian crisis on the valuation of Korean firms. They examine holding period returns around November 18, 1997 (which they define as the event date for the crisis), and find evidence of a negative coefficient on the interaction between a "*chaebol* dummy" and a measure of ownership concentration by family owners. They interpret this finding as evidence that *chaebol* firms with concentrated ownership by controlling shareholders experience a larger decrease in equity value. This result is not inconsistent with the results that we find in this paper. Baek et al. also report evidence that the coefficient on the "*chaebol* dummy" is positive, suggesting that *chaebol* firms experienced a lower decrease in equity value than non-*chaebol* firms at the onset of the Asian crisis. As Baek et al. state in their paper (see p. 281), this result suggests that "...*chaebol* affiliation makes a firm less sensitive to the financial crisis".

To ensure that crisis-induced changes in valuation are consistent with the other results reported in the paper, we examine holding period returns in the same period analyzed by Baek et al. (- 5 to 32 days around November 18, 1997), for *chaebol* and control firms in our sample. To the extent that the market could anticipate the superior post-crisis performance of *chaebol* firms, we should expect higher holding period returns for *chaebol* firms at the onset of the crisis. In fact, we find that *chaebol* affiliates experience a return of -36.7%, compared to -47.8% for similar firms that do not belong to *chaebol* (the control group).

It is important that we discuss the differences between our paper and other papers that examine the role of internal capital markets in business groups. Hoshi, Kashyap and Scharfstein (1991), who examine the difference in investment-cash flow sensitivities across Japanese Keiretsu and non-Keiretsu firms, is a classic reference in this literature. Our methodology avoids the explicit use of investment-cash flow sensitivities, whose usefulness has been questioned in the corporate finance literature. In addition, Korean *chaebol* are probably more suitable for studying the efficiency of internal capital markets than Japanese Keiretsu, since the presence of an owner-manager in *chaebol* creates a greater degree of control and coordination among member firms. The main difference between our paper and

that of Gopalan, Nanda and Seru (2006) is that we focus on the effect of internal capital markets on investment and performance, while they focus on whether groups use internal cash transfers to support group firms that are close to distress. In addition, we focus our analysis on a period of market stress in which both the bright and the dark side of business groups can be exacerbated. Nevertheless, our findings are highly complementary since both papers suggest a largely positive role for internal capital markets in business groups.

Our paper is also related to the literature on internal capital markets in multi-segment firms (e.g., conglomerates). One advantage of using Korean business group data to study internal capital markets is that it may help avoid well-known limitations of segment-level data. Segment-level data are affected by firms' ability to reorganize their segments over time. Furthermore, segments' accounting data may not reflect true values due to arbitrary, and unstable over time allocation of overhead costs and assets among segments (see Berger and Ofek (1995), Lamont (1997), and Shin and Stulz (1998) for additional discussion). In contrast, Korean *chaebol* are composed of legally independent companies that must report their financial information following accounting standards that are strict, and constant over time.<sup>6</sup> Despite this difference in reporting standards, our results are consistent with those in recent papers that examine the efficiency of internal capital markets in times of market turmoil and distress. Gopalan and Xie's (2011) results suggest that US conglomerates' internal capital markets step in during periods of industry distress, and allow conglomerate segments to invest more in R&D during such episodes. Matvos and Seru (2011) find evidence that US conglomerates become more efficient in resource allocation in period of financial market dislocation. Kuppuswamy and Villalonga (2010) find evidence that internal capital markets helped US conglomerates overcome the 2008-2009 financial crisis.

The paper is organized as follows. Our empirical strategy is discussed in detail in Section 2. Section 3 reports empirical results and Section 4 concludes the paper.

## 2 Empirical Strategy

Our main objective is to determine whether and how the internal capital market of *chaebol* affects capital allocation. In this section we describe our identification strategy in greater detail.

### 2.1 The 1997 Asian Financial Crisis

The 1997 Asian currency crisis was truly an unprecedented event in its scale and scope. Many Korean banks and corporations, even better and well known ones, went bankrupt.<sup>7</sup> There were sharp and

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<sup>6</sup>The Korean Accounting Standards Board (KASB) uses accounting standards that are similar to US-GAAP.

<sup>7</sup>For example, the Daewoo group, the fourth largest *chaebol* with the asset size of 3.7 trillion won as of 1997, went bankrupt. The Korea First Bank, one of the most prominent banks in Korea, also went bankrupt.

dramatic changes in interest rates and exchange rates as can be seen in Figure 1.

FIGURE 1 ABOUT HERE

Panel A of Figure 1 shows interest rate changes from January 1995 to June 2011. The biggest impacts occurred in December 1997 (the Asian crisis), and October 2008 (the recent financial crisis). The interest rate on 3-year AA corporate bonds, for example, increased from 14.1% to 24.3% in December. The corresponding interest changes over the 2008 crisis is much smaller. The interest rate on 3-year AA corporate bond changes from 7.46% in September 2008 to 7.95% in October 2008. The 3-year treasury bond rate actually declines from 5.81% to 5.09% over the same period. Panel B shows changes in the Korean Stock Price Index (KOSPI). Over the Asian currency crisis the KOSPI dropped by 23.6%. During the recent crisis, the KOSPI declines by 18.5% from September to October. Panel C shows changes in exchange rates. While the exchange rate increases by 37.2 percent from 1,033.23 to 1,499.38 Korean Won per USD over the Asian currency crisis, it shows only a 15.5% increase in the case of the 2008 crisis. Clearly, the Asian currency crisis had a more sweeping influence on the Korean economy when compared to the recent financial crisis.

Seemingly independent segments of financial markets during normal times may become strongly interdependent if a significant shock hits the economy. The 1997 Asian crisis was no exception. Bank loans, bond issuance and equity issuance were all difficult to complete. As shown in Table 1, the number of bond and stock issuances dramatically decreased in 1998, the year right after the crisis. The number of bond issues in 1998 is less than half of its level in 1997 and the frequency of stock issuances also sharply decreased by 30 percent over the same crisis period. This credit crunch is a natural setting in which to examine the effects of internal capital markets on firms' capital allocation.

TABLE 1 ABOUT HERE

## 2.2 Matching estimators

Since the Asian crisis was unexpected, it is highly unlikely that *chaebol* changed their structure in anticipation of the effects of the crisis. This argument suggests that *chaebol* membership at the time of the crisis is likely exogenous to the post-crisis outcomes. Nevertheless, one can still argue that variables that predict *chaebol* membership in “normal” periods may also explain post-crisis behavior. The matching estimator technique helps us minimize such concerns, by accounting for the effect of observables in a non-parametric way.

We employ a difference-in-differences matching estimator (DID-ME).<sup>8</sup> Essentially, this strategy entails forming a group of control observations from the population of non treated observations, by

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<sup>8</sup>The matching estimator method has also been used by Villalonga (2004), Malmendier and Tate (2009), Campello, Graham, and Harvey (2010) and Almeida, Campello, Laranjeira and Weisbenner (2011).

selecting the closest match to the treated observations in terms of firm characteristics (covariates). In our context, this procedure generates a group of firms that are very similar to *chaebol* firms except for the fact that they do not belong to a *chaebol*. Then, we compare the ex-post outcomes of treated and control groups in order to evaluate the impact of *chaebol* membership on investments and other outcomes. Note that since we compare changes in key outcomes from the period prior to the period post-crisis, we fully account for unobserved time-invariant effects.

The matching estimator methodology has a number of potential advantages over standard OLS approaches. Under OLS, two groups of firms (e.g., treated and non-treated groups of firms) are compared by examining regressions with control variables included to take care of differences in firm characteristics. However, if the control variables (covariates) have a poor distributional overlap between the two groups of firms, the controlling strategy can become ineffective. The matching estimator minimizes this problem since it selects the closest covariate values when forming the control group. The matching estimator also minimizes outlier problems that may affect OLS estimates. Finally, matching estimators are a natural fit to contexts in which non-linear modeling is more appropriate to explain the economic phenomena. More generally, when using OLS, the researcher must make implicit assumptions about the specifics of the economic relationship among variables (for example, the relationship is assumed to be linear). Such assumptions are not required under the matching estimator procedure.

We use the Abadie and Imbens (2002) matching estimator (Average Treatment Effect on the Treated, ATT) since their matching procedure fits our research design. First, this method allows the matching of control firms with treated firms in terms of both categorical and continuous variables. For our purpose the control firm must be from the same industry code as the treated firm, so the categorical matching is essential. Second, although the categorical variables are matched exactly, the continuous variables cannot. Rather, the matching procedure selects the control firm with the covariate values in the closest neighborhood of covariate values of the treated firm. In order to account for this problem, the matching estimator allows for a bias-correction in the estimation.

### **2.3 Addressing time-varying unobservables**

A final, and important concern is that time-varying, unobserved effects may confound the inferences that we can make using the DID-ME. For example, one may argue that *chaebol* acquire firms that are expected to have high capital expenditures in the near future. Thus, greater increases in investment by *chaebol* firms may be due to selection and not to internal capital markets. In order to help rule out such stories, we perform a falsification test based on data of non-crisis periods. If there is a time-varying unobserved variable that explains our results, we should be able to predict differential investment responses across *chaebol* and *non-chaebol* firms in non-crisis periods. For example, the acquisition story above would predict that *chaebol* firms should increase investment by more than *non-chaebol* firms in normal, non-crisis periods. If, in contrast, our argument is correct, we should

observe no evidence of statistical differences between the two groups over non-crisis periods. In this sense, placebo tests help us rule out alternative explanations for the results.

One limitation of these placebo tests is that time-varying, unobservable differences across *chaebol* and non-*chaebol* firms may have stronger effects during crisis years. If this is the case, then placebo tests that examine normal periods may not be sufficient. For example, a plausible story is that *chaebol* and non-*chaebol* firms may be differentially affected by declines in economic activity that affect the demand for investment. Since the Asian crisis also generated demand effects in addition to the credit supply effects that we emphasize above, one could wonder whether our results are explained by a decline in the demand for investment rather than a reduction in credit supply. In order to help rule out this possibility, we conduct a placebo test that examines a recession period, which was not accompanied by a financial crisis (the 1992 recession in Korea, which we discuss in greater detail below). If the results that we report are in fact due to the decline in credit supply in the aftermath of the Asian crisis, then one should not observe differences in investment across *chaebol* and non-*chaebol* firms in this recession year.<sup>9</sup>

The strategies above allow us to examine the role of most alternative mechanisms other than *chaebol* internal capital markets. The only remaining possibilities are associated with time-varying, unobservable differences that have significant effects *only* in the aftermath of the Asian crisis (and not in other normal, or recession years). While we cannot rule out all such possible explanations, we examine two of the most likely alternative stories.

