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# Abstract

This study investigates whether business groups can harm the capital allocation efficiency of non-business group firms. From a sample of Korean firms (1987 to 2010), we compute an annual index of the collective strength and dominance of large business groups (LBG) per industry. We find that this index is negatively associated with the industry-level capital allocation efficiency of non-LBG firms during a period characterized by underdeveloped financial markets and weak investor protection. The association is stronger in industries that may lack collateral or internal equity capital. Results are robust to different measures of the index and investment opportunity.



Keywords: Business group, Internal capital market, Capital allocation efficiency, Financial sector development, Investor protection, Asian financial crisis

JEL Classifications: G3, G31, G32, G34



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# Do Business Groups Harm Capital Allocation Efficiency Outside the Business Group?*

by

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**Abstract**

This study investigates whether business groups can harm the capital allocation efficiency of non-business group firms. From a sample of Korean firms (1987 to 2010), we compute an annual index of the collective strength and dominance of large business groups (LBG) per industry. We find that this index is negatively associated with the industry-level capital allocation efficiency of non-LBG firms during a period characterized by underdeveloped financial markets and weak investor protection. The association is stronger in industries that may lack collateral or internal equity capital. Results are robust to different measures of the index and investment opportunity.

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During the past two decades, studies on business groups have increased significantly. Their specific research questions have also broadened over time.[1] There are papers documenting the divergence between control and cash flow rights (Claessens, Djankov, and Lang, 2000; Claessens et al., 2002; Faccio and Lang, 2002), investigating the value relevance of such a disparity (La Porta et al., 2002; Mitton, 2002; Nenova, 2003; Ferris, Kim, and Kitsabunnarat, 2003; Lemmon and Lins, 2003; Baek, Kang, and Park, 2004; Lin et al., 2011; Bae et al., 2012), comparing the performance of group-affiliated firms against the unaffiliated (Khanna and Palepu, 2000; Joh, 2003; Bertrand et al., 2008), or explaining the factors behind the formation and structure of business groups (Kim, Lim, and Sung, 2007; Almeida et al., 2011; Masulis, Pham, and Zen, 2011). There are also papers investigating the efficiency of internal capital markets that diversified business groups form, and their role in attenuating financial constraints (Park and Shin, 1999; Gopalan, Nanda, and Seru, 2007; Lee, Park, and Shin, 2009; Gopalan, Nanda, and Seru, 2014; Buchuk et al., 2014; Almeida, Kim, and Kim, 2015). On the contrary, there are papers providing evidence of controlling shareholders expropriating minority shareholders through intragroup transactions, known as tunneling (Bae, Kang, and Kim, 2002; Bertrand, Mehta, and Mullainathan, 2002; Cheung, Rau, and Stouraitis, 2006; Baek, Kang, and Lee, 2006; and Black et al., 2015).

However, nearly none of the papers in the existing literature investigates the influence that business groups exert on other sectors of the economy. Business groups do not exist in a vacuum. They coexist with other types of firms and compete against one another in product and input markets. In a country where capital and labor inputs are scarce, successful input mobilization by

[1] Here, we do not survey papers on conglomerates, as they are not the focus of this paper. "Conglomerates" are free-standing firms that engage in a diversified portfolio of businesses, whereas "business groups" are groups of legally independent firms that are connected through intragroup shareholdings.

business group firms may actually imply a deprivation of necessary inputs for non-affiliated firms and disruption of their investments. Moreover, efficient capital allocation within business groups may not guarantee economy-wide capital allocation efficiency. Hence, it is important that we pay attention not only to business groups, but also to their influence on other sectors of the economy. However, the existing literature on business groups is virtually silent on this.

To fill this gap in the literature, this study investigates whether and when business groups can harm capital allocation efficiency of non-business group firms. In particular, we ask the following questions. Can firms without group-affiliation efficiently allocate capital in industries where group-affiliated firms are present? Does this industry-level efficiency of non-affiliated firms worsen when group-affiliated firms enlarge the size of their internal capital market? If financial constraints are what matters, can a country's financial market development or stronger investor protection alleviate such negative spillover effects from business groups? What about non-affiliated firms in industries that lack collateral or internal equity capital? Would they suffer more? Lastly, if financial constraints disrupt timely investment decisions, are non-affiliated firms in business-group dominated industries less likely to make large investments if they have not done so in the past?

We answer these questions using a sample of Korean firms from 1987 to 2010. For a number of reasons, Korea provides an ideal setting in which to investigate our research questions. First, Korea is known for its large family-controlled business groups – also known as chaebols – that have been around for many decades (e.g., Samsung Group, Hyundai Motor Group, SK Group, LG Group, Lotte Group, and many others). However, Korea is also populated with firms that do not belong to any of these business groups. This well-balanced composition of firms in

Korea allows us to investigate whether and when business groups can harm capital allocation efficiency of non-business group firms.

Second, Korea went through an extraordinary event – the Asian financial crisis of 1997/98 – that dramatically changed the nature of its financial markets. Before the crisis, capital was scarce and dominated by business groups. After the crisis, financial constraints eased considerably as business group firms curtailed over-investments and lowered financial leverage. On top of this, a series of corporate governance reform measures that followed immediately after the crisis greatly restored investors' confidence in Korean firms and further eased their financial constraints. Such a regime change in the middle of our sample period allows us to investigate the influence of financial sector development or investor protection on the relationship between business group strength or dominance and capital allocation efficiency of non-business group firms.

Third, to our knowledge, Korea is the only country where detailed business group data are available for more than two decades. Since 1987, the Korean government (Fair Trade Commission) has been identifying and releasing the name of large business groups (LBG) and their individual member firms on an annual basis, for regulatory purposes. Thanks to this, we can use 24 years (1987–2010) of large business group data in this study to investigate how their strength and dominance evolved over time in each industry, and how they influenced the efficiency of capital allocation of non-LBG firms. Korea is also one of the few countries where financial statement data is available even for privately traded companies. This is thanks to the Korean law that subjects companies above a certain asset size to an external audit. Given the dominance of privately traded companies, in and outside of business groups, access to their financial statement data is critical for our study.

Our empirical analyses start with the construction of an index that captures the collective strength and dominance of large business groups (LBG) – our proxy for business groups—in each industry. We name this index the Business Group Strength and Dominance Index (BSDI). From this index, we find a number of noteworthy results.

First, we find evidence consistent with the perception that large business groups can harm capital allocation efficiency outside the large business group, and that this is done by mainly imposing a greater financial constraint upon non-LBG firms. Specifically, we find that the industry-level capital allocation efficiency of non-LBG firms is negatively associated with the BSDI during a period characterized by an underdeveloped financial market and weak investor protection (i.e., before the Asian financial crisis of 1997/98), but not so during a later period. We also find that this association is stronger in industries that may lack collateral (i.e., low asset tangibility) or internal equity capital (low profitability).

Second, we find evidence that low capital allocation efficiency translates into lower profitability. Specifically, we find that the BSDI predicts lower profitability of non-LBG firms before the Asian financial crisis, but not so thereafter. On the contrary, we find that the BSDI predicts higher profitability of large business group firms before the Asian financial crisis, but not much so thereafter.

Third, we find evidence of an LBG-inflicted financial constraint preventing the timely investment of non-LBG firms. Using a proportional hazard model, where events equal large investments above a certain threshold, we find that non-LBG firms in LBG-dominated industries (i.e., high BSDI industries) are less likely to make large investments if they have not done so in the past, than those in low BSDI industries during the pre-crisis period, but not so during the post-crisis period.

Fourth, we find that the collective strength and dominance of large business groups in Korea, on average, declines during our sample period. This overall downward trend, however, is driven by the considerable decline in the cross-sectional variation in later years. Because extremely large BSDI industries disappear in later years, we find that the median index value, as opposed to the mean value, declines only slightly during our sample period. Another important point is that the trend is not monotonic. The index reaches its peak in the crisis years (1997/98), declines to a minimum in 2003, and then slowly increases thereafter. These are all novel findings that have not been reported in the literature, and are important on their own account for policymakers in Korea.

Fifth, we find that industry-level capital allocation efficiency improves after the Asian financial crisis. In our industry-level investment (CAPEX Ratio) regressions, the significance of cash flows (EBITDA Ratio) weakens, whereas that of investment opportunity (Sales Growth) strengthens after the crisis. This is the case regardless of a firm's large business group affiliation. However, note that this finding of improved capital allocation efficiency is not new, as it is well-documented in the existing literature (Hong, Lee, and Lee, 2004; Lee, Park, and Shin, 2009).

Our study makes a number of contributions to the literature. First and foremost, we enhance the literature by investigating whether and when business groups can harm capital allocation efficiency outside the business group. As mentioned earlier, nearly none of the papers in the existing literature investigates the influence that business groups exert on other sectors of the economy. A paper that comes closest to what we do is the work of Boutin et al. (2013). Using a sample of French firms, they show that a firm's entry into new industries and its survival are influenced by the cash hoarded by the incumbent group relative to that hoarded by the entrant group. In other words, they assess the impact of the business group's financial strength on

product market competition. Their focus, however, is on the mode of entry and exit, and not on capital allocation efficiency, which is the topic of this study. In addition, they do not include an exogenous event in their study, which allows the investigation of the influence of financial sector development or investor protection.

Second, we provide empirical support to the theoretical predictions of Almeida and Wolfenzon (2006) that study the relationship between business groups' internal capital markets and the efficiency of economy-wide capital allocation. According to their theoretical model, the effect of the business group's bias toward internal capital reallocation is non-monotonic in the level of investor protection. It is beneficial in low-protection countries, harmful in medium-protection countries, and then irrelevant in high-protection countries. These authors use Korea in the 1990s as anecdotal evidence to support their argument that the negative externality associated with business groups is particularly costly for countries that are at intermediary levels of financial development. We discuss more details of their model in Section 2.

Third, we add to a strand of literature that studies the influence of financial sector development or investor protection on capital allocation efficiency (Wurgler, 2000; Beck and Levine, 2002; Love, 2003; Galindo, Schiantarelli, and Weiss, 2007; Abiad, Oomes, and Ueda, 2008; Mclean, Zhang, and Zhao, 2012). We contribute to this literature by identifying a channel through which stronger investor protection or financial sector development can improve capital allocation efficiency. Our channel is aimed at the alleviation of the financial constraint that business group firms impose on non-business group firms.

Finally, we construct an index – the BSDI (see above) – that captures the collective strength and dominance of large business groups in each industry. We believe that this index can

be useful not only for the purpose of our study, but also in other studies that need to quantify the influence of business groups.

The rest of the paper is organized as follows. Section 1 discusses the theoretical background of our key hypothesis. Section 2 discusses various governance reform measures and new financial sector developments that took place immediately after the crisis and considerably eased the financial constraint of non-LBG firms in Korea. Section 4 introduces the Business Group Strength and Dominance Index (BSDI). Section 5 describes the data used in the empirical analyses. Section 6 provides the results, and Section 7 concludes.

## 1. Theoretical Background

We can find the theoretical foundation of our key hypothesis from the work of Almeida and Wolfenzon (2006). According to their study, business groups' contribution to the economy-wide efficiency of capital allocation depends on the country's level of investor protection. This prediction is derived from the assumption that cash flow pledgeability to investors inside a business group is perfect, whereas pledgeability outside a business group depends on the country's level of investor protection. We summarize here their simple model for three firms with different levels of productivity: high-productivity firm (H), medium-productivity firm (M), and low-productivity firm (L).

If a country's investor protection level is low, stand-alone firms (irrespective of their productivity level) cannot raise external capital. In this case, forming a business group can improve economy-wide allocative efficiency because perfect pledgeability inside a business group allows for capital reallocation to a higher productivity firm within the group (e.g., internal reallocation from firm L to firm M). If investor protection is at an intermediate level firm H, as a

stand-alone firm, can pledge sufficiently high cash flows to raise external capital from firm L (but not enough to raise capital from firm M). In this case, forming a business group (composed of firms L and M) can harm economy-wide allocative efficiency because perfective pledgeability inside a business group allows firm M to pledge more cash flows than firm H, to firm L (i.e., the business group's bias toward internal reallocation). If investor protection level is high, firm H, as a stand-alone firm, can pledge sufficiently high cash flows to raise external capital – not only from firm L, but also from firm M. In this case, forming a business group composed of firms L and M can do no harm to economy-wide allocative efficiency, because cash flow pledged by firm H to firm L is more than that of firm M to firm L.

Almeida and Wolfenzon (2006) use the recent history of Korea as anecdotal evidence to support their theoretical prediction. They note that up until the 1990s, Korean business groups or chaebols were credited with being one of the most important factors in Korea's rapid growth; however, this view changed in the 1990s, as the chaebols were believed to inhibit the growth of small- and medium-sized firms because most of the finance available was concentrated on them (Financial Times, 1998). They also note that, from the 1990s, the Korean government has been exerting pressure on the chaebols to slim their empires, and with the chaebol no longer dominating access to Korea's huge pool of savings, credit began to flow to small- and medium-sized firms (Economist, 2003).

However, as the case of Korea suggests, business groups' bias toward internal reallocation is not the only reason why business group firms may attract more capital and non-business group firms suffer from financial constraints. Having a large internal capital market also helps member firms to raise capital from financial institutions outside the group. When borrowing from banks, they are preferred over non-business group firms as they can secure debt guarantees from their

sister firms, whereas non-business group firms cannot. In addition, when the banking industry is still under state control, larger business group firms that tend to greater political connections have advantage over non-business group firms that typically do not. Lastly, large business groups can benefit from the 'too big to fail' problem due to their size. In times of trouble, these large business groups can get financial support from the government, whereas non-business group firms cannot. When constructing the index that captures the strength and dominance of business groups, we also take these considerations into account.

## 2. Governance Reform and Financial Sector Development in Korea

In this section, we discuss various governance reform measures and new financial sector developments that took place immediately after the crisis. We believe that such reform measures and new developments strengthened investor protection in Korea and considerably eased the financial constraints that Korean companies used to face before the crisis.

### *A. Corporate Governance Reform*

Immediately after the Asian financial crisis (AFC), Korea introduced a series of corporate governance reform measures (Kim and Kim, 2008). In terms of board structure, Korea revised the *Securities and Exchange Act* in late 1999 and mandated listed companies to elect outside directors, the ratio of which must be at least 50 percent for firms with assets over 2 trillion Korean won (KRW) (about 2 billion USD), and 25 percent for others. The same law mandates firms with assets over 2 trillion KRW to have an audit committee (with an outside chair and at least two-thirds of its members from outside the firm) as well as a committee to nominate outside directors. A few papers study the valuation effect of this regulatory reform and find evidence that

the legal shock produces economically large share price increases for large firms with assets over 2 trillion KRW (Black, Jang, and Kim, 2006; Black and Kim, 2012). One paper investigates the channel through which this board structure reform increases value, and finds evidence that reform reduces tunneling (Black et al., 2015).

With respect to chaebol reforms, Korea revised the *Monopoly Regulation and Fair Trade Act* in 1998 to ban any new provision for debt guarantee to domestic affiliates. In late 1999, Korea revised the Act again, mandating board approval and disclosure of related-party transactions. The revision also reintroduced an upper ceiling on the amount of equity investment by a group member firm in domestic affiliates (i.e., 25 percent of a firm's net assets, which equals total assets minus book equity invested by other affiliates). This regulation aims to limit reckless group expansion through pyramiding or circular shareholding that eventually increases the disparity between control and cash flow rights of controlling shareholders in member firms (see Kim, Lim, and Sung (2007) for the details on these reform measures).

Many other measures took place to empower shareholders. For example, Korea revised the *Securities and Exchange Act* in 1998, lowering the shareholding requirements for the filing of derivative suits, dismissal of directors, or convocation of extraordinary shareholders' meetings, among many others. In the same year, Korea also revised the *Commercial Code* so that shareholders can elect directors using cumulative voting. In 2001, Korea revised the *Securities and Exchange Act* and imposed a three percent cap on shareholder's voting rights when electing audit committee members, so that no single shareholder can have a dominant influence over their appointment. As for electing statutory auditors, this three percent cap has been applied since 1963. Measures to increase corporate transparency were also put in place. The most noteworthy endeavor was the introduction of the Data Analysis, Retrieval, and Transfer (DART) System in

1999 by the Financial Supervisory Service (FSS). The DART System is an electronic disclosure system that allows companies to submit disclosures online, where it becomes immediately available to investors and other users.[2]

Shareholders noticed these changes and made use of their empowerment. Most noteworthy is the increase of foreign investors' ownership of listed Korean companies, from 10 percent in 1996 to 39 percent in 2004. Anecdotal evidence and academic studies confirm that there is growing pressure from foreign investors for better governance. For example, SK (a leading firm of the SK group and the fourth largest chaebol at the time) increased its outside director ratio from 50 percent to 70 percent in response to the engagement activities of Sovereign Asset Management (a Monaco-based activist investor). It also introduced a Corporate Governance Committee, a Transparent Management Committee, and a separate meeting of outside directors (Kim, Sung, and Wei, 2015). Accordingly, the share price of SK increased from 8,000 KRW to 70,000 KRW during this period of engagement (March 2003 – July 2005). Academic findings also show that foreign investors are pressuring Korean firms for better governance. Kim, Sung, and Wei (2015), applying an event study approach to block purchase announcements made by foreign portfolio investors in the Korean stock market (KRX), find that stock prices increase upon block purchase announcements when investors declare themselves to be activists.

Grass-roots minority shareholder movements also emerged. A good example is that of People's Solidarity for Participatory Democracy (PSPD), a public interest group that is known for having utilized various minority shareholders' rights that had remained dormant for most of Korea's modern history (Kim and Kim, 2001; Jang and Kim, 2002; Rho, 2007). One such

[2] The website address is http://dart.fss.or.kr (in Korean) or http://englishdart.fss.or.kr (in English).

minority shareholders' right is a derivative action filed against board members to seek their liability on behalf of shareholders. PSPD's derivative action, filed against the former officers of Korea First Bank (KFB) in 1997, is recorded as the first derivative suit ever filed in Korea. Its second derivative action in 1998 is also well known, as it was filed against the board members of Samsung Electronics, the largest company in Korea and later the 13th largest company in the world (Fortune, 2015). At the time of this writing, PSPD and its successor – Solidarity for Economic Reform (SER) – remain as leading organizations in filing derivative actions against the directors of Korean corporations.[3]

### *B. Financial Sector Development*

Various charts in Figure 1 show how the financial sector in Korea changed after the Asian financial crisis. The first two charts show the size of Korea's capital market – a typical measure of financial sector development. Market capitalization, as a fraction of GDP, increases from 24 percent in 1987 to 90 percent in 2010, and bonds outstanding, as a fraction of GDP, also increases from 12 percent in 1987 to 60 percent in 2010 (source: Bank of Korea).

The third chart shows the presence of foreign investors in the Korean stock market. Foreign ownership, as a fraction of GDP, increases from one percent in 1992 (year of market opening) to 31 percent in 2010 and, as a fraction of total market capitalization, increases from three percent in 1992 to 31 percent in 2010 (source: Financial Supervisory Service). One can clearly see that foreign ownership, as a fraction of total market capitalization, increases exponentially from 1998, which coincides with the year in which Korea completely lifted the

[3] Participatory Economy Committee (PEC), the action body that led the shareholder activist movement of PSPD, separated from PSPD in 2006 to launch an organization named the Solidarity for Economic Reform (SER).

remaining foreign ownership limits.

The fourth chart shows net savings (i.e., saving minus investment) of the household and corporate sectors, as a fraction of Korea's total savings (source: Bank of Korea). Before the crisis, households are clearly net savers, providing capital to corporations that are short of savings. This relationship dramatically changes after the crisis. The household sector is no longer a net capital provider and the corporate sector is only a moderate net capital receiver. This change reflects the fact that households borrow as much as they save, and corporations hoard cash as much as they invest. In other words, capital is no longer scarce for corporations in Korea.

The fifth chart shows the yield of three-year investment grade (AA-) corporate bonds (source: Bank of Korea). The yield that used to be 13 percent in 1987, and that peaked at 19 percent in 1991, is at five percent in 2010. It is true that corporate bond rates in other countries also fell during this period. However, Korea is unique in that the drop takes place from 1999, a year after the crisis, whereas in other countries the drop takes place from 2000, the year of the dot-com bubble burst. With low bond rates, bond financing became an important alternative source of funding for Korean corporations. This is consistent with the second chart that shows a jump in the outstanding amount of bonds, as a fraction of GDP.

The sixth chart shows the debt-to-equity ratio of manufacturing firms (source: Bank of Korea).[4] The ratio, which used to be 340 percent in 1987, and which peaked at 400 percent in 1997, declines to 102 percent in 2010. It is true that the initial decline took place as banks withdrew their earlier lendings. The ratio, however, kept declining as Korean firms started to rely more heavily on internal equity financing (i.e., using accumulated retained earnings). Companies'

[4] BOK measures the debt-to-equity ratio as the debt aggregated across all manufacturing firms that file corporate income tax over the equity aggregated across the same set of firms.

lower reliance on debt financing, in particular financing from banks, led many Korean banks to expand their household lending businesses.

The last two charts show the amount of liquidity that manufacturing firms hold. Cash and cash equivalents, as a fraction of total assets, jump from 6.3 percent in 1990 to 9.7 percent in 2010, and the current ratio, defined as current assets over current liabilities, jumps from 100 percent in 1987 to 121 percent in 2010 (source: Bank of Korea).[5] This is consistent with the fourth chart that shows corporations save as much as they invest after the crisis.

## 3. Construction of the Business Group Strength and Dominance Index

In this section, we construct the Business Group Strength and Dominance Index (BSDI) – a measure that captures the collective strength and dominance of business groups in each industry. For this measure to explain the extent to which business groups can attract more capital and, as a result, the extent to which it inflicts financial constraints on non-business group firms, we need to take into account two elements: the size of groups' internal capital market (ICM), as well as their market share in the industries in which non-business group firms also operate.

First, the size of the internal capital market matters for a number of reasons. The larger the size of the internal capital market, the more likely the firms in business groups are to engage in internal reallocation and the less likely they are to provide capital to firms outside the business group. Having a large internal capital market also helps member firms to raise capital from financial institutions outside the group. Banks prefer to extend loans to business group firms that

[5] BOK measures the cash ratio as the cash and cash equivalents aggregated across all manufacturing firms that file corporate income tax over the total assets aggregated across the same set of firms. The current ratio is the current assets aggregated across all manufacturing firms that file corporate income tax over the current liabilities aggregated across the same set of firms.

can secure debt guarantees from their sister firms, over non-business group firms that cannot. In addition, business groups with large internal capital markets tend to have greater political connections, which further help them to raise external debt capital when the banking industry is still under state control. In addition, large business groups can further benefit from the 'too big to fail problem' because of their size, whereas non-business group firms cannot. In times of trouble, these large business groups can get financial support from the government, whereas non-business group firms cannot.

Second, the market share of business groups also matters. Suppose that there is an industry sector where non-business group firms operate alone and business groups are completely absent. Banks – that need to diversify their loan portfolios across different industries for risk management purposes – would extend loans to these non-business group firms despite the shortage of capital in the economy. Also note that this is the case regardless of how large the business groups are, as they are not operating in that industry sector. However, if a business group firm enters this industry, banks may no longer extend loans to non-business group firms. They would prefer to extend loans to business group firms that can secure debt guarantees from their sister firms or that have more significant political connections. Moreover, if the business group's market share increases, reflecting their stronger competitiveness, the tendency to extend loans to business group firms over non-business group firms would strengthen.

To put these two elements – size of business groups' internal capital market and their market share – together, we calculate the BSDI of industry $k$ in year $t$ using the following formula:

$$BSDI_{kt} = \left[\left(\frac{\sum_{i=1}^{n} S_{itk} * w_{it}}{\sum_{i=1}^{n} S_{itk} + \sum_{j=1}^{m} S_{jtk}}\right) / BSDI^{*}\right], where\ w_{it} = \frac{ICM_{it}}{ICM_{t}^{*}} \quad (1)$$

Here, subscript $i\ (= 1, 2, \cdots, n)$ denotes business group (e.g., the Top 30 chaebol) firms present in industry $k$ in year $t$, and $j\ (= 1, 2, \cdots, m)$ denotes non-business group firms present in industry $k$ in year $t$. $S_{itk}(S_{jtk})$ equals total sales of firm $i\ (j)$ in industry $k$ in year $t$, and $w_{\mathrm{it}}$ equals $ICM_{\mathrm{it}}/ICM_{t}^{*}$, where $ICM_{\mathrm{i,t}}$ is the size of the business group's internal capital market (*ICM*), to which firm $i$ belongs in year $t$ and $ICM_{t}^{*}$ is the sum of *ICM*s across all business groups in year $t$. $BSDI^{*}$ is a constant scaling factor that equals the largest value of $[\sum_i S_{itk} \times w_{it}/(\sum_i S_{itk} + \sum_j S_{jtk})]$. We divide by this scaling factor because un-scaled BSDI values are extremely small. From equation (1), one can see that the BSDI value increases with the sales volume of business group firms relative to that of non-business group firms, as well as with the size of their internal capital market relative to that of other business groups not operating in the industry.

Note that we compute $ICM_{\mathrm{it}}$ by adding book asset values of all the group members (excluding firm $i$). We do this because almost every part of a company's assets can be used to support other member firms. Typically, an internal capital market is formed through intragroup loans and equity investments (Gopalan, Nanda, and Seru, 2007; Gopalan, Nanda, and Seru, 2014; Buchuk et al., 2014; and Almeida, Kim, and Kim, 2015). However, a company's physical assets can also assist other member firms as greater investment in PP&E can enhance sales, which in turn can increase the volume of related-party purchases from other member firms (Black et al., 2015; Hwang and Kim, 2015). Cash is also useful, since it can easily be turned into other forms

of assets, such as loans, equity investments, or physical assets that can be used to support other member firms (Boutin et al., 2013).

In a later section, we conduct a robustness test using an alternative measure of $ICM_{\mathrm{it}}$. Instead of aggregating the book asset values of other member firms in the same group, we aggregate only their cash holdings. This is the measure that Boutin et al. (2013) uses in their study on the entry and exit decisions of group-affiliated firms. We show that our results remain intact even if we use this narrowly defined measure of internal capital market when computing the BSDI.

## 4. Data

In this section, we describe the data that we use in the empirical analyses. We provide data sources, variable definitions, and their descriptive statistics.

### *A. Data Sources*

To investigate whether and when business groups can harm the capital allocation efficiency of non-business group firms, we need to identify business groups and their member firms (both public and private) in a consistent manner. We collect this information from the Korea Fair Trade Commission (KFTC).

Starting from 1987, the KFTC annually designates and releases the list of large business groups (LBG), the names of the persons who control each of the groups, and the list of firms under each group's control (i.e., member firms). When it comes to the concept of control, the KFTC has adopted an elaborate method, the details of which are explicitly defined in the *Monopoly Regulation and Fair Trade Act* and its enforcement decree. The KFTC considers not

only directly owned shares, but also the shares indirectly owned through related parties (e.g., relatives, not-for-profit entities, for-profit member firms). It also considers channels of influence that do not rely on share ownership. A person in control could be a natural person or a legal person (in case the shares of the apex firm are dispersedly owned, and therefore do not have a controlling shareholder). In this study, we exclude business groups controlled by a legal person from our analyses. For details on the identification of member firms and the persons in control, we refer to Kim, Lim, and Sung (2007).

The KFTC's identification of large business groups (LBGs) depends on the aggregate size of member firms' assets (net assets in the case of financial firms). From 1987 to 1992, KFTC used a threshold of 400 billion KRW and designated groups above this threshold as large business groups (LBGs). From 1993 to 2002, the KFTC designated the 30 largest business groups without using any size threshold. From 2002 to 2008, the KFTC went back to its earlier method and used a threshold of 2 trillion KRW. Starting from 2009, the KFTC uses a threshold of 5 trillion KRW.