The first story stems from a likely increase in the risk of financial distress in the aftermath of the crisis. While the DID-ME compares firms that are similar across a number of observable variables that should capture distress risk (including profitability, size, market-to-book and others), one could still argue that *chaebol* firms are less sensitive to risk changes than similar control firms for reasons that may not be associated with the operation of internal capital markets in the aftermath of the crisis.<sup>10</sup> This differential effect of the crisis on distress risk may also generate the prediction of greater investment for *chaebol* firms. In order to show that the results are not due to crisis-induced changes in distress risk, we conduct our tests by examining a sample of low-leverage firms.<sup>11</sup> Low-leverage firms should also have been affected by crisis-induced changes in credit supply, but are less likely to have been affected by the distress risk channel.<sup>12</sup>

The second story starts from the premise that *chaebol* are likely to be better politically connected than control group firms. While such connections may matter in all periods including non-crisis years, some of the mechanisms through which political connections affect investment may have been

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<sup>9</sup>We also provide evidence that *chaebol* and non-*chaebol* firm investment followed parallel trends in the years prior to the Asian crisis. That is, the differential change in investment that we observe is specific to the Asian crisis.

<sup>10</sup>For example, debt investors may be less likely to liquidate a *chaebol* firm if they also hold debt that was issued by another firm in the same *chaebol*. Another possibility is that *chaebol* are likely to provide support to member firms that become close to distress (see Gopalan, Nanda and Seru, 2006).

<sup>11</sup>Specifically, we restrict the sample to firms with below-median leverage.

<sup>12</sup>We thank David Reeb for this suggestion.

exacerbated following the Asian crisis. For example, given the wave of defaults in the Korean economy, the government may have been particularly concerned with protecting the *chaebol* in that period. Such favoritism may have manifested itself through subsidized capital to *chaebol* firms. In this case, we would observe that *chaebol* firms would find it easier to raise capital in the aftermath of the crisis when compared to control group firms (a testable hypothesis that we examine in the data).

Finally, we conduct additional tests of the internal capital markets mechanism through which *chaebol* may impact member firm investment. First, theory would suggest that *chaebol* internal capital markets should be particularly effective among *chaebol* with greater diversification in investment opportunities. Accordingly, we examine whether more diversified *chaebol* were able to maintain investment at higher levels than their less diversified counterparts in the aftermath of the crisis. Second, *chaebol* with greater availability of internal funds can more easily reallocate funds in the aftermath of a crisis that reduces firms' ability to raise external funds. Accordingly, we examine whether the availability of internal funds in *other chaebol* firms affected the investment of specific *chaebol* firms following the crisis.

In order to construct a counterfactual for these *chaebol*-level tests, we construct a group of pseudo-*chaebol* using the firms in our control group. The DID-ME selects an individual non-*chaebol* firm as the best match for each *chaebol* firm. In order to construct the pseudo-*chaebol*, we assume that these firms belong to the same group when in fact they are totally independent from each other. Naturally, measures of diversification and internal liquidity in other firms should be unrelated to investment in these cases. These falsification tests involving pseudo-*chaebol* help us rule out explanations that are unrelated to the operation of internal capital market within *chaebol*.

## 2.4 Examining the efficiency of *chaebol* internal capital markets

We also use our empirical strategy to examine other outcome variables that shed light on the *efficiency* of capital allocation by *chaebol*.

First, we examine the sensitivity of post-crisis investment changes to investment opportunities in *chaebol* firms. The efficient internal capital markets hypothesis would predict that investment should flow to *chaebol* firms with greater investment opportunities. We test this hypothesis by sorting firms into high Tobin's  $q$  and low Tobin's  $q$  groups in each *chaebol*.<sup>13</sup> We then examine the post-crisis changes in investment for these two groups of firms. Crucially, the matching estimator again allows us to use the control group of firms as a benchmark. That is, we also sort control firms into high and low  $q$  groups, and examine whether investment behaved differently for these two groups. Recall that the DID-ME procedure also assures that the control firms are similar to *chaebol* firms. Thus, this test sheds light on the nature of capital reallocation in *chaebol*, that is, whether *chaebol* allocated capital to member firms with the best investment opportunities in the post-crisis period, when benchmarked

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<sup>13</sup>Business group data allow us to measure investment opportunities at the firm-level rather than using industry-level proxies as in the conglomerate literature.

against the control group of independent firms with similar characteristics.

Second, we examine post-crisis profitability changes in *chaebol* and control firms. While one cannot directly attribute the entire difference in performance following the crisis to differential investment behavior, such tests can provide at least suggestive evidence of whether capital was allocated in an efficient way following the crisis, or not. In particular, such tests can help distinguish between over- and underinvestment hypotheses. That is, if *chaebol* use their internal capital markets to support negative NPV investments (overinvestment), one would expect a decline in performance relative to control group firms.

Third, we examine the impact of the crisis on the valuation of *chaebol* and control firms. Our analysis follows Baek, Kang and Park (2004), who focus on the effects of the Asian crisis on the valuation of Korean firms. Specifically, they examine holding period returns around November 18, 1997 (– 5 to 32 days around November 18, 1997). Accordingly, we examine median and average holding period returns in this period, for *chaebol* and control firms in our sample.

## 2.5 Data and Variables

Most studies on internal capital markets focus on U.S. conglomerates and use segment-level data. Since conglomerates are single legal entities, the accounting data of the segments may not reflect the actual value due to an arbitrary allocation of the values of accounting items across segments. In addition, segment data suffer from problems due to differences in accounting practices across firms in different industries, not to mention severe limitations on the availability of division-level data. Furthermore, identifying conglomerate divisions by SIC-based proxies is also problematic, since the reported SIC segments very often do not represent actual business units.<sup>14</sup>

On the other hand, since a Korean business group is composed of member firms that are independent legal entities, firm-level data are available. The data for our paper are collected from the TS2000 (the database provided by the Korea Listed Companies Association), one of the most representative databases in Korea. Since our focus is on the operation of internal capital markets during the period of 1997 Asian financial crisis, we collect the data for the period of 1990-2000.<sup>15</sup> Most of our tests focus on the period of 1996 to 1998. For this period, the total sample before deleting firms that belong to the industries without *chaebol* firms' presence is 1,912 firm-years. From this, we delete firms in the industries where there are no *chaebol* firms. We also delete the observations with missing values for the variables used in the analysis. Additionally deleting unreasonable observations such as negative equity and debt bigger than total assets, we end up with 1,481 firm-years in the analysis.

The Abadie-Imbens matching procedure requires matching covariates. We use covariates that are

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<sup>14</sup>There are a few papers that attempt to avoid some of these difficulties (Maksimovic and Phillips, 2002; Khanna and Tice, 2001; and Schoar, 2002).

<sup>15</sup>We use data earlier to 1996 to examine pre-crisis trends in investment, and post-crisis data up to 2000 to examine post-crisis profitability changes,

similar to those used in other recent papers that estimate matching models for investment, namely firm size, Tobin’s  $q$ , cash flow, cash holdings, leverage, pre-crisis investment and industry (see, e.g., Almeida et al., 2011 and Campello et al., 2010).<sup>16</sup> These variables are also likely determinants for a firm’s selection into the treatment (*chaebol* membership). The variable definitions are as follows: Firm size is equal to the natural logarithm of total assets and Tobin’s  $q$  equals total assets minus book value of equity plus market value of equity over total assets. Cash flow is defined as earnings before interest and taxes plus depreciation over total assets, cash holdings are equal to cash and cash equivalents over total assets, and leverage equals total debt over total assets. In addition, investment is defined as the negative of the cash flow from investment activity divided by total assets.

### 3 Empirical Results

#### 3.1 Descriptive Statistics

Table 2 compares the distributional properties of treated, non-treated, and control firms at the end of 1997 (before the IMF bailout).<sup>17</sup> The treated firms are 107 *chaebol* firms and the non-treated firms are the remaining 434 non-*chaebol* firms. The 107 control firms are the closest matches to the treated (*chaebol*) firms in terms of firm characteristics (size, Tobin’s  $q$ , cash flow, cash holdings, leverage, and the 6-digit industry codes). Panel A shows pre-crisis median differences of these covariates across the three data groups. We use the continuity-corrected Pearson  $X^2$  statistics to test the median differences. Panel B reports mean differences of the same data groups and associated mean test results. The Abadie-Imbens matching estimator procedure is nonparametric, and so it is relatively robust to extreme observations. However, since the treated and control firm outcomes are compared based on mean differences, we winsorize the variables at the 1 percentile in order to reduce the effects of outliers.

TABLE 2 ABOUT HERE

As can be seen in Panel A, the subsample of treated firms is quite different from the subsample of non-treated firms. The treated firms (*chaebol* firms) are bigger, have a higher Tobin’s  $Q$  and leverage, and carry a lower amount of cash holdings than the non-treated firms. Table 2 also shows the difference of investments between the two groups. Treated firms invest significantly more than non-treated firms. The lower part of Panel A compares the medians between treated firms and corresponding control firms. The control group is formed using the Abadie-Imbens matching estimator procedure where we control for distributional differences that could affect both the selection into the treatment and the post-crisis outcomes. The results are strikingly different from the comparison between treated and non-treated firms. The medians of covariates are not significantly different between the two

<sup>16</sup>The Korea Exchange classifies industries based on a 6-digit system which is similar to the SIC codes used in the US.