The choice of KFTC's thresholds, whether they are in monetary amounts or in ranks, may seem arbitrary. However, one needs to understand that this arbitrariness is inevitable. This is because a clear-cut distinction between business groups and stand-alone firms exist only in theory. In the real world, between the largest business group and a stand-alone firm, there exists a continuum of smaller business groups. For example, there can be many tiny business groups composed of only two or three member firms. However, they do not fit with the perception that we have of business groups. Thus, an arbitrary cut-off somewhere in-between is inevitable.

For our purpose, what is important is to use a threshold that can identify business groups large enough to have internal capital markets of meaningful size. In addition, we need to use a

threshold that is not only consistent throughout our sample period, but that also gives us a meaningful number of business groups each year. We believe that a threshold of the 30 largest business groups (i.e., the Top 30 chaebols) fits these two conditions. First, in their study of chaebols during the pre-crisis period, Bae, Kang, and Kim (2002) compare the Top 30 chaebols against other smaller business groups and stand-alone firms, and conclude that they are more diversified, have a greater number of member firms, have greater economic power, are more heavily levered, and rely more heavily on debt guarantees. For these reasons, prior studies on Korean business groups almost always use Top 30 chaebols as their sample of business groups (Shin and Park, 1999; Bae, Kang, and Kim, 2002; Hong, Lee, and Lee, 2004; Kim, Lim, and Sung, 2007; Lee, Park, and Shin, 2009; Almeida, Kim, and Kim, 2015).

Second, if we use a threshold monetary amount (inflation adjusted or not) and apply it throughout our sample period, we have to accommodate two data problems: a missing data problem in later years and a sample size problem in earlier years. For example, if we use the threshold of 400 billion KRW throughout our sample period – i.e., the threshold that the KFTC used during 1987–1992, with a value of approximately 1 trillion KRW in 2009 – we end up having no data for business groups whose aggregate asset size is less than 5 trillion KRW in 2009 as they were not identified by the KFTC in that year ("missing data problem"). Also, if we use the threshold of 5 trillion KRW throughout our sample period – i.e., the threshold used by the KFTC since 2009, with a value of approximately 2 trillion KRW in 1987 – we end up having only a couple of business groups left in earlier years ("sample size problem"). However, we do

not have these problems if we use a threshold of the 30 largest business groups (i.e., the Top 30 chaebols).[6]

Thus, in our empirical analyses we use as proxy for business group firms those affiliated to the Top 30 chaebols and non-business group firms for all others. Since our proxy for business group firms include only those from large business groups and our proxy for non-business group firms include not only stand-alone firms but also those from smaller business groups, we label them hereafter as large business group (LBG) firms and non-LBG firms, respectively.

For our research purpose, it is also very important to have financial statement data for privately traded companies. This is because a predominant fraction of firms in our sample, whether they are group-affiliated or not, are privately traded. In the case of Korea, thanks to the *Act on External Audit of Stock Companies,* firms with an asset size above a certain threshold are subject to external auditing and their financial statement data are available to the public.[7] In our study, we make use of this data provided by TS2000 – a database compiled by the Korea Listed Companies Association – and D&B Korea.[8] As for publicly traded companies throughout our sample period (1987–2010) and for privately traded companies from 1999, we use the TS200 database. For privately traded companies before 1999, we rely on a unique data set that we purchased from D&B Korea. Both databases are free from survivorship bias.

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[6] Note, however, that the composition of the Top 30 chaebols, although quite stable, changes over time. In unreported analyses, we use business groups limited to those that appear in the Top 30 chaebol list every year, plus the ones that separate themselves from such groups. We obtain results that are similar to what we find with the Top 30 chaebols.

[7] During our sample period, the threshold gradually increased over the years: 3 billion KRW during 1987–1989, 4 billion KRW during 1990–1992, 6 billion KRW during 1993–1997, 7 billion KRW during 1998–2008, and 10 billion KRW in 2009.

[8] D&B Korea is a joint venture established in 2002 between National Information & Credit Evaluation (NICE) Inc. (Korea's first credit information service provider) and Dun & Bradstreet (D&B) International, a US business information provider.

Throughout our analyses, we exclude firms from the financial or utility industries for obvious reasons. They either do not make capital expenditures, or their capital expenditures are heavily regulated by the government.

### *B. Definition of Variables*

In this study, most of our analyses are carried out by conducting industry-level regressions. Accordingly, our key variables are also defined at the industry-level: the Business Group Strength and Dominance Index (BSDI), Industry CAPEX Ratio, Industry Sales Growth, and Industry EBITDA Ratio. We use industry-level data because the distribution of our non-business group firms is heavily skewed toward small firms (the book asset value has a mean of 39 billion KRW and a median of 15 billion KRW). If we use firm-level data, our results would be driven by firms that may not individually be significant at all in the economy. Moreover, two of the investment opportunity measures used in our robustness tests, Tobin's $q$ and Industry Value Added Growth, are available only at the industry-level.

The BSDI is defined in the previous section. Industry CAPEX Ratio is the median value of firm-level CAPEX ratios, calculated for three different sets of firms (LBG-firms, non-LBG firms, and all firms combined), in a given industry $k$ in year $t$, expressed in percentage terms. The CAPEX ratio of firm $i$ in year $t$ equals $(CAPEX_{i,t}/Trailing\ Assets_{i,t})$, where $CAPEX_{i,t}$ is the net capital expenditure for firm $i$ in year $t$ and $Trailing\ Assets_i$ is the book value of firm $i$'s assets in year $t-1$ (adjusted for inflation using GDP deflator).

Industry Sales Growth is our measure of investment opportunity, which is defined as the median value of firm-level sales growth measures, calculated across all firms (both LBG firms and non-LBG firms), in a given industry $k$ in year $t$, expressed in percentage terms. Sales

growth of firm $i$ in year $t$ equals $ln(Sales_{i,t}/Sales_{i,t-1})$, where $Sales_t$ and $Sales_{t-1}$ (adjusted for inflation using the GDP deflator) are firm $i$'s total sales at fiscal year-end $t$ and $t-1$, respectively. Notice that we use sales growth over Tobin's $q$ as our primary measure of investment opportunity. This is to avoid the problem that arises when regressing investment on marginal $q$ with measurement errors and cash flows. As well documented in Erickson and Whited (2000), when marginal $q$ has a measurement error, cash flow becomes significant even in the absence of financial constraints. Nevertheless, in our robustness tests we use many alternative measures of investment opportunity – Industry Tobin's $q$, Industry Intangible Ratio, and Industry Value Added Growth – and find that they give qualitatively similar results. Detailed definitions of these alternative variables are provided in the Appendix.

The Industry EBITDA Ratio is the median value of firm-level EBITDA ratios, calculated for three different sets of firms (LBG-firms, non-LBG firms, and all firms combined) in a given industry $k$ in year $t$, expressed in percentage terms. The EBITDA ratio of firm $i$ in year $t$ equals $(EBITDA_{i,t}/Trailing\ Assets_{i,t})$, where $EBITDA_{i,t}$ is earnings before interest, taxes, depreciation, and amortization for firm $i$ in year $t$ and $Trailing\ Assets_i$ is the book value of firm $i$'s assets in year $t-1$ (adjusted for inflation using the GDP deflator).

As for industry classification, we start with the two-digit Korea Standard Industrial Classification (KSIC) codes. However, to ensure that each industry has a sufficient and a balanced number of firms, we use four-digit codes in case the number of firm-years in a given two-digit industry is greater than 10,000 (e.g., manufacturing sector). If the number of firm-years in a given two-digit industry is greater than 3,000, but less than 10,000, we use three-digit codes for that industry. In unreported analyses (available upon request), we conduct a series of

robustness tests using alternative industry classification methods (using two-digit, three-digit, or four-digit industry codes throughout, regardless of the number of firms in a given industry) and find qualitatively similar results.

### *C. Descriptive Statistics*

Table 1 reports the summary statistics of the Business Group Strength and Dominance Index (BSDI) calculated annually for each industry (excluding financial or utility industries) from 1987 to 2010 (24 years). One can see that the collective strength and dominance of large business groups in Korea, on average, falls within our sample period. The mean index value of 0.128 in 1987 declines to 0.096 in 2010. What is hidden behind this overall downward trend, however, is the cross-sectional variation that declines considerably in later years. The maximum value of the BSDI, which used to be well above 0.7, declines to 0.261 in 2006. Accordingly, the standard deviation of 0.173 as of 1987 declines to 0.104 in 2010. Since extremely large BSDI industries disappear in later years, we find that the median index value, as opposed to mean value, declines only slightly during our sample period, with a reduction from 0.056 in 1987 to 0.061 in 2010. Another important point is that the trend is not monotonic. The median index value peaks in the crisis years (0.084 in 1997), reaches a minimum in 2003 at 0.026, and then gradually increases thereafter (0.061 in 2010). We believe that these are all novel findings that have not been reported in the literature and are important on their own account for policymakers in Korea.

Also notice from Table 1 that the maximum value of the BSDI is 1.000 in 1994. This means that there is an industry in 1994 that has the highest un-scaled BSDI value throughout our sample period (its un-scaled BSDI value is 0.147). This is the "Sale of Motor Vehicle Parts and Accessories" industry, where five large business group firms are present. They jointly comprise

94.78 percent of the market share. Hyundai Motor Service, which has an 87.58 percent market share, belongs to the Hyundai Group – the largest business group in 1994.

Figure 2 is a graphical presentation of Table 1. It presents the yearly mean and median values of the BSDI over our entire sample period. We superimpose fitted lines to show the time trend. Consistent with our findings in Table 1, the figure shows that the BSDI is decreasing over time, as is evidenced by the two downward sloping fitted lines. Also, there seems to be a sudden decline in the BSDI immediately after the Asian financial crisis (1997/98), which may be reflecting the fact that large business groups became more focused (compared to the pre-crisis period) in response to the crisis.

Table 1 also reports the number of industries in each year for which the BSDI is calculated (second column) and the mean or median number of firms within individual industries (third and fourth columns). One can observe that the number of industries in a given year ranges from 38 to 44. Over the entire sample period, we have a total of 1,029 industry-year observations. The median number of firms within an industry ranges from 69.5 in the beginning of our sample period to 285 at the end.

As a way to assure that this index can effectively capture important corporate or group events that change the strength and dominance of large business groups, we examine six real cases: two acquisitions, two divestures, and two group splits. The first example is the acquisition of "Loen Entertainment" by SK Group in late 2005. This acquisition led the BSDI of the industry in which "Loen Entertainment" operates (i.e., Printing and Service Activities related to Print, Reproduction of Recorded Media) to increase from 0.0001 in 2005 to 0.0229 in 2006. The second example is the acquisition of "Hankook Heavy Industries & Construction" by Doosan Group in late 2000 when the government sold its stakes in the company as part of its

privatization program. This led the BSDI of the industry in which "Hankook Heavy Industries & Construction" operates (i.e., Manufacture of Fabricated Metal Products) to increase from 0.0021 in 2000 to 0.0086 in 2001.

Third, in the second half of 1999, SK and Daewoo Group, respectively, sold "Dongryung Chemicals" and "Kyungwoo Purification Technology," which operate in the "Manufacture of Rubber and Plastic Products" industry. This divesture led to a decrease in the industry's BSDI from 0.0307 in 1999 to 0.0176 in 2000. Fourth, in late 1999, Daewoo Group lost control over "Daewoo Heavy Industry and Construction," that had to enter a workout program. This led the BSDI of the industry in which "Daewoo Heavy Industry and Construction" operates (i.e., Manufacture of Other Machinery and Equipment) to drop from 0.0981 in 1999 to 0.0632 in 2000.

The fifth example comes from the separation of Hyundai Motor Group in late 2000 from Hyundai Group. This led the BSDI of the industry in which "Hyundai Motor Company" (a leading company of Hyundai Motor Group) operates (i.e., Manufacture of Motor Vehicles, Trailers, and Semitrailers), to decrease from 0.534 in 2000 to 0.188 in 2001. Finally, the split of GS Group from LG Group in early 2005 led to a drop in the BSDI from 0.174 in 2004 to 0.047 in 2005 in the industry to which GS Caltex (a leading company of GS Group) belongs (i.e., Manufacture of Coke, Hard-coal and Lignite Fuel Briquettes, and Refined Petroleum Products).

Table 2 reports the descriptive statistics of our key industry-level variables (BSDI, Industry CAPEX Ratio, Industry Sales Growth, and Industry EBITDA Ratio) used in this study over a full sample period (1987 to 2010, including 1997 and 1998) and over two sub-periods: one before the 1997–98 Asian financial crisis (1987–1996) and one thereafter (1999–2010). First, one can see that the mean value of the BSDI is lower during the post-crisis period (reduced from 0.139 to 0.117 in the combined sample), providing evidence consistent with that in Table 1 and

Figure 2. Second, by construction, the mean and the median BSDI values are greater when they are computed using industries where large business group firms operate (0.164 vs. 0.129 in the case of mean values during the full sample period).

Third, the Industry CAPEX Ratio decreases significantly across the board – but more so in the case of large business group firms – after the crisis. As for large business group firms, the average Industry CAPEX Ratio decreases from 3.69 percent during the pre-crisis period to 1.35 percent during the post-crisis period, whereas it decreases from 2.44 percent during the pre-crisis period to 1.58 percent during the post-crisis period for non-LBG firms. This is consistent with the view that large business group firms in Korea engaged in over-investment before the crisis (Chang, Park, and Yoo, 1998). Median values show a similar pattern.

Fourth, Industry Sales Growth also declines after the crisis, but more so in the case of non-LBG firms. As for non-LBG firms, average Industry Sales Growth decreases from 7.95 percent during the pre-crisis to 5.95 percent during the post-crisis period, whereas it decreases from 6.89 percent during the pre-crisis period to 6.58 percent during the post-crisis period for large business group firms. Median values show a similar pattern.

Fifth, the Industry EBITDA Ratio rises in the case of large business group firms, whereas it decreases in the case of non-LBG firms after the crisis. As for large business group firms, the average Industry EBITDA Ratio rises from 5.89 percent during the pre-crisis to 7.45 percent during the post-crisis period, whereas it decreases from 7.28 percent during the pre-crisis period to 5.66 percent during the post-crisis period for non-LBG firms. Median values show a similar pattern.

## 5. Results

### *A. Industry-Level Capital Allocation Efficiency over Time*

Before going into our main results on the effect of large business groups' strength and dominance, in this subsection we confirm the findings in the prior literature that Korean firms' capital allocation efficiency improves and their financial constraints ease after the Asian financial crisis (Hong, Lee, and Lee, 2004; Lee, Park, and Shin, 2009). We do this by estimating industry-level regressions, where we regress the Industry CAPEX Ratio on Industry Sales Growth, Industry EBITDA Ratio, year fixed effects, and industry fixed effects. We run regressions, where variables are calculated using all firms combined, non-LBG firms only, and large business group firms only. To see how efficiency and financial constraints evolve over time, we also run regressions separately for years before the crisis (1987–1996) and years thereafter (1999–2010). When using a sample that combines both periods (before + after), we construct a period dummy that takes a value of one before the crisis and zero thereafter, and interact it with our two key regressors (Industry Sales Growth and Industry EBITDA Ratio).

The first three columns in Table 3 report the results when all firms are combined. Note that standard errors are clustered at the industry-level. One can see that, before the crisis, Korean firms do not allocate the capital efficiently and suffer from financial constraints, as is evidenced by the insignificant coefficient of Industry Sales Growth, but a significant coefficient of the Industry EBITDA Ratio (column 1). The coefficient of 0.174 on the Industry EBITDA Ratio before the crisis suggests that a 1-SD (one standard deviation) increase in the Industry EBITDA Ratio (3.7) increases the Industry CAPEX Ratio by 0.64, which is 26 percent of the Industry CAPEX Ratio's mean value of 2.44. However, this is not the case after the crisis as the Industry

CAPEX Ratio becomes significantly sensitive to Industry Sales Growth, but not to the Industry EBITDA Ratio (column 2). Also, notice that the decline in the coefficient of the Industry EBITDA Ratio after the crisis is statistically significant. When we add the period dummy and interact it with the Industry EBITDA Ratio, the coefficient of the interaction term is negative and also statistically significant at the one percent level, suggesting the ease of financial constraints after the crisis.

However, the results are mainly driven by non-LBG firms. As shown in columns 4–5, the coefficient of Industry Sales Growth, that is insignificant before the crisis, becomes significant thereafter. In addition, the coefficient of the Industry EBITDA Ratio, which is significant at 0.219 before the crisis, declines to 0.081 after the crisis. Furthermore, notice that the decline in the coefficient of the Industry EBITDA Ratio and the rise in the coefficient of Industry Sales Growth are significant, at the 1 and 10 percent levels, respectively (see the coefficients of the interaction terms in Column 6).

The investments of large business group firms, on the contrary, behave quite differently. First, the coefficient of the Industry Sales Growth is positive and statistically significant throughout the sample period. The coefficient of 0.106 on Industry Sales Growth before the crisis suggests that a 1-SD increase in Industry Sales Growth (6.7) increases the Industry CAPEX Ratio by 0.71, which is 19 percent of the Industry CAPEX Ratio's mean value of 3.69. Second, the coefficient of the Industry EBITDA Ratio is never statistically significant, which suggests that large business group firms do not suffer from financial constraints, neither before nor after the crisis. Notice that none of the interaction terms in Column 9 is significant.

It is worth noting that the results in Table 3 are consistent with our assumption that the advancement in financial sector development and the strengthening of investor protection take

place around the crisis period (1997/98). Borrowing the terms used in Almeida and Wolfenzon (2006), our findings give us the rationale to use 1997/98 as years that can separate the periods of "intermediate investor protection" and "high investor protection." In fact, the results from a series of Chow's Tests using differently defined period dummies show that the level of F-statistics is the highest (at 8.55 with a p-value of 0.0001) when the period dummy takes a value of one, from 1999 onwards.[9]

### *B. The BSDI and Industry-Level Capital Allocation Efficiency*

In Tables 4 and 5, we examine how our index on large business groups' collective strength and dominance affects the efficiency of industry-level capital allocation over time. To do so, we include our regression BSDI and its interactions with our two key regressors (Industry Sales Growth and the Industry EBITDA Ratio). We first do this using a sample that combines all firms (LBG and non-LBG firms) when constructing the industry-level variables. In other words, we first test the economy-wide equilibrium effect of the BSDI.

Table 4 reports the results, from which we can see that the BSDI hardly has any effect on capital allocation efficiency throughout our sample period. That is, the coefficients of the interaction terms between the BSDI and Industry Sales Growth ([a] × [b]) are always negative, but never statistically significant. In addition, the coefficients of the interaction terms between the BSDI and the Industry EBITDA Ratio ([b] × [c]) are also statistically insignificant. Accordingly, the triple interaction terms ([a] × [b] × [d] and [b] × [c] × [d]) are also statistically insignificant. These results suggest that greater strength and dominance of large business group

[9] We experiment with 13 different period dummies, each taking a value of one starting at different points in time (1992, 1993, 1994, 1995, 1996, 1999, 2000, 2001, 2002, 2003, 2004, 2005, and 2006).

firms do not necessary improve or deteriorate economy-wide capital allocation efficiency. There can be two possibilities. One is the BSDI having no effect on both types of firms; another is the BSDI having opposite effects and that these two completely offset each other. For example, the BSDI may improve the efficiency of large business group firms, but that may be completely offset by the deterioration of non-LBG firms' efficiency.

### *C. Negative Externality of Business Groups' Strength and Dominance*

To uncover what is actually taking place underneath this combined result, we investigate non-LBG and large business group firms separately (see Table 5). In columns 1–4, we include only non-LBG firms when constructing the industry-level variables. We find that the coefficient of the interaction term [a] × [b] is negative (-0.188) and statistically significant at the five percent level before the crisis (column 2), but loses significance after the crisis (column 3). In other words, the sensitivity of the Industry CAPEX Ratio in respect to Industry Sales Growth declines by half if the BSDI of the industry non-LBG firms operate in increments from zero to its mean value of 0.139 during the pre-crisis period.[10] Accordingly, the triple interaction term [a] × [b] × [d] is also statistically significant at the 10 percent level (column 4). These results suggest that before the crisis, when financial sector is underdeveloped and investor protection is weak, the BSDI deteriorates capital allocation efficiency of non-LBG firms. In other words, we find evidence of large business groups' negative externality on firms outside the large business group.

In columns 5–6, we include only large business group firms when constructing the industry-level variables. We find that the coefficient of the interaction term [a] × [b] is positive

[10] If the BSDI=0, the sensitivity is 0.05 (coefficient of Industry Sales Growth). If the BSDI=0.139, the sensitivity is 0.05 - 0.188 x 0.139 = 0.0239.

(0.134) before the crisis (column 6), but becomes negative after the crisis (column 7). Although statistically insignificant, this positive interaction effect of 0.134 from the large business group result and the negative interaction effects of -0.188 from the non-LBG result explain why we have a moderately negative interaction effect of -0.096 from the combined result. In other words, if we put the results in Tables 4 and 5 together, we can conclude that the BSDI's moderately positive effect on large business group firms has been completely offset by its negative effect on non-LBG firms before the crisis.

Figure 3 shows a similar result graphically. It plots the yearly estimated coefficients of the interaction term between Industry Sales Growth and the BSDI when conducting regressions similar to that of column 1 in Table 5, year-by-year, for non-LBG firms. Since we calculate these regressions yearly, we omit year and industry fixed effects. We superimpose horizontally fitted lines to show how the coefficients differ before and after the crisis. One can observe that the coefficients on the interaction terms have large variations over the sample period, which is not surprising given the small number of industries in our yearly cross-sectional regressions. However, one can clearly observe that the coefficients are lower and negative before the crisis, suggesting that the capital allocation efficiency of non-LBG firms is negatively associated with the collective dominance and strength of large business groups before the crisis.

One example of large business groups harming the investment efficiency of non-LBG firms during the pre-crisis period can be found in the "Sale of Motor Vehicles and Parts" industry. In 1993, the BSDI of this industry increased to 0.9576 from previous year's 0.8683 (a 10.3 percent increase). Accordingly, despite the increase in industry sales growth ratio from 0.53 percent in 1993 to 11.27 percent in 1994 (a 2,000 percent increase) in the following year, the

industry CAPEX Ratio of non-LBG firms declined from 3.69 percent in 1993 to -1.79 percent in 1994 (a 149 percent decrease).

In unreported analyses, we calculate the regression of column 4 in Table 5 using differently defined period dummies, and find that the triple interaction term ([a] × [b] × [d]) is statistically significant (at the 10 percent level) only when using the original period dummy that takes a value of one, starting from 1999.[11] This result suggests that the LBG-inflicted financial constraints on non-LBG firms eased considerably immediately after the crisis.

### *D. Decomposition of the BSDI into Strength and Dominance*

As mentioned earlier, the BSDI is an index that captures two distinct features: the collective size of the internal capital market of large business groups ("strength") and their collective market share ("dominance"). In this subsection we decompose BSDI strength and dominance, in order to investigate which feature of the index is driving the results in Table 5. The decomposition can be easily carried out by regressing the BSDI on large business groups' collective market share in the industry without year or firm fixed effects; this is done separately for the entire sample period, the pre-crisis sample, and the post-crisis sample. The fitted value of the regression is referred to as the component of the BSDI that is related to large business groups' collective market share in the industry (LBG MKT Share), whereas the orthogonal residual term is referred to as the component of the BSDI that is related to the size of large business groups' internal capital market (ICM Size).

[11] As in our earlier Chow's Tests, we experiment with 13 different period dummies, each taking a value of one starting at different points in time (1992, 1993, 1994, 1995, 1996, 1999, 2000, 2001, 2002, 2003, 2004, 2005, and 2006).

We report the results in Table 6 Panel A, where we run regressions that are exactly the same as those in columns 1–4 in Table 5, except that we split the BSDI into LBG MKT Share and ICM Size. One can observe that the coefficients of the interaction terms of interest to us ([a] × [b] and [a] × [c]) are both negative and statistically significant before the crisis (column 2), but lose significance after the crisis (column 3). Between the two, however, one can see that ICM Size matters more. Accordingly, the coefficient of the triple interaction term involving ICM Size ([a] × [c] × [e]) is positive and significant at the 10 percent level, whereas that of the triple interaction term involving LBG MKT Share ([a] × [b] × [e]) is insignificant.

These results suggest that large business groups' negative externality on the investment efficiency of non-LBG firms is not merely determined by their share in the market where they compete against non-LBG firms, but more so by the size of their internal capital market—where they can get their financing.

In Panel B, we confirm this finding using an alternative method. Instead of interacting Industry Sales Growth and the two components (LBG MKT Share and ICM Size) of the BSDI, we decompose the pre-crisis (before 1997) sample into four, using the median values of LBG MKT Share and ICM Size. The four subsamples include the High MKT Share and High ICM Size subsample; the High MKT Share and Low ICM Size subsample; the Low MKT Share and High ICM Size subsample; and the Low MKT Share and Low ICM Size subsample.

The results are consistent with the findings in Panel A. The coefficients of Industry Sales Growth is statistically significant only in one subsample, where both components are below the median (column 4) and statistically insignificant in all other three subsamples, where at least one of the BSDI components are above the median (columns 1–3). In other words, we can say that both components of the BSDI – the collective size of large business groups' internal capital

market ("strength") and their collective market share ("dominance") – harm the investment efficiency of non-LBG firms during the pre-crisis period.

### *E. The Financial Constraint Channel of Negative Externality*

If the period dummy that we use in earlier tables (Tables 5 and 6) – which is one after the Asian financial crisis, and zero before – captures the degree of financial sector development or the strength of investor protection only, and nothing else, we can conclude that the negative externality that large business group firms impose on the investment efficiency of non-LBG firms is solely due to financial constraints. However, the period dummy that we use in earlier tables may capture many other factors. For example, before the crisis large business groups could have been better positioned to attract skilled labor or secure government approval to enter promising industries, which in turn could have enhanced their investment efficiency at the expense of non-LBG firms.

To verify that the main underlying reason behind negative externality is coming from financial constraints, we re-calculate the regressions in Table 5, for different sets of subsamples. First, we split the sample into low and high tangibility industries. Industries with the median tangibility ratio (during 1987–2010 for a given industry) below (above) the global median (during 1987–2010 across all industries) are categorized as low (high) tangibility industries. The tangibility ratio is defined as tangible assets over trailing assets, adjusted for inflation using the GDP deflator. We expect that the negative externality on the investment efficiency of non-LBG firms takes place only in industries with low tangibility, as they may not have enough collateral to secure bank loans. Table 7 reports the results. Consistent with our expectation, we find a negative and statistically significant (at 5 percent level) coefficient of the interaction term of our

interest ([a] × [b]); this holds only before the crisis in industries where asset tangibility is low (column 3), and nowhere else. Accordingly, the coefficient of the triple interaction term ([a] × [b] × [d]) is positive and statistically significant at the one percent level only in industries where asset tangibility is low (column 4), and nowhere else.

Second, we split the sample into low and high cash flow industries. Industries with the median (during 1987–2010) EBITDA ratio below (above) the global median (during 1987–2010 across all industries) are categorized as low (high) cash flow industries. The EBITDA ratio is defined as EBITDA over trailing assets adjusted for inflation, using the GDP deflator. We expect that the negative externality on the investment efficiency of non-LBG firms takes place only in industries with low cash flows, as they may not have enough retained earnings to finance their investment projects internally. Table 8 reports the results. Consistent with our expectation, we find a negative and statistically significant (at 10 percent level) coefficient of the interaction term of our interest ([a] × [b]); this holds only before the crisis in industries where the cash flow levels are low (column 3), and nowhere else. Accordingly, the coefficient of the triple interaction term ([a] × [b] × [d]) is positive and statistically significant at the 10 percent level only in industries where the cash flow levels are low (column 4), and nowhere else. Note that we omit the Industry EBITDA Ratio from our regression, as it is used to divide the sample into high and low cash flow industries.