<sup>17</sup>The Korean government announced IMF bailout plan on November 21, 1997. Since we use annual data, the impact of the final month on the whole year’s performance would be negligible. We examine the robustness of the results later by using 1996 as our pre-crisis period.

groups of firms except for the size variable. This result indicates that the matching procedure is quite effective. The bigger size of the treated firms is understandable, considering the status of *chaebol* groups in Korea. According to the Fair Trade Commission of Korea, the total revenue (asset) of the top 10 business groups is 643.8 (475.8) trillion won that is 71.44 (52.80) percent of GDP as of 2007 (Solidarity for Economic Reform, 2009). Note that the size difference between the treated and control group is significantly smaller than that between the treated and non-treated group. This result again suggests the effectiveness of the matching procedure. Panel B compares the mean differences of the covariates across different groups of firms. Again, we see that the distributional properties of the treated and non-treated firms are quite different and this difference decreases significantly when we use the matching procedure. The results of mean differences between the treated and control firms are similar to those of Panel A except for the leverage variable. *Chaebol* firms on average use less debt than control firms.

The evidence so far indicates that the characteristics of the treated firms and non-treated firms are quite different. Therefore, statistical inferences based on a comparison between these two groups of firms would not be an appropriate procedure. Instead, we compare treated firms with matched control firms. As shown in Panel B, these two subsamples are very comparable except for the size variable.

Table 3 demonstrates the results of comparing the entire distributions of covariates across the three groups of firms. Panel A is the comparison between the treated and non-treated group and Panel B is the comparison between the treated and control group. The results reinforce those of Table 2. A Kolmogorov-Smirnov test indicates that the distributions of covariates are significantly different between the treated and non-treated firms, except for the cash flow variable, so the statistical inference comparing these two groups of firms would be inappropriate. The differences in the distributions of covariates disappear when we compare the treated and control firms except for the size variable as shown in Panel B.

TABLE 3 ABOUT HERE

### **3.2 The Effects of the 1997 Crisis on Investment**

In order to benchmark our main findings, we compare the investments of treated firms and non-treated firms before the IMF bailout (that is, before matching). As reported in Panel A of Table 4, the investment levels of the two groups are significantly different at the 10 percent level in 1997, which indicates that *chaebol* firms invested more than non-*chaebol* firms before the 1997 currency crisis. This result suggests that the comparison of investments between the two groups could be influenced by other confounding factors. Panel A also shows the investment levels in 1998. The mean tests indicate that both treated and non-treated firms significantly reduce their investments in 1998 compared to 1997 due to the financial crisis. The treated firms decrease their investment by 3.1 percent of total capital stock, while non-treated firms decrease their investment by 4.2 percent of capital. However,

the difference-in-differences estimator shows that there is no difference in the decrease of investments in 1998 from that of 1997 between the two groups.

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TABLE 4 ABOUT HERE

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Panel B compares the investment levels of treated group with those of counterfactuals (matched controls) generated by the matching estimator procedure. Differently from the results in Panel A, the investments of *chaebol* firms are not different from those of control firms in 1997, which is expected due to the matching process. In 1998, both treated and control firms significantly reduce their investments compared to 1997 due to the Asian financial crisis. Panel B also presents the result of difference-in-differences matching estimator that is central to our paper. Even though both groups decrease their investments in 1998, the investment reduction of control firms is far larger than the reduction of treated firms. The decrease of investments for *chaebol* firms is 3.1% of total assets, while that for independent firms is 8.7%. The difference-in-differences of investments is 5.6% and the matching estimator (ATT) is 6.7% (both are highly statistically significant).

Taken together, the results on Panel A and B suggest two main conclusions. First, a comparison across the non-treated and control groups suggest that the pre-crisis firm characteristics that were associated with *chaebol* membership (high investment, high leverage, low cash holdings, etc.) were associated with *greater* declines in investment in the aftermath of the crisis. This point can be made by noting that the decline in investment is significantly greater for the control group when compared to the group of non-treated firms in Panel A. This result also means that a simple comparison across *chaebol* and non-*chaebol* firms is not appropriate. Second, when comparing *chaebol* firms with non-*chaebol* firms that are observationally very similar (the control group), it becomes clear that *chaebol* membership was associated with greater investment in the aftermath of the crisis (Panel B).

In Panel C we do the same experiment for the years of 1996 and 1997, i.e. over the period with no financial crisis. We perform this test to rule out other explanations about the difference in relative investment reduction of *chaebol* firms. Our main assertion is that the operation of internal capital markets provides financial flexibility for *chaebol* firms that allows them to overcome the financial crunch caused by the Asian financial crisis. If some other factors not captured by our matching procedure produce the results in Panel B, then we should observe a similar result in other non-crisis period. The results show that there is again no difference in investment levels of treated firms and control firms in 1996. In addition, although the investment decreases in 1997 compared to 1996, we could not find any significant difference in investment changes across *chaebol* and control firms as shown by the insignificant difference-in-differences estimator and the matching estimator. This result supports our preferred explanation for the difference in the decline of investment rates (*chaebol* internal capital markets).

### 3.2.1 Additional placebo tests

The advantage of the 1996-1997 placebo test is that it is the closest period that precedes the crisis, and thus we are more likely to be capturing a similar set of *chaebol* firms to the one we focus on in the 1997-1998 period.<sup>18</sup> On the other hand, as explained in Section 2.3, there is a particular benefit of focusing on a recession year for an alternative placebo test. Provided that the recession year in question was not characterized by financial turmoil, such placebo tests can help separate credit supply from investment demand effects. In particular, if there is any particular reason why *chaebol* firms are affected differentially by a demand shock that changes investment opportunities, such patterns should be captured by these placebo tests.

In the case of the Korean economy, 1992 is a good candidate for such a placebo test. The year of 1992 is the only year between 1990 and 1997 in which macroeconomic indicators point to a sustained decline in demand and output. For example, the standard summary measure of business conditions used in Korea (the Trend-Adjusted Coincident Business Index) shows negative innovations during the entire year of 1992. Despite the evidence of decline in overall business conditions, financial markets showed no signs of disruption during 1992. Due to data availability, we examine three spreads: CD spreads (yields on 91 day CDs minus Uncollateralized Overnight Call Rates); Financial Debenture spreads (yields on 1 year Financial Debentures - Yields on 364 day Monetary Stabilization Bonds); and Corporate Bond spreads (yields on 3 year AA- Bonds - yields on 3 year Financial Debentures).<sup>19</sup> At the beginning of 1992, the values of the three spreads were 2.79%, 0.33%, and 0.43%. These spreads declined during 1992 to levels of 1.68%, 0.12%, and 0.13%. So, one can see that the 1992 recession was not accompanied by a credit supply shock of significant magnitude.

To implement a placebo test, we measure the changes in investment by *chaebol* and control firms from 1991 to 1992, following the same matching procedure described above. The simple difference-in-differences estimator for investment outcomes across *chaebol* and control firms in the 1992 recession yields a statistically insignificant value of 0.007 (p-value = 0.489), when compared to 0.056 in the 1998 baseline. Similarly, the Abadie-Imbens ATT estimate for this test is  $-0.031$ , and is statistically insignificant (p-value = 0.149), compared to a statistically significant point estimate of 0.067 points for 1998. These results suggest that if anything *chaebol* firms tend to reduce investment relative to control firms in a normal recession year, though the statistical evidence for this pattern is weak. These results support the contention that *chaebol* were able to mitigate the impact of a decline in credit supply following the Asian crisis.

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<sup>18</sup>Besides natural attrition due to bankruptcy, M&A, and others, there is a formal, regulatory definition of what it means to belong to a Korean *chaebol*. The set of *chaebol* firms may thus change significantly over time as we focus on alternative years.

<sup>19</sup>In Korea, the Monetary Stabilization Bonds are often used as a substitute for T-bonds.

### 3.2.2 Testing for Parallel Trends

The results in Table 4 suggest that investment followed different paths for *chaebol* and control firms following the Asian crisis. Our preferred interpretation is that this difference in outcomes is associated with the effect of the crisis on credit supply and the mitigating effect of *chaebol* internal capital markets. Thus, a natural consistency check is to examine whether *chaebol* and control firms were following similar (e.g., parallel) trends in investment *prior* to the Asian crisis. If one observes the same differential change in investment prior to the crisis, this would be evidence against our preferred hypothesis.<sup>20</sup>

In order to verify the parallel trends condition, we examine the changes in investment across *chaebol* and control firms in several different time windows prior to the crisis. The placebo test in Table 4, Panel C already shows no difference in trends from 1996 to 1997. As shown in Table 5, the same result obtains for all time windows prior to 1997, starting in 1990. This provides evidence that the differential change in investment that we report in Table 4 is specific to the Asian crisis.

TABLE 5 ABOUT HERE

### 3.2.3 Additional robustness checks

In our research design we compare 1997 with 1998 data. One potential problem with this methodology is that the 1997 data may partly include the effect of the crisis. We do not expect this issue to influence our results too much, since the crisis had occurred nearly at the end of the year. Specifically, the Korean government abandoned the defense of the value of Korean Won on November 18, 1997, and applied for a rescue package from the IMF on November 22, 1997. Nonetheless, we repeat the analysis of Table 4 by comparing 1996 with 1998 data and report the results in Table 6. The results are almost identical to those of Table 4. When we compare treated firms with non-treated firms as in Panel A, we find no difference in the investment reduction between the two groups of firms. But, when we compare treated firms with control firms, we find a significant difference in the investment reduction between the two groups of firms as evidenced by the matching estimator in Panel B.

TABLE 6 ABOUT HERE

An additional concern with our design is that the result may be driven only by one, or a few groups. The largest Korean *chaebol* comprise a significant fraction of our sample, and they may be different from the other groups in dimensions other than internal capital markets.<sup>21</sup> In order to show that this

<sup>20</sup>Notice that the matching estimator only requires control firms to have the same *level* of investment in the year prior to the crisis, and thus it does not ensure the parallel trends condition.

<sup>21</sup>On the other hand, larger *chaebol* are potentially more diversified and can thus use internal capital markets more efficient. Thus, we may in fact expect the results to be stronger for the largest *chaebol*.

concern is not driving our results, we perform two different kinds of experiments. First, we repeat our estimation eliminating one group at a time. Second, we eliminate the top *chaebol* from the sample and again repeat our estimations. We find that the results survive both kinds of robustness checks. For example, the ATTs (z-statistics) in the first exercise for the results in Table 4 range from 0.055 to 0.070 (2.62 to 3.33). The ATT in Table 4 becomes 0.056 after eliminating the top three *chaebol* from the sample (z-statistic equal to 2.4). Thus, the results do not appear to be driven by only one, or a few of the largest *chaebol*.

A third concern is that the results may be confounded by differential access to foreign ownership because of governance or financing reasons. Given that the Asian crisis was associated with a large exchange rate depreciation, access to foreign capital may have mitigated the effects of the crisis. Having foreign owners may also impact the governance of group firms, and thus change the way in which group firms responded to the crisis. In order to alleviate these concerns, we include direct foreign ownership among the matching variables, and repeat our estimation. The results are virtually unchanged (matching ATT = 0.054 with a z-stat of 2.5) suggesting that foreign ownership does not confound the results reported above.<sup>22</sup>

Finally, one may worry that the results may be affected by differential failure rates in *chaebol* and control firms. Specifically, it may be the case that *chaebol* firms were more likely to go bankrupt in 1998 than control firms (even after matching on leverage and other characteristics that may predict bankruptcy). Thus, the average investment level of *chaebol* firms may be biased up by selection, to a greater extent than control firms. In order to address this possibility, we keep in the sample firms (both *chaebol* and non-*chaebol*) that went out of business in 1998. We allow the matching estimator to select the best match for *chaebol* firms that went out of business in 1998, using 1997 data (as in the baseline results). For firms that went bankrupt in 1998, we assume that their investment decreased by 100% (e.g., to zero) in 1998, both for *chaebol* and control firms. The results are again unchanged (matching ATT = 0.075 with a z-stat of 3.5) suggesting that differential failure rates do not explain the results. The only difference in the results is that 1998 average investment levels decrease a bit, reflecting the inclusion of bankrupt firms in the sample.<sup>23</sup>

### 3.3 Do Internal Capital Markets Explain Higher Investments for *chaebol* Firms Following the Crisis?

The tests above allow us to rule out some alternative explanations to our findings. In particular, time-invariant firm characteristics and/or time-varying effects that also apply to normal years or recession years with no financial disruption (such as simple stories based on investment opportunities) do not

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<sup>22</sup>Another relevant variable could be whether a Korean firm had ADRs cross-listed in foreign markets. In our sample, the frequency of cross-listings is very small (only 10 firms were cross-listed at the time of the crisis), so we cannot examine this hypothesis. However, the low number of ADRs already shows that cross-listing is not a likely explanation for the results.

<sup>23</sup>For example, average *chaebol* firm investment goes from 0.072 (Table 4) to 0.070 (if we include bankrupt firms).

seem to explain the findings. However, it is still possible that other time-varying, unobservable differences that have significant effects *only* in the aftermath of the Asian crisis (and not in other normal, or recession years) can explain the results. While we cannot rule out all such possible explanations, we examine two of the most likely alternative stories in this Section. In addition, we attempt to provide evidence for additional cross-sectional implications of the internal capital markets hypothesis.

### 3.3.1 Alternative explanations

As explained in Section 2.3, we explain two alternative explanations. The first one is that *chaebol* firms are less sensitive to risk changes than similar control firms for reasons that may not be associated with the operation of internal capital markets in the aftermath of the crisis. The second is that *chaebol* firms can raise capital more easily in the external market than non-*chaebol* firms, since they are relatively bigger and politically better connected than non-*chaebol* firms.

To test the first hypothesis we examine a sub-sample of firms that is a priori unlikely to be much affected by distress risk changes, namely a sample of low leverage firms. If the results are due to exposure to distress risk following the crisis, then they should disappear in this sample. To maximize the number of observations we focus on a sample of firms with below median leverage, though the results are similar for different cutoffs. We drop from the sample all *chaebol* firms with greater than median leverage. The resulting sample contains 43 *chaebol* firms. Table 2 shows that the median debt ratio for *chaebol* firms prior to the crisis is 0.79. Dropping all *chaebol* firms with debt ratios greater than this value, we end up with a sub-sample whose median leverage ratio is 0.65. These *chaebol* firms are then matched to control firms based on observable characteristics (for example, the median leverage ratio of control firms is 0.67).

#### TABLE 7 ABOUT HERE

The results, reported in Table 7, are virtually identical to those reported in Table 4 above. The only significant difference is that investment appeared to have declined by less for firms with low leverage, both for *chaebol* and control samples, when compared to all firms in Table 4. Most importantly, the difference in investment behavior across *chaebol* and control firms is still statistically and economically significant (ATT equal to 0.064 for this sample, with a *t*-statistic equal to 2.24). This evidence suggests that *chaebol* firms' unique ability to withstand crisis-induced changes in distress risk are an unlikely explanation for our results.<sup>24</sup> Broadly, while high leverage was associated with greater declines in investment (as expected), this pattern holds for both *chaebol* and control samples leaving our DID-ME estimates virtually unchanged.

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<sup>24</sup>As an additional robustness check, we introduce a proxy for risk (cash flow volatility) among the matching variables and re-estimate Table 4. Again, the results are unchanged, indicating that exposure to risk is unlikely to be an explanation for our results.

To test the second hypothesis, we examine whether the debt or equity issues of *chaebol* firms were higher than control firms in 1998, i.e., in the post-crisis period. Specifically, we examine three external financing variables: equity growth rate, debt growth rate, and the growth rate of number of shares outstanding. The results are reported in Table 8.

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TABLE 8 ABOUT HERE

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Panel A shows that in 1997, the debt financing of both *chaebol* and control firms increased by more than 35 percent when compared to the previous year. But there is almost no growth in debt level in 1998, as can be seen in Panel B. This partly reflects the Korean government's efforts to reduce the debt level of corporate sector following the recommendation of the IMF. Figure 2 shows the levels of debt in Korea for both all industries and only the manufacturing sector over the period of 1990-2006. The debt-equity ratios before 1997 were over 300 percent, with a sharp increase to well over 400 percent in 1997. The Korean government judged that the high debt level was one of the culprits of the currency crisis and directed firms to reduce debt level afterwards. Therefore, raising capital for investments in the form of debt was extremely difficult.

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FIGURE 2 ABOUT HERE

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This economic environment induced firms to issue more stocks than bonds as shown in Table 8. The equity growth rates of both *chaebol* and control firms in 1998 are almost sixty percent which is much bigger than the figures in 1997. This increase in equity issues in 1998 is also evidenced by the change in the number of shares outstanding for both *chaebol* and control firms.<sup>25</sup> Nevertheless, the results in Table 8 indicate that there is no difference between the two groups of firms. That is, in both 1997 and 1998, there is no significant difference in equity growth and debt growth between *chaebol* and control firms. The exception is the change in the number of shares outstanding that shows a significant difference between the two groups in 1998. However, the bigger growth rate of control firms suggest that the control firms issue more shares than *chaebol* firms, which is contradictory to the argument of more external financing of *chaebol* firms. All in all, the results in Table 8 cast doubt on the assertion that *chaebol* firms are better able to raise capital in the external market than the control firms, in the aftermath of the financial crisis.

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<sup>25</sup>Given the government's mandate to reduce leverage, the capital raised with equity issuance was employed mostly towards debt reduction.

### 3.3.2 Additional Tests of the Internal Capital Markets Hypothesis

Next, we attempt to provide direct evidence that internal capital markets help explain the lower reduction in investments by *chaebol* firms. As discussed above, we test two specific hypothesis. First, more diversified *chaebol* are better able to employ internal capital markets following the crisis, and consequently investment should decline the least for diversified *chaebol*. Second, the decline in investment for *chaebol* firms should be lower when the other firms in the same *chaebol* have greater availability of liquid funds.

In both cases, we benchmark the results by constructing a group of pseudo-*chaebol* that are formed using the control group firms. Specifically, for each *chaebol* firm, the matching estimator selects an individual match. By placing these firms in the same pseudo-*chaebol*, we can construct the *chaebol*-level variables below for this control group.

In order to obtain a proxy variable for diversification in *chaebol* (and pseudo-*chaebol*), we employ a methodology similar to Duchin (2010). He suggests that diversification in investment opportunities is closely associated with active internal capital markets. To wit, let the investment opportunity volatility of firm  $i$ , be defined as the standard deviation of investment opportunity stream measured by Tobin's  $q$ . Then, the volatility of investment opportunities of a business group with  $N$  member firms can be defined as

$$\sigma = \sqrt{\sum_{i=1}^N \sum_{j=1}^N w_i w_j \rho_{i,j} \sigma_i \sigma_j} \quad (1)$$

where  $\rho_{i,j}$  is the correlation between investment opportunity streams of member firms  $i$  and  $j$ , and  $w_i$  is the weighting of firm  $i$  in the *chaebol*, given by the ratio of its asset over the total combined asset value of the *chaebol*. In order to calculate the value of  $\sigma_i$  and  $\rho_{i,j}$  in equation (1), we use the value of Tobin's  $q$  of each firm of a given *chaebol* over the period of 1990-2008. If the business areas of member firms range over many different industries, the correlation coefficient will be lower and there will be more diversification effects in the overall business group. Duchin (2010) shows that the lower correlation coefficients among divisions, i.e., more diversified investment opportunities, are related to a more active internal capital market. In a similar context, Rajan et al. (2000), Lamont and Polk (2002), and Billett and Mauer (2003) report that the 'corporate socialism' is more severe for conglomerates with more diverse quality of investment opportunities across divisions. To measure the cross-company correlation in investment opportunities of a *chaebol* group, we first compute volatility in case of zero diversification, i.e., the case where the pair wise correlations of the investment opportunities of member firms are all equal to 1 as follows:

$$Volatility = S = \sqrt{\sum_{i=1}^N \sum_{j=1}^N w_i w_j \sigma_i \sigma_j} \quad (2)$$

Finally, the degree of diversification, i.e., the degree of intensity of internal capital markets can be measured like equation (3)

$$Diversification = S - \sigma \tag{3}$$

So if a business group is more diversified by having its member firms in a wide variety of business areas, the capital transfer among member firms would be more active, and the value of diversification measure would be larger. We construct a similar measure for pseudo-*chaebol*.