Third, in unreported analyses (available upon request), we split the sample into low and high export industries. Industries with the median (during 1987–2010 for a given industry) values of industry-wide export ratio below (above) the global median (during 1987–2010 across all industries) are categorized as low (high) export industries. Industry-wide export ratios are computed for a given industry at a given year by dividing the sum of exports across all firms

within that industry by the sum of sales across all firms within the same industry. During the pre-crisis period, we expect non-LBG firms with high export ratios to suffer less from financial constraints despite the presence of large business group firms, as they enjoyed export subsidies of various kinds. Note that Korea joined the World Trade Organization (WTO) in 1995. The results confirm this conjecture. We find that, before the crisis, the negative coefficient of the interaction between Industry Sales Growth and the BSDI declines in magnitude for industries with high export ratios.

### *F. The BSDI and Firm-Level Profitability*

In this subsection, we investigate whether low capital allocation efficiency of non-LBG firms translates into lower profitability, and whether high capital allocation efficiency of large business group firms translates into higher profitability. More specifically, we regress the firm-level EBITDA ratio on the BSDI, while controlling for firm size (log of total assets) and leverage ratio (debt-to-assets ratio). We do this for the entire sample period, before and after the crisis, for both non-LBG firms and large business group firms.

Table 9 reports the results. Specifically, we find that the BSDI predicts lower profitability of non-LBG firms before the Asian financial crisis, but not so thereafter. The BSDI coefficient of -3.913 (statistically significant at the five percent level) before the crisis for non-LBG firms suggests that a 1-SD increase in the BSDI (0.194) decreases profitability by 0.76, which is 11.4 percent of the EBITDA Ratio's mean value of 6.65. In contrast, we further find that the BSDI predicts the higher profitability of large business group firms before the Asian financial crisis, but only moderately so thereafter. The coefficient of 10.074 of the BSDI (statistically significant at the five percent level) for large business group firms before the crisis suggests that a 1-SD

increase in the BSDI (0.194) increases profitability by 1.95, which is 33 percent of the EBITDA Ratio's mean value of 5.92.

### *G. The BSDI and the Likelihood to Make Large Investments*

In this subsection, we employ a different set of tests to examine the external effect of large business groups, namely the duration analysis. That is, we examine how the level of large business groups' collective strength and dominance is associated with the probability of making large investment decisions conditional on not having done so in the past.

Recently, duration analysis is adopted by a number of papers to study the investment behavior of firms (for example, Whited, 2006; Akdoğu and MacKay, 2008; Billett, Garfinkel, and Jiang, 2011). It has several advantages over the regression analysis that examine the relationship between investment and growth opportunity, as we do in our earlier sections. First and foremost, it does not make use of growth opportunity that is prone to measurement concerns. Second, as mentioned in Whited (2006), corporate investment has the nature of being lumpy and sporadic, a property that is suitable for duration analysis.

Following Whited (2006), we use the mixed proportional hazard model first developed by Meyer (1990). Its specification is as follows:

$$\lambda_i(t) = \varpi_i \lambda_0(t) \exp[x_i(t)'\beta] \qquad (2)$$

Here, the number of years that firm $i$ has not reached a certain investment threshold is denoted by $t$. Following Whited (2006), we assume that a spike (i.e., a large investment above a

threshold) takes place when a firm's CAPEX ratio exceeds two times its median value.[12] The hazard function $\lambda_i(t)$, which measures the probability that firm $i$ will make a large investment exceeding the threshold in a given year $t$ conditional on not having done so in the past $t$ years, could then be represented as the product of three parts: $\varpi_i$ captures the unobserved heterogeneity, similar to random effects in standard linear regressions; $\lambda_0(t)$ is the baseline hazard, a function that is solely determined by duration $t$; and $x_i(t)$ is the time varying covariates vector where the corresponding coefficient vector is denoted as $\beta$. As discussed in Whited (2006), Meyer (1990)'s partial parametric model has the advantage of dealing with interval censored data, as we have here (in this model, the parametric part comes from $\beta$ and the assumption that $\varpi_i$ is normally distributed, and the nonparametric part comes from the baseline hazard $\lambda_0(t)$, which is restricted to be only a discrete step function).

More specifically, we first divide our firm-level data of non-LBG firms into two subsamples: low and high BSDI industries. Industries with the median (before 1996 and after 1999) BSDI value below (above) the global median (before 1996 and after 1999, across all industries) are categorized as low (high) BSDI industries. We then conduct duration analysis for both subsample periods: before the crisis (1987–1996) and thereafter (1999–2010). Our covariates include the EBITDA ratio and the two fixed effects (year and industry). Also, note that we require at least four consecutive years of data to be available for a firm to be included in the sample.

We predict that non-LBG firms in high BSDI industries would exhibit lower hazards than those in low BSDI industries during the pre-crisis period (1987–1996). This is because they

[12] In our unreported analysis, we also use the model to estimate when the spike takes place when a firm's CAPEX Ratio exceeds its median value. We find essentially the same results.

would invest less, not more, if financial constraints are what renders non-LBG firms' investments to be insensitive to growth opportunities.

Table 10 reports the results of our duration analysis. When we compare the baseline hazards between low and high BSDI industries, we observe that the hazards of low BSDI industries are always greater than those of high BSDI industries during the pre-crisis period (1987–1996). For example, the three-year hazards of 0.128 and 0.067 for low and high BSDI industries, respectively, suggest that the probability of a firm in a low BSDI industry making a large investment is twice as high as that of a firm in a high BSDI industry if both firms equally have not done so in the past three years. Also, notice that the differences in baseline hazards are in most cases statistically significant with the exception of a two-year hazard. However, the results look very different after the crisis. The significant differences in baseline hazards between the two subsamples disappear entirely during the post-crisis period.

In other words, during the pre-crisis period we find that the strength and the dominance of large business groups not only render the investments of non-LBG firms insensitive to growth opportunities, but also delay them. The mutually consistent findings of our duration analyses and of our earlier analyses based on investment sensitivity to growth opportunities reinforce the reliability of both results.

### *H. Falsification and Robustness Tests*

In this subsection, we conduct a falsification test to disprove a competing explanation, as well as a number of robustness tests to show that our key findings in Table 5 remain intact even when we use alternative measures of the BSDI and of investment opportunity.

In our falsification test, we construct an alternative index for each industry-year pair that simply adds the market share of the top five firms, regardless of group affiliation; we then determine if this index can explain the investment inefficiency of firms that rank lower in terms of market share. If it does, we cannot argue that our earlier findings solely come from the presence of large business groups. In unreported analyses (available upon request), we show that this is not the case. The interaction term between Industry Sales Growth and Top 5 MKT Share (i.e., the combined market share of the top five firms in terms of market share) is insignificant in a regression for non-Top 5 firms during the pre-crisis period. This finding confirms that the presence of large business groups do matter, and that our earlier finding on negative externality only emerges between LBG and non-LBG firms.

As our fist robustness test, we try an alternative measure of the BSDI that calculates the size of the internal capital market in a different way. Instead of aggregating the book asset values of other member firms in the same group, we aggregate their cash holdings. This measure is used by Boutin et al. (2013) in their study on the entry and exit decisions of group-affiliated firms. However, this alternative measure is incomplete for two reasons. First, it includes only the assets that have the potential to be extended (i.e., cash holdings), but not the assets that have already been extended to other member firms (i.e., lending and equity investments). Second, it leaves out fixed assets that can be used to enhance the volume of related-party sales and eventually the earnings of other member firms. If earnings accumulate, they become the source of internal capital. We believe that this mechanism of extending capital indirectly through related-party sales is equivalent to extending capital directly through loans or equity investments.

Nevertheless, we check here whether our earlier results remain intact, even if we use a narrowly defined measure of internal capital market when computing the BSDI. Table 11 reports

the results. Similar to Table 5, the interaction term between Industry Sales Growth and the BSDI ([a] × [b]) for non-LBG firms is negative and statistically significant with a coefficient of -0.215 during the pre-crisis period, but insignificant thereafter. Accordingly, the triple interaction term ([a] × [b] × [d]) is positive and statistically significant (at the 10 percent level). As expected, none of these interaction terms are statistically significant for LBG firms.

Next, we assess alternative measures of investment opportunity. The first measure that we examine is Tobin's $q$. Although Tobin's $q$ has several well-known problems, it is still the primary measure of growth opportunity in many studies. Since our sample includes both public and private firms, we use the median value of Tobin's $q$ of all publicly traded firms within the same industry (Industry Tobin's $q$). The results based on tests parallel to those of Table 5 are shown in the first three columns of Table 12. Similar to Table 5, the interaction term between the Industry Tobin's $q$ and the BSDI ([a] × [b]) is negative and statistically significant with a coefficient of -0.081 during the pre-crisis period, but insignificant thereafter. Accordingly, the triple interaction term ([a] × [b] × [d]) is positive and statistically significant (at the 10 percent level).

The second measure of growth opportunity that we used is the Industry Intangible Ratio, following Acharya, Davydenko, and Strebulaev (2012). Note that we define the Industry Intangible Ratio as the sum of intangible assets across all firms within a given industry over the sum of trailing assets across all firms within the same industry. The results are reported in columns 4–6 of Table 12. The primary variable of interest—the interaction term between the Industry Intangible Ratio and the BSDI ([a] × [b]) – is also negative and statistically significant with a coefficient of -1.514 during the pre-crisis period, but insignificant thereafter. Accordingly,

the triple interaction term ([a] × [b] × [d]) is positive and statistically significant (at the one percent level).

The final growth opportunity measure that we use is Industry Value Added Growth. Following Wurgler (2000), we collect the industry value added data of Korea from the United Nation's INDSTAT-3 database. Industry Value Added Growth is defined as the logarithm of a given year's industry value added minus the logarithm of the previous year's industry value added.[13] Note that the United Nation's INDSTAT-3 database allows us to cover only a subset of manufacturing industries (22) over a subset of our sample period (1990–2008).

The last three columns in Table 12 report the results. One can see that the coefficient of the interaction term between Industry Value Added Growth and the BSDI ([a] × [b]) is still negative and statistically significant with a coefficient of -0.040 before the crisis, but loses significance thereafter. Accordingly, the triple interaction term ([a] × [b] × [d]) is positive and statistically significant (at the 10 percent level).

## 6. Conclusion

This study investigates whether and when business groups can harm capital allocation efficiency of non-business group firms. From a sample of Korean firms during 1987 to 2010, we compute an annual index that captures the collective strength and dominance of large business groups in each industry. We find that this index (the BSDI) is negatively associated with the industry-level capital allocation efficiency of non-LBG firms during a period characterized by underdeveloped

[13] UN's INDSTAT database also reports industry-wide gross capital formation, from which Wurgler (2000) calculates industry-level investment. However, we do not use this measure as it does not allow us to calculate industry-wide investments separately for large business group and non-LBG firms. As such, we use the Industry CAPEX Ratio, as in our earlier analyses.

financial markets and weak investor protection (i.e., before the Asian financial crisis of 1997/98), but not so during a later period. We also find that this negative association is stronger in industries that may lack collateral (low asset tangibility) or internal equity capital (low profitability). The results are robust to different measures of the BSDI and investment opportunity.

This study makes a number of contributions to the literature. First and foremost, we fill the gap in the literature by investigating what influence business groups exert on other sectors of the economy, a question that has not been adequately addressed in the literature. Second, we provide empirical support for the theoretical predictions of Almeida and Wolfenzon (2006) that business groups' contribution to the economy-wide investment efficiency depends on the country's level of investor protection. Third, we add to a strand of literature that studies the influence of financial sector development or investor protection on capital allocation efficiency. Finally, we construct an index that captures the collective strength and dominance of business groups in each industry. We believe that this index, which we name the Business Group Strength and Dominance Index (BSDI), can be useful not only for the purpose of our study, but also in other studies that need to quantify the influence of business groups.