In previous studies, diversification was also measured by the number of business segments of the firm. For example, Opler et al. (1999) used the number of business segments as a measure of diversification and documented an inverse relationship between cash holdings and diversification. Since our focus is on the group of firms called *chaebol*, it is natural to use the total number of member firms as a measure of diversification. The definition is the number of member firms of a *chaebol* reported to the Korea Fair Trade Commission. Similarly, we count the number of firms that are assigned to each pseudo-*chaebol*.<sup>26</sup>

In addition to the diversification variable shown in equation (3) we also use two measures of other firms' cash flows, *Other Cash Flow/Asset* and *Other Cash Flow/Sales* as proxy variables for internal capital markets. *Other Cash Flow/Asset* is measured as an average of earnings before interest and taxes plus depreciation divided by an average of total assets of other firms within a *chaebol*. *Other Cash Flow/Sales* is similarly defined as an average of net income plus depreciation divided by an average of sales of other firms within a *chaebol*. As Shin and Stulz (1998) argue, cash flows of other member firms should not affect the investments of the firm if the internal capital markets do not exist. However, other firms' cash flow will increase the investments of the firm if the internal capital markets are active. Importantly, our framework allows us to compute similar variables for pseudo-*chaebol* and thus examine whether other-firm liquidity affects investment through channels other than internal capital markets. One possible story is related to industry links. Even when firms are not in the same industry, there can be common components to changes in investment opportunities across industries, which may then give rise to spurious links between investment and other-firm liquidity. However, since we include industry among our matching variables, this spurious link should also be observed in pseudo-*chaebol*.

Table 9 shows the results. Panel A focuses on *chaebol*, and Panel B on pseudo-*chaebol*. In both panels we split firms into two subsamples based on the median of each variable and show the difference in average investments between the two subsamples. The change in investments is demeaned at the level of the industry, to further control for potential industry effects.<sup>27</sup>

Panel A presents the difference in investments between above median and below median group of

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<sup>26</sup>Notice that the number of firms in the pseudo-*chaebol* is identical to the number of firms in *chaebol* because of the matching procedure.

<sup>27</sup>We obtain similar results using the unadjusted changes in investment.

chaebol firms in 1998. The above median firms with regard to each variable tend to invest more than the below median firms. For the group of firms formed according to diversification, other firms' cash flow, and total number of member firms, the difference in investments is very significant statistically. The differences are also economically significant. For example, firms in highly diversified *chaebol* tend to invest 6.2% more than comparable industry firms following the crisis, while firms in less diversified *chaebol* invest similarly to their industry counterparts. In addition, notice that none of these findings obtain in the control group of pseudo-*chaebol*. For example, other-firm liquidity is unrelated to investment among pseudo-*chaebol* firms. These findings are consistent with the hypothesis that internal capital markets are behind the differential changes in investment uncovered in this paper.

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TABLE 9 ABOUT HERE

### 3.4 Do *chaebol* allocate capital to the right firms?

The results above suggest that *chaebol* used internal capital markets to finance investment in the aftermath of the crisis, but they do not show which member firms were supported by *chaebol*. If internal capital markets were used efficiently, we would expect funds to have flown to member firms with the greatest investment opportunities.

In order to examine the efficiency of internal capital markets, Table 10 compares the average changes in industry-adjusted investments from 1997 to 1998 for two subsamples of firms with high and low  $Q$ , for both *chaebol* and control firms. Firms are assigned to “above median” and “below median” groups based on whether their  $Q$  is above or below the median value of  $Q$  for each *chaebol*. A similar procedure is applied to the sample of control firms, which are assigned to “above median” or “below median” groups based on whether their  $Q$  is higher or lower than the median value of  $Q$  for that sample.

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TABLE 10 ABOUT HERE

The table shows that the change in industry demeaned investments for high  $Q$  firms is significantly bigger than that for low  $Q$  firms, among *chaebol* firms (the difference across groups is 5.1%). This result is particularly interesting given that for the sample of control firms, investment actually tends to decline the most for high  $Q$  firms (the difference across groups is  $-4.9\%$ , though it is not significant). This result indicates that high  $Q$  firms tended to suffer the most (relative to other industry firms) in the aftermath of the financial crisis. But high  $Q$  firms that belonged to *chaebol* tended to invest significantly more than other industry firms. Finally, notice that the difference-in-differences (*chaebol* minus control) is positive, economically large (equal to 10%) and highly significant. These results are

consistent with the argument that *chaebol* used internal capital markets to allocate capital to member firms with the best investment opportunities, and by doing so significantly mitigated financing frictions that appeared to hurt these firms the most.

### 3.5 Evidence on Post-Crisis Profitability

An alternative, and complementary way to examine whether *chaebol* allocated capital efficiently following the crisis is to examine ex-post profitability outcomes. If *chaebol* are overinvesting or allocating capital poorly in the aftermath of the crisis, we would expect *chaebol* firms to become less profitable relative to non-*chaebol* firms in the control group. On the other hand, if *chaebol* internal capital markets help mitigate underinvestment, we would expect *chaebol* profitability to increase relative to control firms.

Specifically, we examine the changes in industry demeaned cash flows (DICF) over one, two, and three year periods after the Asian financial crisis for *chaebol* and control firms. Cash flows (CF) for individual firms are measured as earnings before interest and taxes plus depreciation over total assets. Industry demeaned cash flows (ICF) for individual firms are computed by subtracting industry average cash flows from each company's cash flows. The results are reported in table 11. Panel A reports the test results of mean difference of DICF between *chaebol* and control firms while Panel B shows the test results of median difference of the same variable between the two groups for one, two, and three years after the crisis.

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TABLE 11 ABOUT HERE

Our evidence suggests that *chaebol* firms turn out to be more profitable than control firms. The industry-adjusted cash flows of *chaebol* firms up to three years after the Asian crisis are significantly higher than those of control firms. Specifically, Table 11 suggests that *chaebol* firms' did not become less profitable as a result of the crisis. In contrast, the profitability of firms in the control group significantly declined in the aftermath of the crisis. In addition, notice that the difference in profitability across *chaebol* and control firms is statistically significant (the matching estimator's ATT is approximately 3%). These results are again consistent with the argument that *chaebol* structure helps mitigate financing frictions in the aftermath of the Asian crisis.

### 3.6 Crisis-induced changes in valuation

The results above suggest that *chaebol* used internal capital markets to support investment by their member firms following the crisis, particularly for those firms with good investment opportunities. Possibly as a result of this capital reallocation, *chaebol* firm operating performance was superior to that of similar, non-*chaebol* firms in the aftermath of the Asian financial crisis.

These results contrast with previous literature, which associates *chaebol* with largely negative outcomes. For example, Ferris, Kim and Kitsabunnarat (2003) find a negative correlation between Korean *chaebol* membership and Tobin’s Q. Joh (2003) examines the effects of corporate governance on Korean firms before the Asian crisis, and finds evidence that firms affiliated with large business groups underperform relative to independent firms. It is now well-known that comparing Tobin’s Q across diversified and non-diversified firms provides little information on whether diversification creates value or not (see the survey paper by Maksimovic and Philips (2007) for a detailed discussion). Recent literature on business groups also suggest that comparing profitability across group and non-group firms is unwarranted, because profitability is one of the key variables that determines whether an independent firm is likely to be acquired by a business group (see for example Almeida et al.(2011)). Our paper distinguishes itself from these earlier papers through the use of a different research methodology, which allows for sharper identification of the effect of chaebol on corporate outcomes.

The paper that is closest to ours is Baek, Kang and Park (2004) who focus on the effects of the Asian crisis on the valuation of Korean firms. They examine holding period returns around November 18, 1997 (which they define as the event date for the crisis), and find evidence of a negative coefficient on the interaction between a “*chaebol* dummy” and a measure of ownership concentration by family owners. While there are important differences in the methodology (for example, Baek et al. do not use a matching procedure and do not report placebo tests to verify whether the results are unique to the crisis), there are also similarities in that both papers employ the Asian crisis as a device to aid identification.

Baek et al. interpret their findings as evidence that *chaebol* firms with concentrated ownership by controlling shareholders observed a larger decrease in equity value. However, note that their results are not inconsistent with the results that we find in this paper. Baek et al. also report evidence that the coefficient on the “*chaebol* dummy” is positive, suggesting that chaebol firms experienced a lower decrease in equity value than non-*chaebol* firms at the onset of the Asian crisis. As Baek et al. state in their paper (see p. 281), this result suggests that “...*chaebol* affiliation makes a firm less sensitive to the financial crisis”. The negative coefficient that they report on the interaction between the chaebol dummy and family ownership suggests that *chaebol* firms with concentrated ownership experienced more negative returns than *chaebol* firms with less concentrated ownership.<sup>28</sup> However, it does *not* mean that *chaebol* firms with concentrated family ownership suffered greater declines in valuation than *non-chaebol* firms.<sup>29</sup>

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<sup>28</sup>Notice that this result is likely inconsistent with the tunneling hypothesis, which predicts that the family would favor firms in which it has higher ownership (Bertrand et al., 2002).

<sup>29</sup>In order to make this comparison, one must add the *chaebol* dummy to the coefficient of the interaction between the *chaebol* dummy and family ownership. For example, in Table 6, column 2 of Baek et al., the coefficient on the *chaebol* dummy is 0.088, and the coefficient on the interaction term is  $-0.383$ . Baek et al. report in Table 1 that the average value of the family ownership variable for *chaebol* firms is approximately 0.07. Thus, the effect of *chaebol* ownership at the average level of family ownership is  $0.088 - 0.383 * 0.07 = 0.062$ . This suggests that the *chaebol* firm with average family ownership suffered a lower decrease in valuation than a non-*chaebol* firm. To revert the positive coefficient on the

To ensure that crisis-induced changes in valuation are consistent with the other results reported in the paper, we examine holding period returns in the same period analyzed by Baek et al. (– 5 to 32 days around November 18, 1997), for *chaebol* and control firms in our sample. To the extent that the market could anticipate the superior post-crisis performance of *chaebol* firms, we should expect higher holding period returns for *chaebol* firms at the onset of the crisis. We also report a comparison between *chaebol* and non-*chaebol* (prior to matching) for benchmarking purposes. Results are reported in the text.