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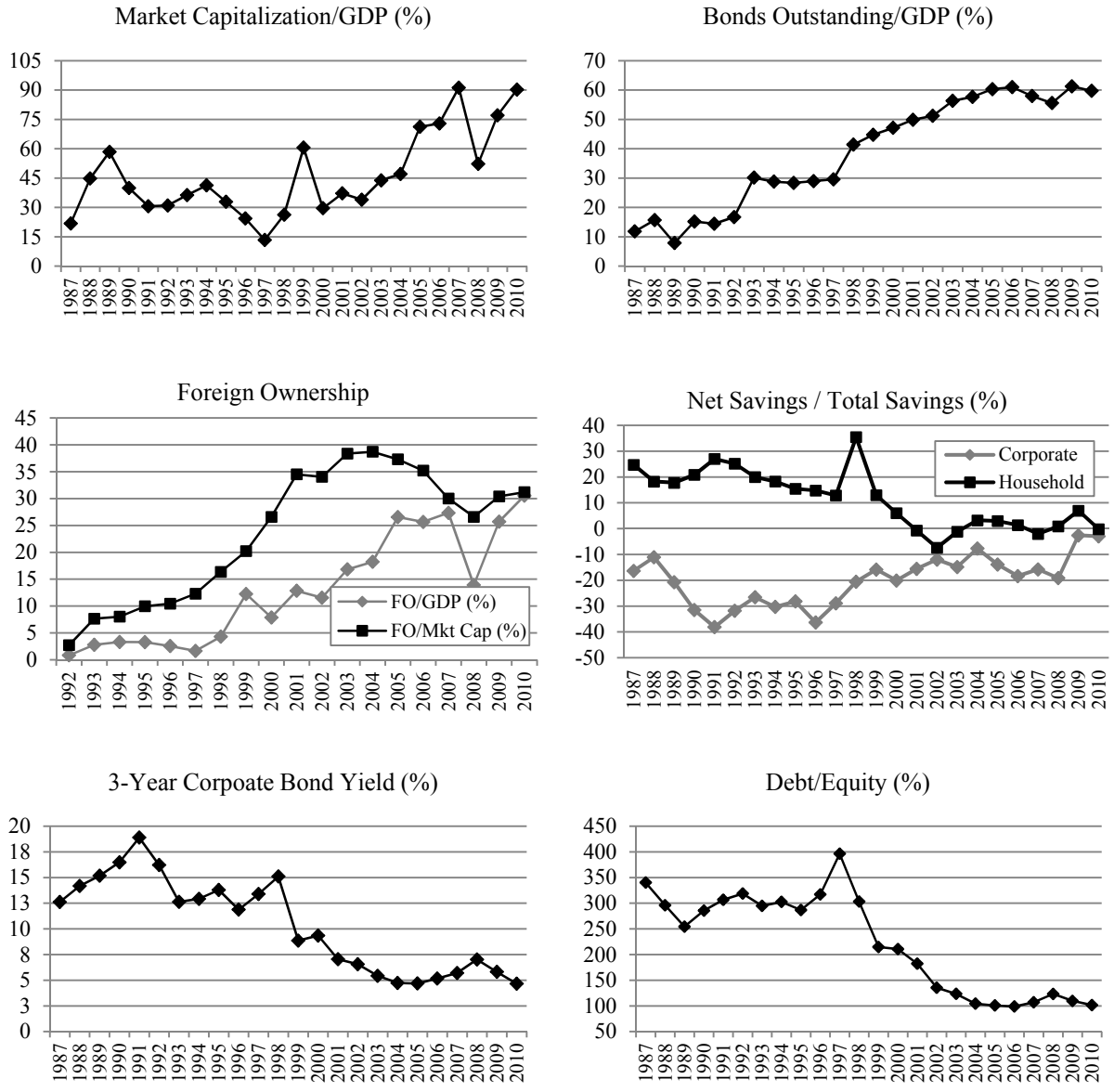
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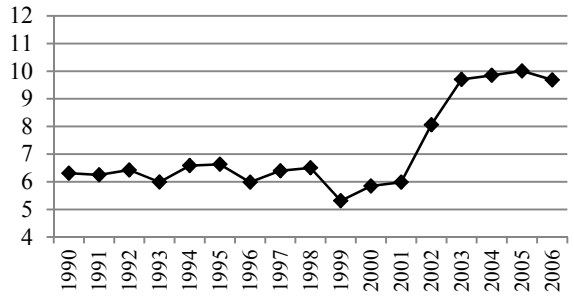
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**Figure 1: Financial Sector Development in Korea**

These figures present total market capitalization over GDP, total bond outstanding over GDP, fraction of foreign ownership (over GDP and over total market capitalization), net savings of corporate and household sectors as a fraction of country's total savings, three-year corporate bond yield (investment grade), debt-to-equity ratio, cash over assets, and current ratio of Korean firms before and after the Asian financial crisis (AFC). Foreign ownership data come from the Financial Supervisory Service (FSS) and all other data come from the Bank of Korea (BOK). Debt-to-equity ratio, cash ratio, and current ratio use all manufacturing sector firms filing corporate income tax.



Cash Ratio (%)




Current Ratio (%)

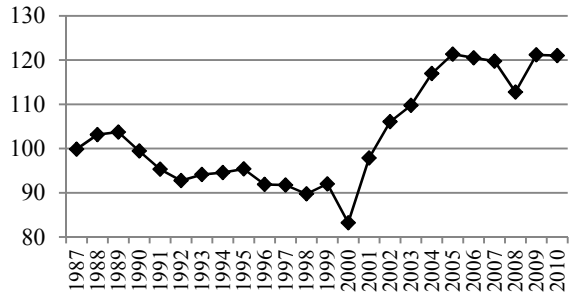


**Table 1: Business Group Strength and Dominance Index (BSDI)**

This table reports the summary statistics of the Business Group Strength and Dominance Index (BSDI), calculated for each industry (excluding financial or utility industry) every year from 1987 to 2010 (i.e., 24 years). We calculate the index based on the Top 30 business groups in Korea. For more detailed information about the index, please refer to the Appendix.

| | | No. of Firms within Industry | | BSDI | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | No. of Industries | Mean | Median | Mean | Median | S.D. | Max. | Min. |
| 1987 | 38 | 87.4 | 69.5 | 0.128 | 0.056 | 0.173 | 0.734 | 0 |
| 1987 | 39 | 99.0 | 83.0 | 0.127 | 0.066 | 0.163 | 0.661 | 0 |
| 1989 | 40 | 107.2 | 82.5 | 0.131 | 0.060 | 0.179 | 0.723 | 0 |
| 1990 | 41 | 116.9 | 90.0 | 0.125 | 0.041 | 0.195 | 0.854 | 0 |
| 1991 | 42 | 136.8 | 108.0 | 0.123 | 0.038 | 0.188 | 0.804 | 0 |
| 1992 | 43 | 137.8 | 110.0 | 0.122 | 0.052 | 0.191 | 0.866 | 0 |
| 1993 | 43 | 126.0 | 93.0 | 0.139 | 0.055 | 0.208 | 0.967 | 0 |
| 1994 | 43 | 143.2 | 113.0 | 0.139 | 0.058 | 0.210 | 1.000 | 0 |
| 1995 | 44 | 161.5 | 113.5 | 0.140 | 0.063 | 0.207 | 0.887 | 0 |
| 1996 | 44 | 167.5 | 112.0 | 0.124 | 0.060 | 0.173 | 0.687 | 0 |
| 1997 | 44 | 184.9 | 133.5 | 0.131 | 0.084 | 0.168 | 0.787 | 0 |
| 1998 | 44 | 161.9 | 111.0 | 0.135 | 0.073 | 0.182 | 0.858 | 0 |
| 1999 | 44 | 205.5 | 155.0 | 0.122 | 0.053 | 0.185 | 0.768 | 0 |
| 2000 | 44 | 236.4 | 165.5 | 0.108 | 0.044 | 0.156 | 0.648 | 0 |
| 2001 | 44 | 269.0 | 191.0 | 0.084 | 0.032 | 0.107 | 0.403 | 0 |
| 2002 | 44 | 309.6 | 215.5 | 0.081 | 0.027 | 0.100 | 0.378 | 0 |
| 2003 | 44 | 328.2 | 223.5 | 0.075 | 0.026 | 0.091 | 0.322 | 0 |
| 2004 | 44 | 346.6 | 233.0 | 0.075 | 0.029 | 0.089 | 0.323 | 0 |
| 2005 | 44 | 364.0 | 236.0 | 0.075 | 0.036 | 0.084 | 0.286 | 0 |
| 2006 | 44 | 360.8 | 233.5 | 0.079 | 0.038 | 0.082 | 0.261 | 0 |
| 2007 | 43 | 424.5 | 268.0 | 0.079 | 0.046 | 0.081 | 0.273 | 0 |
| 2008 | 43 | 427.3 | 270.0 | 0.085 | 0.049 | 0.094 | 0.382 | 0 |
| 2009 | 43 | 413.8 | 270.0 | 0.096 | 0.053 | 0.101 | 0.371 | 0 |
| 2010 | 43 | 437.7 | 285.0 | 0.096 | 0.061 | 0.104 | 0.409 | 0 |

**Figure 2: Evolution of Business Group Strength and Dominance over Time**

This figure presents the yearly mean and median values of the BSDI over our entire sample period (1987–2010). We superimpose fitted lines to show the time trend. For more detailed information about the index, please refer to the Appendix.

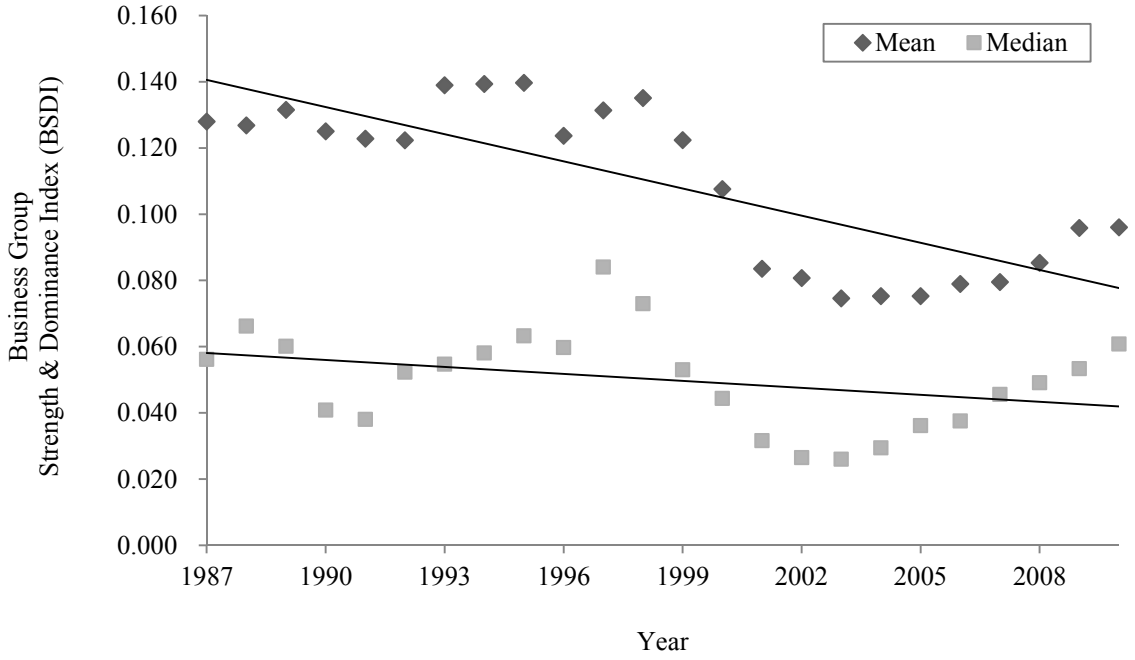


**Table 2: Summary Statistics of Key Variables**

This table reports the descriptive statistics of key variables (BSDI, Industry CAPEX Ratio, Industry Sales Growth, and Industry EBITDA Ratio) used in this study over a full sample period (1987 to 2010; including 1997 and 1998) and over two sub-periods: one before the 1997–98 Asian financial crisis (1987–1996) and one thereafter (1999–2010). We exclude firms that belong to the financial or utility industry from the sample. "Large Business Group Firms" refers to firms affiliated to the Top 30 chaebols and "Non-LBG Firms" refers to those that are not. For a detailed definition of each variable, please refer to the Appendix.

| | All Firms Combined | | | | Non-LBG Firms | | | | LBG Firms | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | Mean | Median | Std. | *N* | Mean | Median | Std. | *N* | Mean | Median | Std. |
| *Full Sample Period* (1987–2010) | | | | | | | | | | | | |
| BSDI | 1,029 | 0.129 | 0.062 | 0.171 | 1,029 | 0.129 | 0.062 | 0.171 | 778 | 0.164 | 0.114 | 0.178 |
| Industry CAPEX Ratio | 1,029 | 2.141 | 1.489 | 3.714 | 1,029 | 1.945 | 1.419 | 3.503 | 778 | 2.427 | 1.074 | 6.009 |
| Industry Sales Growth | 1,029 | 6.002 | 5.477 | 8.583 | 1,029 | 6.002 | 5.477 | 8.583 | 778 | 5.723 | 5.471 | 7.853 |
| Industry EBITDA Ratio | 1,029 | 6.518 | 6.405 | 3.830 | 1,029 | 6.218 | 6.400 | 3.635 | 778 | 6.693 | 6.142 | 5.180 |
| *Before 1997* (1987–1996) | | | | | | | | | | | | |
| BSDI | 417 | 0.139 | 0.058 | 0.194 | 417 | 0.139 | 0.058 | 0.194 | 296 | 0.179 | 0.114 | 0.206 |
| Industry CAPEX Ratio | 417 | 2.980 | 2.443 | 4.221 | 417 | 2.444 | 2.075 | 4.116 | 296 | 3.686 | 2.621 | 7.432 |
| Industry Sales Growth | 417 | 7.951 | 6.795 | 8.762 | 417 | 7.951 | 6.795 | 8.762 | 296 | 6.890 | 6.450 | 6.705 |
| Industry EBITDA Ratio | 417 | 7.016 | 6.757 | 3.700 | 417 | 7.282 | 7.261 | 4.227 | 296 | 5.892 | 6.233 | 3.845 |
| *After 1998* (1999–2010) | | | | | | | | | | | | |
| BSDI | 524 | 0.117 | 0.056 | 0.143 | 524 | 0.117 | 0.056 | 0.143 | 412 | 0.149 | 0.112 | 0.147 |
| Industry CAPEX Ratio | 524 | 1.337 | 0.844 | 3.166 | 524 | 1.577 | 1.001 | 2.951 | 412 | 1.351 | 0.217 | 4.950 |
| Industry Sales Growth | 524 | 5.947 | 5.183 | 7.078 | 524 | 5.947 | 5.183 | 7.078 | 412 | 6.579 | 5.518 | 6.869 |
| Industry EBITDA Ratio | 524 | 6.412 | 6.022 | 3.903 | 524 | 5.659 | 5.979 | 3.200 | 412 | 7.446 | 6.306 | 5.913 |

**Table 3: Industry-Level Capital Allocation Efficiency over Time**

This table reports the results of an industry-level regression that examines how efficiently capital is allocated across industries. We run regressions where variables are calculated using all firms combined, non-LBG firms only, and LBG firms only. To see how industry-level capital allocation efficiency evolves over time, we run regressions using years before the Asian financial crisis (1987–1996) and thereafter (1999–2010). We exclude firms that belong to the financial or utility industry from the sample. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | All Firms Combined | | | Non-LBG Firms | | | LBG Firms | | |
| Dependent Variable: | Before | After | Before + | Before | After | Before + | Before | After | Before + |
| Industry CAPEX Ratio | 1997 | 1998 | After | 1997 | 1998 | After | 1997 | 1998 | After |
| Industry Sales Growth [a] | 0.010 | 0.032*** | 0.030* | -0.009 | 0.031*** | 0.007 | 0.106* | 0.084*** | 0.090** |
| | (0.018) | (0.008) | (0.015) | (0.016) | (0.006) | (0.011) | (0.055) | (0.024) | (0.044) |
| Industry EBITDA Ratio [b] | 0.174** | 0.040 | 0.149*** | 0.219*** | 0.081** | 0.195*** | -0.076 | 0.053 | 0.044 |
| | (0.067) | (0.033) | (0.052) | (0.043) | (0.032) | (0.036) | (0.115) | (0.056) | (0.081) |
| Period Dummy [c] | | | 1.380** | | | 1.062** | | | -3.523** |
| | | | (0.564) | | | (0.460) | | | (1.423) |
| [a] × [c] | | | 0.001 | | | 0.025* | | | 0.005 |
| | | | (0.016) | | | (0.013) | | | (0.050) |
| [b] × [c] | | | -0.137*** | | | -0.117*** | | | -0.020 |
| | | | (0.046) | | | (0.038) | | | (0.088) |
| Constant | -1.536** | 0.125 | -1.660*** | -1.809** | -0.083 | -1.851*** | 3.980*** | 0.881 | 3.442*** |
| | (0.693) | (0.261) | (0.583) | (0.689) | (0.252) | (0.554) | (1.271) | (0.835) | (1.023) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Observations | 417 | 524 | 941 | 417 | 524 | 941 | 296 | 412 | 708 |
| Within R-squared | 0.245 | 0.466 | 0.307 | 0.244 | 0.441 | 0.294 | 0.126 | 0.132 | 0.148 |

**Table 4: BSDI and Industry-Level Capital Allocation Efficiency (All Firms)**

This table reports the results of an industry-level regression that examines how the large business groups' collective strength and dominance index (BSDI) is associated with industry-level capital allocation efficiency over time. We exclude firms that belong to the financial or utility industry from the sample. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| Dependent Variable: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.062*** | 0.055* | 0.066*** | 0.067*** |
| | (0.016) | (0.031) | (0.017) | (0.022) |
| BSDI [b] | 0.893 | -0.771 | -1.323 | 1.079 |
| | (1.078) | (1.515) | (1.309) | (1.354) |
| Industry EBITDA Ratio [c] | 0.041 | 0.149* | -0.022 | 0.099 |
| | (0.037) | (0.082) | (0.038) | (0.067) |
| Period Dummy [d] | | | | 0.355 |
| | | | | (0.622) |
| [a] × [b] | -0.061 | -0.096 | -0.024 | -0.089 |
| | (0.041) | (0.074) | (0.054) | (0.076) |
| [a] × [d] | | | | -0.014 |
| | | | | (0.021) |
| [b] × [c] | -0.194 | -0.079 | 0.065 | -0.122 |
| | (0.189) | (0.189) | (0.238) | (0.207) |
| [b] × [d] | | | | -0.479 |
| | | | | (2.009) |
| [c] × [d] | | | | -0.095 |
| | | | | (0.068) |
| [a] × [b] × [d] | | | | 0.060 |
| | | | | (0.096) |
| [b] × [c] × [d] | | | | -0.080 |
| | | | | (0.327) |
| Constant | -0.564 | -1.239* | 0.602** | -1.197** |
| | (0.434) | (0.704) | (0.279) | (0.582) |
| Year Fixed Effects | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes |
| No. of Observations | 1,029 | 417 | 524 | 941 |
| With R-squared | 0.288 | 0.240 | 0.412 | 0.283 |

**Table 5: BSDI and Industry-Level Capital Allocation Efficiency (Non-LBG vs. LBG Firms)**

This table reports the results of an industry-level regression that examines how large business groups' collective strength and dominance index (BSDI) is associated with industry-level capital allocation efficiency of non-LBG and LBG firms over time. We exclude firms that belong to the financial or utility industry from the sample. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: | Non-LBG Firms | | | | LBG Firms | | | |
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.052*** | 0.050 | 0.055*** | 0.073*** | 0.096*** | 0.073 | 0.095*** | 0.089 |
| | (0.011) | (0.040) | (0.014) | (0.026) | (0.026) | (0.067) | (0.032) | (0.055) |
| BSDI [b] | -0.183 | -0.189 | -1.311 | 0.225 | -1.984 | -2.806 | -2.431 | -3.678 |
| | (1.012) | (2.122) | (1.265) | (1.321) | (2.336) | (12.152) | (3.659) | (3.831) |
| Industry EBITDA Ratio [c] | 0.086* | 0.135* | 0.013 | 0.171** | 0.000 | -0.213 | 0.033 | -0.056 |
| | (0.049) | (0.071) | (0.040) | (0.076) | (0.049) | (0.132) | (0.078) | (0.124) |
| Period Dummy [d] | | | | 1.629*** | | | | -3.500** |
| | | | | (0.585) | | | | (1.414) |
| [a] × [b] | -0.091** | -0.188** | -0.034 | -0.200** | -0.018 | 0.134 | -0.076 | 0.060 |
| | (0.040) | (0.081) | (0.047) | (0.081) | (0.078) | (0.177) | (0.095) | (0.157) |
| [a] × [d] | | | | -0.024 | | | | 0.015 |
| | | | | (0.019) | | | | (0.060) |
| [b] × [c] | 0.042 | 0.002 | 0.202 | 0.002 | 0.307 | 0.699 | 0.198 | 0.417 |
| | (0.143) | (0.187) | (0.203) | (0.232) | (0.316) | (0.436) | (0.389) | (0.402) |
| [b] × [d] | | | | -0.378 | | | | 3.229 |
| | | | | (2.385) | | | | (4.809) |
| [c] × [d] | | | | -0.146** | | | | 0.093 |
| | | | | (0.061) | | | | (0.126) |
| [a] × [b] × [d] | | | | 0.154* | | | | -0.197 |
| | | | | (0.089) | | | | (0.157) |
| [b] × [c] × [d] | | | | 0.087 | | | | -0.408 |
| | | | | (0.350) | | | | (0.481) |
| Constant | -1.081* | -1.188 | 0.365 | -2.007*** | 3.713*** | 4.920** | 1.263 | 4.274*** |
| | (0.549) | (0.962) | (0.228) | (0.709) | (1.000) | (2.157) | (1.119) | (1.119) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Observations | 1,029 | 417 | 524 | 941 | 778 | 296 | 412 | 708 |
| Within R-squared | 0.290 | 0.144 | 0.437 | 0.206 | 0.140 | 0.138 | 0.135 | 0.136 |

**Figure 3: BSDI on Industry-Level Capital Allocation Efficiency (Non-LBG Firms)**

This figure plots yearly estimated coefficients of the interaction term between Industry Sales Growth and BSDI when running regressions similar to that of Column (1) in Table 5, year-by-year, for non-LBG firms (these regressions omit year and industry fixed effects). We superimpose horizontally fitted lines to show how different the coefficients are before and after the crisis. Variable definitions are reported in the Appendix.

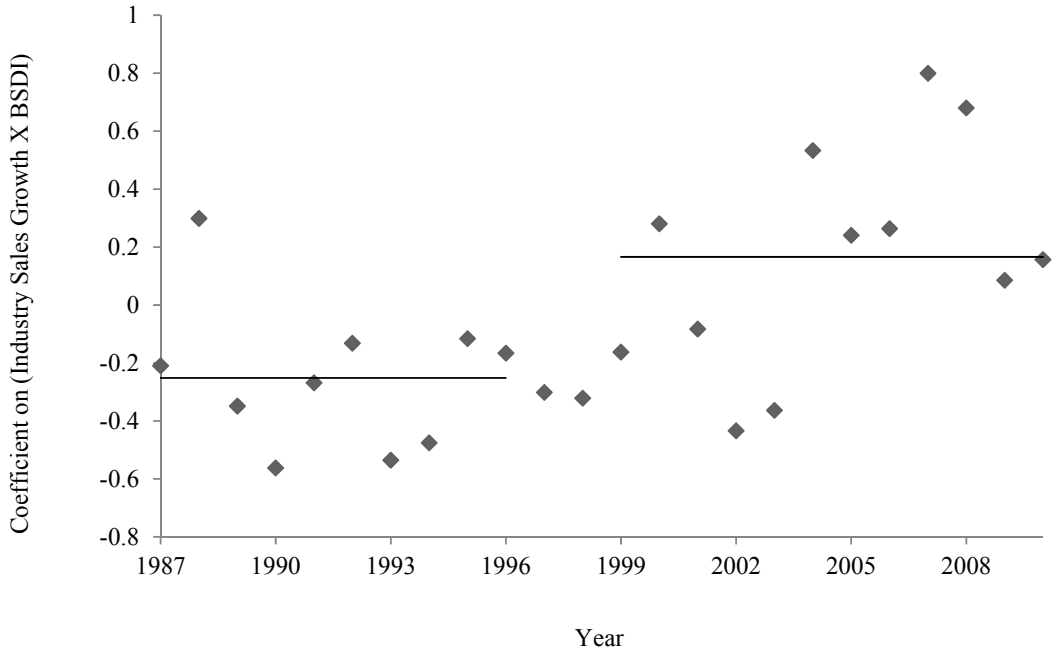


**Table 6: Decomposition of BSDI into Strength and Dominance**

Panel A reports the results of an industry-level regression that examines how large business groups' collective strength and dominance are separately associated with the industry-level capital allocation efficiency of non-LBG firms over time. To decompose the BSDI into strength (size of the internal capital market) and dominance (market share), we regress the BSDI on large business group's collective market share in the industry. The fitted value of the regression is the component related to the large business groups' collective market share (LBG MKT Share), whereas the orthogonal residual term is the component related to the large business groups' collective internal capital market size (ICM Size). Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Panel A

| Dependent Variable: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.055*** | 0.050 | 0.043*** | 0.048*** |
| | (0.014) | (0.031) | (0.011) | (0.015) |
| LBG MKT Share [b] | 1.127 | 5.619 | -3.007 | -0.233 |
| | (1.539) | (6.320) | (1.980) | (1.454) |
| ICM Size [c] | -2.169 | -7.559 | -0.084 | -1.146 |
| | (1.321) | (6.205) | (1.984) | (2.174) |
| Industry EBITDA Ratio [d] | 0.103* | 0.218*** | 0.013 | 0.120*** |
| | (0.055) | (0.077) | (0.035) | (0.042) |
| Period Dummy [e] | | | | 1.067** |
| | | | | (0.472) |
| [a] × [b] | -0.056 | -0.165* | 0.030 | -0.094 |
| | (0.072) | (0.097) | (0.051) | (0.065) |
| [a] × [c] | -0.195* | -0.284** | -0.173 | -0.324*** |
| | (0.115) | (0.135) | (0.141) | (0.095) |
| [a] × [e] | | | | -0.009 |
| | | | | (0.019) |
| [b] × [d] | -0.061 | -0.219 | 0.186 | 0.051 |
| | (0.172) | (0.290) | (0.228) | (0.179) |
| [b] × [e] | | | | 0.609 |
| | | | | (2.407) |
| [c] × [d] | 0.309 | 0.415 | 0.288 | 0.384 |
| | (0.214) | (0.494) | (0.361) | (0.268) |
| [c] × [e] | | | | -1.339 |
| | | | | (2.513) |
| [d] × [e] | | | | -0.087* |
| | | | | (0.045) |
| [a] × [b] × [e] | | | | 0.124 |
| | | | | (0.085) |
| [a] × [c] × [e] | | | | 0.244* |
| | | | | (0.142) |
| [b] × [d] × [e] | | | | -0.241 |
| | | | | (0.344) |
| [c] × [d] × [e] | | | | 0.138 |
| | | | | (0.451) |
| Constant | -1.325** | -2.573*** | 0.590** | -1.391*** |
| | (0.604) | (0.898) | (0.291) | (0.502) |
| Year & Industry Fixed Effects | Yes | Yes | Yes | Yes |
| No. of Observations | 1,029 | 417 | 524 | 941 |
| Within R-squared | 0.269 | 0.218 | 0.453 | 0.284 |

Panel B reports the results of regressions where we regress industry CAPEX Ratio on Industry Sales Growth, Industry EBITDA Ratio, industry fixed effects, and year effects for non-LBG firms during the pre-crisis period (before 1997) across four different subsamples: (i) high LBG MKT share and high ICM size, (ii) high LBG MKT share and low ICM size, (iii) low MKT share and high ICM size, and (iv) low MKT share and low ICM size. We use the median value of LBG MKT share (ICM size) to decompose high and low LBG MKT share (ICM size) subsamples. LBG MKT share and ICM size are obtained by regressing the BSDI on the large business group's collective market share in the industry. The fitted value of the regression is the component related to large business groups' collective market share (LBG MKT Share), whereas the orthogonal residual term is the component related to large business groups' collective internal capital market size (ICM Size). Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Panel B

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable: | High MKT | High MKT | Low MKT | Low MKT |
| Industry CAPEX Ratio | High ICM | Low ICM | High ICM | Low ICM |
| Industry Sales Growth [a] | -0.035 | -0.008 | 0.004 | 0.103** |
| | (0.023) | (0.023) | (0.026) | (0.040) |
| Industry EBITDA Ratio [d] | 0.159 | 0.113 | 0.084 | 0.194** |
| | (0.094) | (0.124) | (0.060) | (0.090) |
| Constant | -0.221 | -1.236 | -2.152** | -7.731*** |
| | (2.081) | (0.955) | (0.755) | (2.360) |
| Year & Industry Fixed Effects | Yes | Yes | Yes | Yes |
| No. of Observations | 74 | 132 | 109 | 102 |
| Within R-squared | 0.564 | 0.792 | 0.707 | 0.455 |