Our sample of *chaebol* firms experienced an average holding period return of –36.7% and a median return of –41.4% around the event date of November 18, 1997. Clearly, the Asian crisis badly hit the valuation of *chaebol* firms. However, the decline in valuation is significantly larger for firms that did not belong to *chaebol*. Such firms experienced an average holding period return of –47.8%, and a median return of –49.4%. This difference in performance remains after we compare *chaebol* firms with control firms that are similar in key dimensions such as pre-crisis size, leverage, market-to-book, cash flow, cash holdings, investment, and industry. Control firms experienced an average holding period return equal to –44.1%, and a median return of –45.1%. The differences in returns across *chaebol* and control firms are also statistically significant (the p-value for the 7.4% difference in average returns is 0.008). Thus, our results suggest that *chaebol* membership was associated with lower declines in firm value at the onset of the Asian crisis.

### 3.7 How do *chaebol* internal capital markets work?

Our results raise some natural questions: what *kind* of capital reallocation activity allowed *chaebol* to transfer funds across member firms? Were some capital transfer mechanisms more effective than the others? While we do not answer these questions formally in the current paper, we discuss some possibilities in the current Section and present some anecdotal evidence.

One way in which *chaebol* can effect capital transfers is by selling off “noncore” member firms and use the funds to support investment in core activities.<sup>30</sup> We were able to gather some basic statistics on the sell-off of business lines in the aftermath of the crisis (1996-1999) that are suggestive of this possibility.<sup>31</sup> In the year prior to the crisis (1996), there are only 3 recorded instances of business sell-offs by *chaebol*. This frequency increased to 10 sell-offs in 1997, and 18 in 1998 and 1999. By comparison, sell-off of business lines by independent firms did not change much in this period (there are approximately 8 to 12 recorded instances in the period of 1996 to 1998).<sup>32</sup>

Naturally, sell-offs and liquidations are only one way in which *chaebol* can reallocate capital inter-  


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*chaebol* dummy, one needs direct family ownership to be greater than 25%.

<sup>30</sup>Opler et al. (1999) make a similar argument in the context of US conglomerates.

<sup>31</sup>The source for the evidence in this Section is the Korea Investor’s Network for Disclosure System.

<sup>32</sup>On June 18th, 1998, the Korean Financial Supervisory Committee announced 55 firms that were going out of business. 55 firms were members of business groups, while only 3 were independent firms. Streamlining *chaebol* by eliminating inefficient member may have allowed them to direct investment to more promising members.

nally. We also gathered other disclosures of intra-*chaebol* transactions in the aftermath of the crisis, which could have allowed them to reallocate capital.<sup>33</sup> In 1998, for example, we found disclosures related to the following: 1) To provide guarantees for other member firms' security issues, 2) to provide payment guarantees for member firms' borrowing, 3) to lease real estate to member firms, 4) to participate in private equity offerings by other member firms, 5) to buy facilities from other member firms, and 6) to buy bonds of member firms issued by private offering. These guarantees and cross-firm transfers may have contributed to *chaebol* internal reallocation.<sup>34</sup> Ironically, while some of these activities may sound questionable, the evidence in our paper suggests that they may have contributed to efficient capital reallocation by *chaebol* in the aftermath of the crisis.

## 4 Concluding Remarks

In this paper we study the workings of internal capital markets in business groups, by investigating the changes in investment by Korean firms during the period of the Asian financial crisis of 1997-1998. The Asian crisis likely exacerbates the impact of *chaebol*'s internal capital markets on resource allocation. We use a matching estimator technique to form a control group out of non-*chaebol* firms that is closest to the treatment group of *chaebol* firms, by matching treatment to control firms along observable variables. Our difference-in-differences estimator takes care of the effect of unobservable, time-invariant firm characteristics. In addition, we perform a series of placebo and falsification tests to rule out alternative explanations for our findings. Finally, we examine the efficiency of internal capital reallocation by *chaebol* in the aftermath of the Asian crisis.

The empirical results are consistent with the active workings of efficient internal capital markets, and can be summarized as follows. First, *chaebol* firms reduce their investments significantly less than control firms following the Asian financial crisis, even though these control firms are virtually identical to *chaebol* firms in the pre-crisis period along several observable dimensions. Second, placebo tests that focus on non-crisis periods show that there is no difference in investment behavior across *chaebol* and similar non-*chaebol* firms in these periods, even when they are accompanied by recessions and declines in investment demand. Third, additional tests support the contention that active internal capital markets are behind the lower decline in investment for *chaebol* firms. There are no significant differences in the ability of *chaebol* and control firms to raise external finance in the crisis period. The

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<sup>33</sup>Intra-company loans were not allowed in the period following the Asian crisis.

<sup>34</sup>These intra-company transactions were in some cases object of litigation. For example, in April, 2000, the Fair Trade Commission (FTC) disclosed a commission decision in which it found illegal activities to support member firms by demurrants who were member firms of Hyundai Group: Lending at a below-market rate, lending excessive principal amount, purchasing foreign bonds at a higher price, converting convertible bonds at a lower price, participating in equity issues, overpaying commission for sales of beneficiary certificates, paying advertisement costs on behalf of other member firms, helping firms owned by relatives by lending at zero interest rates through advance payments, purchasing commercial papers at a higher price, underwriting bonds issued by member firms at a lower costs, purchasing stocks of member firms at a higher price, and delaying collection of service charges. The FTC judged aforementioned activities as a violation of clause 1-7 of Article 23 (Unfair Support) of Anti-Monopoly And Fair Trade Act and issued orders for prohibiting accused activities, announcing the fact of legal violation, and paying penalties.

results continue to hold for a sub-sample of low leverage firms, ruling out explanations associated with time varying distress risk. Better diversified business groups invest more in the aftermath of the crisis, and there is a positive relationship between the investment of a *chaebol* firm and the cash flows of other *chaebol* member firms. Fourth, the evidence suggests that *chaebol* allocate capital to member firms with the best investment opportunities, and that *chaebol* firms perform better than firms in the control group in the aftermath of the crisis. Thus, not only are *chaebol* internal capital markets active, but they appear to operate efficiently and allocate capital to the right uses following the Asian crisis.

Overall, our results suggest a largely positive role for *chaebol* on the Korean economy in the aftermath of the Asian Financial Crisis. *Chaebol* were able to use their internal capital markets to mitigate the negative effects of the crisis on corporate investment, while similar firms that could not rely on internal capital markets invested less and lost profitability as a result of the crisis. The results are consistent with theories and recent empirical work that suggest that conglomerates allocate resources efficiently through internal capital markets.

We end the paper with words of caution. First, while our results are consistent with efficient capital reallocation by business groups in the aftermath of a financial crisis, it does not rule out the possibility that groups may misallocate capital internally in other, “normal” periods. It is unfortunately harder to measure the efficiency of capital allocation in a non-crisis period, as one lacks the salient financial shock that aids identification in this paper.<sup>35</sup> Measuring the relative performance of *chaebol* in normal periods is an exciting topic for future research. Second, even if groups’ internal capital markets operate efficiently and add value to member firms relative to an appropriate counter-factual, business groups may still be harmful to economic welfare because of general equilibrium effects and other externalities that they may impose on their local economies. For example, Almeida and Wolfenzon (2006) argue that groups’ efficient internal capital markets may increase financial constraints on independent firms and be harmful to economy-wide capital allocation. Measuring the welfare effects of business groups in a convincing way is probably one of the most important questions in emerging markets’ corporate finance.

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<sup>35</sup>See Matvos and Seru (2011) for an attempt to identify the efficiency of conglomerate internal capital markets in normal periods, using a structural approach.

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**Table 1. Issuance of Bonds and Stocks in Korea, 1994-1999**

This table illustrates the number of bond and stock issuances during the period surrounding the 1997 Asian financial crisis.

	1994	1995	1996	1997	1998	1999
Number of bond issues	2,714	2,823	3,206	2,246	1,097	803
Number of stock issues	198	219	210	209	141	486

Source: Korean Statistical Information Service

**Table 2. Comparison of Treated, Non-Treated, and Control Firms at the End of 1997**

This table compares the distributional characteristics of treated, non-treated, and control firms at the end of 1997. We split the 541 sample firms into the 107 treated (*chaebol*) and the 434 non-treated (independent) firms. The 107 control firms are a subset of the non-treated firms that best match the treated firms with regard to the following firm characteristics (covariates): size, Tobin's q, cash flow, cash holdings, leverage, and the 6-digit industry code. Panel A (B) shows the comparison of medians (means) across different groups of firms. We test for a difference in the medians of the variables by calculating the continuity-corrected Pearson's  $X^2$  statistics with the corresponding p-values of the test. For the test of mean differences, we report the t-values. The variable definitions are as follows: Size =  $\ln(\text{total assets})$ , Tobin's Q =  $(\text{total assets} - \text{book value of equity} + \text{stock price} \times \text{number of shares outstanding}) / \text{total assets}$ , Own Cash Flow/Assets =  $(\text{earnings before interest and taxes} + \text{depreciation}) / \text{total assets}$ , Cash/Asset =  $\text{cash and cash equivalents} / \text{total assets}$ , Debt/Asset =  $\text{total debt} / \text{total assets}$ , Investment =  $-\text{cash flow from investment activities} / \text{total assets}$ .

	Size	Tobin's Q	Own Cash Flow/Assets	Cash/Asset	Debt/Asset	Investment
Panel A. Medians for Treated, Non-Treated, and Control Firms in 1997						
Treated	20.648	0.869	0.061	0.043	0.788	0.102
Non-Treated	18.120	0.835	0.062	0.078	0.669	0.066
Difference	2.528	0.034	-0.001	-0.035	0.119	0.036
Median Test p-value	0.000***	0.002***	0.846	0.000***	0.000***	0.017**
Treated	20.648	0.869	0.061	0.043	0.788	0.102
Control	20.152	0.871	0.060	0.045	0.802	0.105
Difference	0.496	-0.002	0.001	-0.002	-0.014	-0.003
Median Test p-value	0.029**	0.891	1.000	0.274	1.000	0.584
Panel B. Means for Treated, Non-Treated, and Control Firms in 1997						
Treated	20.527	0.882	0.062	0.063	0.759	0.104
Non-Treated	18.266	0.854	0.067	0.103	0.667	0.083
Difference	2.261	0.027	-0.005	-0.040	0.093	0.020
Mean Test t-value	16.957***	1.135	0.962	4.530***	4.876***	1.775*
Treated	20.527	0.882	0.062	0.063	0.759	0.104
Control	19.949	0.870	0.061	0.066	0.775	0.108
Difference	0.577	0.011	0.001	-0.003	-0.015	-0.005
Mean Test t-value	6.480***	1.278	.332	-0.764	-1.858*	-0.431

**Table 3. Distributional Tests on the Sample of Treated, Non-Treated, and Control Firms at the End of 1997**

This table illustrates distributional tests for the comparability of non-treated firms and control firms with treated firms. The variable definitions are as follows: Size is the natural logarithm of the book value of total assets. Tobin's Q is equal to book value of total assets minus book value of equity plus market value of equity divided by total assets. Own Cash Flow/Assets is measured as earnings before interest and taxes plus depreciation divided by total assets. Cash/Asset equals cash and cash equivalent over total assets. Debt/Asset is book value of debt over total assets. Investment is defined as a negative of the cash flow from investment activities over total assets. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

		25 <sup>th</sup> %	Median	75 <sup>th</sup> %	Kolmogorov-Smirnov
Panel A. Difference between Treated and Non-Treated Firms					
Size	Treated	19.352	20.648	21.467	0.000***
	Non-Treated	17.399	18.120	19.027	
Tobin's Q	Treated	0.794	0.869	0.944	0.003***
	Non-Treated	0.722	0.835	0.959	
Own Cash Flow / Assets	Treated	0.038	0.061	0.082	0.277
	Non-Treated	0.033	0.062	0.092	
Cash / Asset	Treated	0.028	0.043	0.078	0.000***
	Non-Treated	0.041	0.078	0.136	
Debt / Asset	Treated	0.678	0.788	0.853	0.000***
	Non-Treated	0.554	0.669	0.780	
Investment	Treated	0.046	0.102	0.165	0.003***
	Non-Treated	0.021	0.066	0.132	
Panel B. Difference between Treated and Control Firms					
Size	Treated	19.353	20.648	21.467	0.002***
	Control	18.947	20.152	20.736	
Tobin's Q	Treated	0.794	0.869	0.944	0.244
	Control	0.784	0.871	0.910	
Own Cash Flow / Assets	Treated	0.038	0.061	0.082	0.511
	Control	0.041	0.060	0.076	
Cash / Asset	Treated	0.028	0.043	0.078	0.624
	Control	0.029	0.045	0.092	
Debt / Asset	Treated	0.678	0.788	0.853	0.409
	Control	0.681	0.802	0.855	
Investment	Treated	0.046	0.102	0.165	0.319
	Control	0.053	0.105	0.152	

**Table 4. Investments Before and After the Financial Crisis and Placebo Test**

This table reports the changes in investments before and after IMF bailout with the results of difference-in-differences tests for treated, non-treated, and control firms. Panel A is the comparison between the treated and non-treated group of firms and Panel B is the comparison between the treated and control group. Panel C shows the investment changes of the treated and control firms surrounding other non-crisis year. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

	1997	1998	1998-1997
Panel A. Investments Before and After 1997 Financial Crisis (Treated vs. Non-Treated)			
Treated Firms	0.104	0.072	-0.031** (2.251)
Non-Treated Firms	0.083	0.040	-0.042*** (5.592)
Difference (t-value)	0.021* (1.775)	0.031*** (2.632)	0.011 (0.655)
Panel B. Investments Before and After 1997 Financial Crisis (Treated vs. Control)			
Treated Firms	0.104	0.072	-0.031** (2.251)
Control Firms	0.108	0.021	-0.087*** (-7.448)
Difference (t-value)	-0.005 (-0.431)	0.050*** (4.196)	0.056** (3.669)
Matching Estimator (ATT)			0.067*** (3.160)
Panel C. Investments Before and After 1996 (Treated vs. Control)			
	1996	1997	1997-1996
Treated Firms	0.128	0.105	-0.024** (-2.493)
Control Firms	0.113	0.095	-0.020** (-2.007)
Difference (t-value)	0.015 (1.397)	0.010 (0.754)	-0.004 (-0.304)
Matching Estimator (ATT)			0.009 (0.410)

**Table 5: Trends in Investment for Treated and Control Firms Before Crisis**

This table reports the mean and median change in investment for firms in the treatment and control groups going back many years prior to 1998. The first row in the table reports statistics for changes in investment going back two years prior to the crisis (investment changes from 1995 through 1997) normalized by the firm's capital stock). A similar calculation is reported in the second row of the table, but the data goes back three years prior to the 1997 currency crisis (starting in 1994). Subsequent rows go back farther in time at larger increments. The table also reports  $p$ -values associated with test statistics for mean differences (standard t-test) and values of Pearson's  $\chi^2$  for median differences across groups.

Period	Treatment	Control	P-value of Difference
	Mean [Median] (percentage points)	Mean [Median] (percentage points)	t-test [Pearsons $\chi^2$ ]
1995-1997	-1 [-0.57]	-1.56 [-0.53]	0.5 [0.02]
1994-1997	-0.92 [-0.86]	-1.26 [-0.92]	0.72 [0.03]
1993-1997	-0.8 [-0.91]	-1.39 [-0.68]	0.58 [0.02]
1992-1997	-1.6 [-1.13]	-2.21 [-2.21]	0.63 [0.87]
1991-1997	-3.18 [-2.47]	-4.59 [-3.58]	0.39 [0.56]
1990-1997	-5.21 [-3.87]	-5.78 [-3.06]	0.83 [0.20]

**Table 6. Investment Before and After the Financial Crisis – Robustness**

This table reports the robustness test of the changes in investments before and after IMF bailout. The pre-crisis period is 1996 and the post-crisis period is 1998. Panel A is the comparison between the treated and non-treated group of firms and Panel B is the comparison between the treated and control group. The results are almost identical to those of comparing 1997 as pre-crisis period with 1998 as post-crisis period. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

	1996	1998	1998-1996
Panel A. Investment Before and After Financial Crisis (Treated vs. Non-Treated)			
Treated Firms	0.128	0.066	-0.062** (-5.218)
Non-Treated Firms	0.093	0.033	-0.060*** (-7.469)
Difference (t-statistic)	0.035*** (3.060)	0.032*** (2.647)	-0.003 (-0.183)
Panel B. Investment Before and After Financial Crisis (Treated vs. Control)			
Treated Firms	0.128	0.066	-0.062** (-5.218)
Control Firms	0.113	0.039	-0.075*** (-6.944)
Difference (t-statistic)	0.015 (1.373)	0.027** (2.057)	0.012 (0.805)
Matching Estimator (ATT)			0.040* (1.840)

**Table 7: Investment Before and After the Asian Crisis: Low Leverage Firms**

This table reports the changes in investments before and after IMF bailout with the results of difference-in-differences tests for treated (chaebol), and control firms. In this table we restrict the sample to chaebol firms with below-median leverage. Consequently, the control group of firms also contain firms with low leverage (since they match the characteristics of chaebol firms). \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

	1997	1998	1998-1997
Treated Firms	0.129	0.109	-0.021 (-0.953)
Control Firms	0.109	0.035	-0.074** (-3.044)
Difference (t-value)	0.020 (1.105)	0.074*** (3.723)	0.054* (1.973)
Matching Estimator (ATT)			0.064** (2.240)

**Table 8. Financing Sources of Firms**

This table reports the difference of external financing between *chaebol* firms and control firms. The variable definitions are as follows: Equity growth =  $[\text{Equity}(t) - \text{Equity}(t-1) - \{\text{Net Income}(t) - \text{Dividend}(t)\}] / \text{Equity}(t-1)$ . Debt growth =  $[\text{Debt}(t) - \text{Debt}(t-1)] / \text{Debt}(t-1)$ . Number growth =  $[\text{Num}(t) - \text{Num}(t-1)] / \text{Num}(t-1)$  where Num is the number of shares outstanding. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

	Debt growth	Equity growth	Change in number of shares outstanding
Panel A. As of 1997			
<i>Chaebol</i> Firms	0.360	0.248	0.103
Control Firms	0.379	0.147	0.150
Difference	-0.019	0.101	-0.046
t-value	(0.179)	(0.713)	(-1.237)
Panel B. As of 1998			
<i>Chaebol</i> Firms	0.018	0.590	0.205
Control Firms	0.006	0.604	0.733
Difference	0.012	-0.013	-0.528**
t-value	(0.387)	(-0.081)	(-2.421)

**Table 9. Do Internal Capital Markets Explain *Chaebol* Investment Behavior?**

This table compares the average investments of two subsamples of *chaebol* firms formed by using various proxy variables of internal capital markets. *Chaebol* firms are grouped into two subsamples, above median and below median for each variable. We compare the average changes in industry adjusted investments from 1997 to 1998. The variable definitions are as follows: Diversification is the difference between the  $q$  volatility calculated assuming a correlation of 1 among all member firms and the  $q$  volatility obtained accounting for the  $q$  correlations among member firms (details in the text). Other Cash Flow/Asset is measured as an average of earnings before interest and taxes plus depreciation divided by an average of total assets of other firms within a *chaebol*. Other Cash Flow/Sales is defined as an average of net income plus depreciation divided by an average of sales of other firms within a *chaebol*. Total Number is the number of member firms of a *chaebol* reported to the Korea Fair Trade Commission. Investment is defined as the negative of cash flow from investment activities over total assets. We compute similar variables for pseudo-chaebol that are formed using firms in the control group, that is, firms that are as similar as possible to chaebol firms along observable characteristics. Panel A reports results for chaebol, and Panel B reports results for pseudo-chaebol. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

Dependent variable: Changes in Industry Demeaned Investments								
Group	Diversification		Other Cash Flow/Asset		Other Cash Flow/Sales		Total Number	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: Chaebol Firms								
Above median	0.062	0.179	0.066	0.162	0.064	0.169	0.051	0.167
Below median	-0.007	0.143	-0.006	0.172	-0.011	0.164	-0.005	0.159
Difference	0.069**		0.072**		0.075**		0.056*	
t-value	(2.078)		(2.018)		(2.124)		(1.668)	
Panel B: Pseudo-Chaebol Firms								
Above median	-0.051	0.198	-0.012	0.192	-0.023	0.137	-0.031	0.181
Below median	-0.024	0.137	-0.067	0.126	-0.049	0.193	-0.047	0.144
Difference	-0.027		0.055		0.026		0.017	
t-value	-0.398		-0.814		-0.386		-0.234	

**Table 10. The Relation Between Investment and Investment Opportunities for *Chaebol* and Control Firms**

This table compares the average changes in industry adjusted investments from 1997 to 1998 for two subsamples. Member firms are assigned to “above median” and “below median” groups based on the value of  $q$  for each chaebol. Above (below) median firms are combined across different business groups to form total above (below) median group of firms. Similarly, the sample of control firms is split into groups of firms that have  $q$  above and below the median value for that sample. The third column reports the difference in changes in investment across chaebol and control firms, for each group. Investment is defined as the negative of cash flow from investment activities over total assets. \*\*\*, \*\*, and \* indicate the statistical significance at the 1%, 5%, and 10% levels.

Dependent variable: Changes in Industry Demeaned Investments						
Group	<i>Chaebol</i> firms		Control firms		<i>Chaebol</i> - control	
	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Above median $q$	0.049*	0.026	-0.036	0.029	0.085**	0.043
Below median $q$	-0.002	0.023	0.014	0.034	-0.016	0.041
Difference	0.051*		-0.049		0.100**	
t-value	(1.471)		(-0.654)		(1.690)	
p-value for one tail test	0.073		0.859		0.047	

**Table 11. Profitability of *Chaebol* vs. Control Firms**

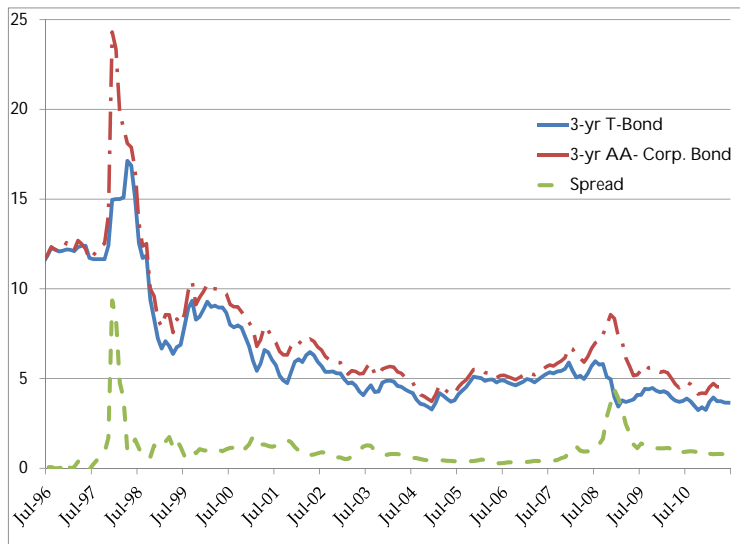
This table shows the changes in industry demeaned cash flows (DICF) over one, two, and three year periods after the Asian financial crisis for *chaebol* and control firms. Cash flows (CF) for individual firms are measured as earnings before interest and taxes plus depreciation over total assets. Industry demeaned cash flows (ICF) for individual firms are computed by subtracting industry average cash flows from each company's cash flows. Panel A reports the test results of mean difference of DICF between *chaebol* and control firms while Panel B shows the test results of median difference of the same variable between the two groups for one, two, and three years after the crisis.

	1998-1997	1999-1997	2000-1997
Panel A. Mean Differences of DICF between <i>chaebol</i> and control firms			
Treated Firms	0.001	-0.001	0.009
(t-stat)	(0.129)	(-0.209)	(1.586)
Control Firms	-0.021**	-0.011*	-0.027***
(t-stat)	(-2.351)	(-1.690)	(-3.130)
Difference	0.022*	0.009	0.036***
(t-stat)	(1.931)	(1.085)	(3.584)
Matching estimator(ATT)	0.027**	0.002	0.031**
(z-stat)	(2.09)	( 0.20)	(2.17)
Panel B. Median Differences of DICF between <i>chaebol</i> and control firms			
Treated Firms	0.000	0.000	0.000
(p-value)	(0.253)	(0.717)	(0.305)
Control Firms	-0.005**	-0.004	-0.007**
(p-value)	(0.022)	(0.422)	(0.026)
Difference	0.005*	0.005	0.007***
(p-value)	(0.059)	(0.573)	(0.001)

## Figure 1: Comparison between the 1997 Asian Crisis and the 2008 Financial Crisis

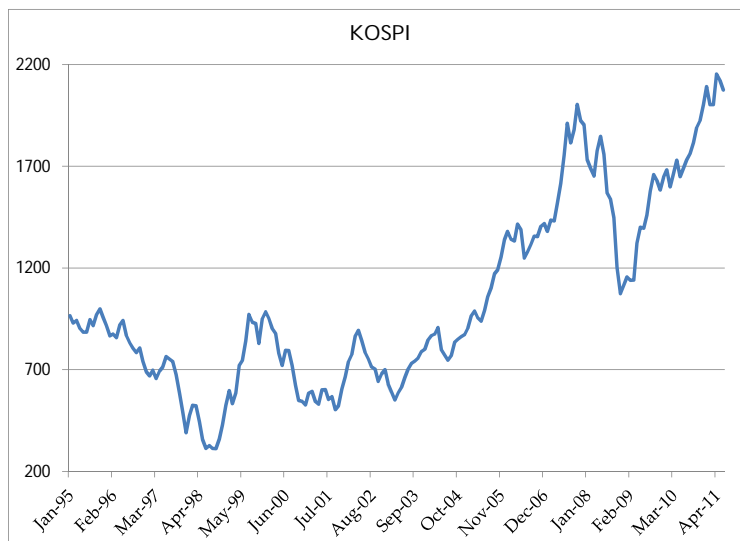
These figures show interest rates, the Korea Stock Price Index, and exchange rates from January 1995 to June 2011. They show the impacts of two important economic events, the 1997 Asian currency crisis and the 2008 financial crisis.

**Panel A: Interest Rates**

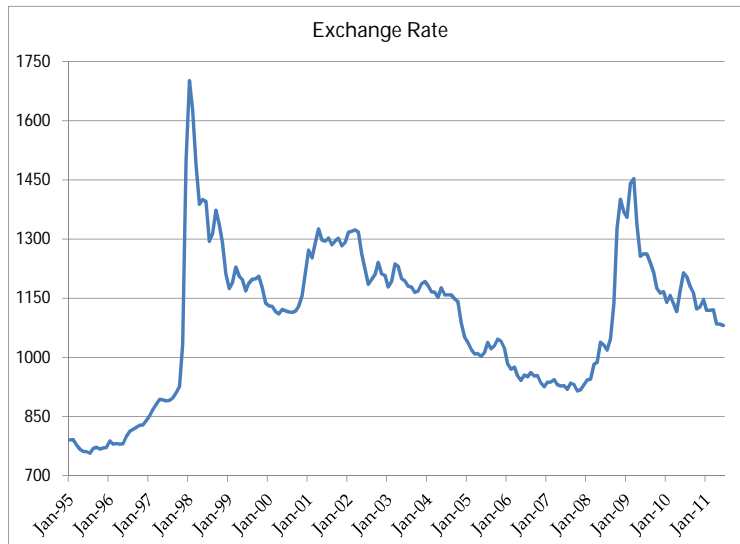


Source: Bank of Korea

**Panel B: Korea Stock Price Index (KOSPI)**



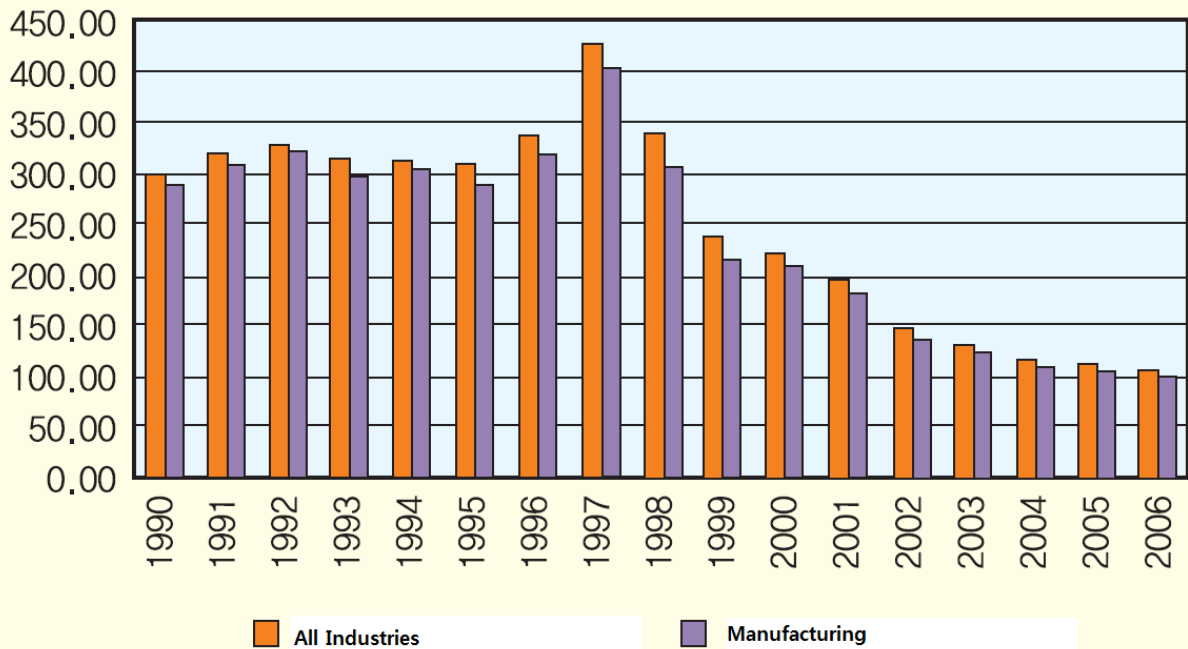
**Panel C: Exchange Rates (Korean Won/US\$)**



Source: Bank of Korea and Statistics Korea

**Figure 2. The Debt Level of Korean Firms**

This figure presents the change of debt-equity ratios for the corporate sector of Korea over the period of 1990-2006, for firms in all industries and for firms only in the manufacturing sector.



Source: Bank of Korea, Corporate Management Analysis, 2007.