**Table 7: BSDI and Industry-Level Capital Allocation Efficiency (High vs. Low Tangibility)**

This table reports the results of an industry-level regression that examines how tangibility attenuates the association between the BSDI and the industry-level capital allocation efficiency of non-LBG firms. Industries with the median (during 1987–2010) tangibility ratio below (above) the global median (during 1987–2010 across all industries) are categorized as low (high) tangibility industries. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: | Low Tangibility | | | | High Tangibility | | | |
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.033*** | 0.043 | 0.030*** | 0.043 | 0.065*** | 0.061 | 0.062** | 0.120*** |
| | (0.012) | (0.036) | (0.009) | (0.028) | (0.016) | (0.053) | (0.025) | (0.033) |
| BGDI [b] | -0.685 | -2.806 | -4.534* | 0.881 | -0.607 | 8.074 | -0.436 | 1.026 |
| | (0.821) | (2.165) | (2.196) | (1.182) | (1.773) | (12.011) | (1.561) | (4.138) |
| Industry EBITDA Ratio [c] | 0.105** | 0.189*** | -0.001 | 0.251*** | 0.043 | -0.036 | 0.009 | 0.083 |
| | (0.050) | (0.016) | (0.020) | (0.056) | (0.076) | (0.131) | (0.060) | (0.114) |
| Period Dummy [d] | | | | 2.118*** | | | | 2.102* |
| | | | | (0.737) | | | | (1.051) |
| [a] × [b] | -0.081* | -0.225** | 0.074 | -0.200*** | -0.041 | -0.118 | -0.085 | -0.159 |
| | (0.044) | (0.091) | (0.054) | (0.072) | (0.072) | (0.165) | (0.088) | (0.188) |
| [a] × [d] | | | | -0.021 | | | | -0.067** |
| | | | | (0.029) | | | | (0.030) |
| [b] × [c] | 0.035 | 0.095 | 0.356 | -0.091 | 0.145 | 0.091 | 0.211 | 0.048 |
| | (0.151) | (0.159) | (0.261) | (0.222) | (0.332) | (0.523) | (0.316) | (0.541) |
| [b] × [d] | | | | -6.661** | | | | 0.174 |
| | | | | (3.034) | | | | (5.177) |
| [c] × [d] | | | | -0.253*** | | | | -0.114 |
| | | | | (0.068) | | | | (0.076) |
| [a] × [b] × [d] | | | | 0.248*** | | | | 0.090 |
| | | | | (0.089) | | | | (0.213) |
| [b] × [c] × [d] | | | | 0.513 | | | | 0.084 |
| | | | | (0.382) | | | | (0.606) |
| Constant | -1.259 | -1.673 | 0.404* | -2.407*** | -0.521 | 0.081 | 0.653* | -1.489 |
| | (0.749) | (0.980) | (0.217) | (0.669) | (0.728) | (1.396) | (0.329) | (1.062) |
| Year & Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Observations | 529 | 213 | 272 | 485 | 500 | 204 | 252 | 456 |
| Within R-squared | 0.297 | 0.201 | 0.530 | 0.278 | 0.351 | 0.181 | 0.472 | 0.229 |

**Table 8: BSDI and Industry-Level Capital Allocation Efficiency (High vs. Low Cash Flow)**

This table reports the results of an industry-level regression that examine how cash flow attenuates the association between the BSDI and the industry-level capital allocation efficiency of non-LBG firms. Industries with the median (during 1987–2010) EBITDA ratio below (above) the global median (during 1987–2010 across all industries) are categorized as low (high) cash flow industries. Note that we omit from our regressions the Industry EBITDA Ratio as it is used to divide the sample into high and low cash flow industries. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: | Low Cash Flow | | | | High Cash Flow | | | |
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.063*** | 0.070 | 0.047*** | 0.060*** | 0.035*** | 0.041 | 0.059*** | 0.033* |
| | (0.017) | (0.048) | (0.013) | (0.021) | (0.010) | (0.033) | (0.019) | (0.018) |
| BSDI [b] | -0.001 | 0.014 | -0.003 | 0.007 | -0.003 | -0.016 | -0.008 | -0.009 |
| | (0.008) | (0.025) | (0.007) | (0.007) | (0.007) | (0.033) | (0.009) | (0.014) |
| Period Dummy [c] | | | | 0.000 | | | | -0.017*** |
| | | | | (0.006) | | | | (0.005) |
| [a] × [b] | -0.090** | -0.196* | -0.026 | -0.147* | -0.038 | -0.038 | -0.021 | -0.028 |
| | (0.042) | (0.101) | (0.036) | (0.075) | (0.068) | (0.130) | (0.097) | (0.104) |
| [a] × [c] | | | | -0.028 | | | | 0.019 |
| | | | | (0.020) | | | | (0.031) |
| [b] × [c] | | | | -0.019** | | | | 0.007 |
| | | | | (0.008) | | | | (0.016) |
| [a] × [b] × [c] | | | | 0.235* | | | | -0.006 |
| | | | | (0.134) | | | | (0.126) |
| Constant | -0.010 | -0.011 | 0.003 | -0.010** | 0.007 | 0.009 | 0.006** | 0.008* |
| | (0.006) | (0.006) | (0.003) | (0.005) | (0.004) | (0.007) | (0.003) | (0.004) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Observations | 507 | 203 | 260 | 463 | 522 | 214 | 264 | 478 |
| Within R-squared | 0.265 | 0.142 | 0.442 | 0.239 | 0.340 | 0.222 | 0.448 | 0.300 |

**Table 9: BSDI and Firm-Level Profitability**

This table reports the results of firm-level regressions that examine the association between the BSDI and firm profitability, separately for non-LBG and LBG firms. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Dependent | Non-LBG Firms | | | LBG Firms | | |
| Variable: | Entire | Before | After | Entire | Before | After |
| Firm Profitability | Period | 1997 | 1998 | Period | 1997 | 1998 |
| BSDI | -1.553*** | -3.913** | -0.748 | 2.274 | 10.074** | 3.098* |
| | (0.501) | (1.759) | (0.517) | (1.517) | (4.032) | (1.866) |
| Log Total Assets | 0.775*** | -0.305** | 1.339*** | -0.775*** | -1.400*** | -1.625*** |
| | (0.082) | (0.139) | (0.106) | (0.268) | (0.494) | (0.463) |
| Leverage Ratio | -11.463*** | -10.718*** | -13.242*** | -4.894*** | -2.314 | -5.531*** |
| | (0.237) | (0.496) | (0.293) | (0.970) | (1.440) | (1.340) |
| Constant | 12.553*** | 22.379*** | 2.579** | 21.230*** | 25.965*** | 33.515*** |
| | (0.946) | (1.670) | (1.269) | (3.701) | (7.084) | (6.417) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Obs. | 206,797 | 42,584 | 153,603 | 8,869 | 3,099 | 5,054 |
| Within R-squared | 0.088 | 0.088 | 0.090 | 0.027 | 0.027 | 0.032 |

**Table 10: BSDI and Investment (Proportional Hazard Model)**

This table reports the results of a discrete proportional hazard model that examines how the level of large business groups' collective strength and dominance is associated with the probability of making a large investment decision if the firm has not done so in the past. A spike (i.e., large investment above a threshold) takes place when a firm's CAPEX ratio exceeds two times the median value of its CAPEX ratio. Industries with the median (before 1996 and after 1999) BSDI below (above) the global median (before 1996 and after 1999, across all industries) are categorized as low (high) BSDI industries. We exclude firms belonging to the financial or utility industry from the sample. Numbers in parentheses are standard errors. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Before 1997 | | | After 1998 | | |
| | Low BSDI | High BSDI | Low - High | Low BSDI | High BSDI | Low - High |
| EBITDA Ratio | 0.204 | 1.959*** | | 1.582*** | 1.193*** | |
| | (0.700) | (0.749) | | (0.422) | (0.220) | |
| 1 year hazard | 0.256*** | 0.153*** | 0.103** | 0.108*** | 0.117*** | -0.009 |
| | (0.030) | (0.014) | | (0.023) | (0.016) | |
| 2 year hazard | 0.120*** | 0.081*** | 0.039 | 0.076*** | 0.068*** | 0.008 |
| | (0.011) | (0.006) | | (0.014) | (0.008) | |
| 3 year hazard | 0.128*** | 0.067*** | 0.061** | 0.076*** | 0.069*** | 0.007 |
| | (0.014) | (0.005) | | (0.014) | (0.008) | |
| 4 year hazard | 0.181*** | 0.081*** | 0.100** | 0.068*** | 0.081*** | -0.013 |
| | (0.025) | (0.007) | | (0.012) | (0.010) | |
| Year Fixed Effect | Yes | Yes | | Yes | Yes | |
| Industry Fixed Effect | Yes | Yes | | Yes | Yes | |
| Log likelihood | -1038.24 | -1149.52 | | -1834.83 | -4573.94 | |
| Number of Spells | 1,107 | 1,243 | | 2,020 | 4,789 | |

**Table 11: BSDI and Industry-Level Capital Allocation Efficiency (Alternative Measure of BSDI)**

This table reports the results of an industry-level regression that examines how the large business groups' collective strength and dominance index (BSDI) is associated with the industry-level capital allocation efficiency of non-LBG and LBG firms over time. When measuring the size of the internal capital market that goes into the calculation of the BSDI, we aggregate the cash holdings (as opposed to the entire book assets) across all other group members. We exclude firms belonging to the financial or utility industry from the sample. Variable definitions are reported in the Appendix. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: | Non-LBG Firms | | | | LBG Firms | | | |
| Industry CAPEX Ratio | Entire Period | Before 1997 | After 1998 | Before + After | Entire Period | Before 1997 | After 1998 | Before + After |
| Industry Sales Growth [a] | 0.051*** | 0.057 | 0.053*** | 0.082** | 0.095*** | 0.080 | 0.102*** | 0.089* |
| | (0.012) | (0.048) | (0.015) | (0.033) | (0.026) | (0.065) | (0.033) | (0.053) |
| BSDI [b] | -0.375 | 0.673 | -1.794 | 0.590 | -2.257 | 1.251 | -3.895 | -3.572 |
| | (1.086) | (2.006) | (1.518) | (1.439) | (2.607) | (11.399) | (4.707) | (4.166) |
| Industry EBITDA Ratio [c] | 0.085* | 0.154* | 0.010 | 0.185** | 0.006 | -0.203 | 0.027 | -0.053 |
| | (0.050) | (0.081) | (0.042) | (0.085) | (0.048) | (0.125) | (0.074) | (0.120) |
| Period Dummy [d] | | | | 1.794*** | | | | -3.372** |
| | | | | (0.635) | | | | (1.364) |
| [a] × [b] | -0.095* | -0.215** | -0.022 | -0.236** | -0.011 | 0.118 | -0.148 | 0.068 |
| | (0.051) | (0.100) | (0.067) | (0.098) | (0.107) | (0.192) | (0.144) | (0.180) |
| [a] × [d] | | | | -0.032 | | | | 0.022 |
| | | | | (0.024) | | | | (0.059) |
| [b] × [c] | 0.049 | -0.104 | 0.247 | -0.075 | 0.304 | 0.756 | 0.322 | 0.442 |
| | (0.167) | (0.254) | (0.213) | (0.287) | (0.317) | (0.475) | (0.400) | (0.427) |
| [b] × [d] | | | | -0.545 | | | | 1.884 |
| | | | | (3.026) | | | | (5.225) |
| [c] × [d] | | | | -0.152** | | | | 0.075 |
| | | | | (0.067) | | | | (0.122) |
| [a] × [b] × [d] | | | | 0.156* | | | | -0.302 |
| | | | | (0.092) | | | | (0.203) |
| [b] × [c] × [d] | | | | 0.187 | | | | -0.231 |
| | | | | (0.414) | | | | (0.486) |
| Constant | -1.076* | -1.495 | 0.394 | -2.251*** | 3.714*** | 4.343** | 1.367 | 4.199*** |
| | (0.546) | (1.151) | (0.238) | (0.792) | (0.986) | (1.721) | (1.184) | (1.070) |
| Year & Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of Observations | 1,029 | 417 | 524 | 941 | 778 | 296 | 412 | 708 |
| Within R-squared | 0.289 | 0.126 | 0.437 | 0.183 | 0.140 | 0.140 | 0.137 | 0.137 |

**Table 12: BSDI and Industry-Level Capital Allocation Efficiency (Alternative Measures of Investment Opportunity)**

This table reports the results of an industry-level regression that examines how the large business groups' collective strength and dominance index (BSDI) is associated with the industry-level capital allocation efficiency of non-LBG firms over time using alternative measures of investment opportunity. These measures include Industry Tobin's *q*, Industry Intangible Ratio, and Industry Value Added Growth. Variable definitions are reported in the Appendix. Each regression includes year and industry fixed effects. Numbers in parentheses are robust standard errors clustered at the industry-level. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

| Dependent Variable: | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Industry CAPEX Ratio | Before 1997 | After 1998 | Before + After | Before 1997 | After 1998 | Before + After | Before 1997 | After 1998 | Before + After |
| Industry Tobin's *q* [a] | 0.014 | 0.001 | 0.018 | | | | | | |
| | (0.021) | (0.007) | (0.022) | | | | | | |
| Industry Intangible Ratio [a] | | | | 0.206 | -0.312 | -0.018 | | | |
| | | | | (0.240) | (0.198) | (0.203) | | | |
| Industry Value Added Growth [a] | | | | | | | 0.010 | 0.000 | 0.019* |
| | | | | | | | (0.010) | (0.009) | (0.010) |
| BSDI[b] | 15.060** | -7.011 | 7.581 | -1.470 | -3.683 | 1.079 | 1.028 | -3.784 | -1.962 |
| | (6.271) | (4.986) | (5.347) | (4.249) | (3.359) | (1.449) | (1.686) | (4.047) | (1.855) |
| Industry EBITDA Ratio[c] | 0.198 | 0.142 | 0.348*** | 0.365*** | 0.280*** | 0.383*** | 0.271*** | 0.166*** | 0.139** |
| | (0.132) | (0.157) | (0.099) | (0.052) | (0.063) | (0.052) | (0.080) | (0.051) | (0.067) |
| Period Dummy[d] | | | 6.697** | | | 3.917*** | | | 0.873 |
| | | | (2.641) | | | (1.090) | | | (0.590) |
| [a] × [b] | -0.081** | 0.017 | -0.088* | -1.514** | 0.992 | -1.124*** | -0.040** | 0.019 | -0.054*** |
| | (0.039) | (0.021) | (0.045) | (0.628) | (0.789) | (0.381) | (0.014) | (0.031) | (0.014) |
| [a] × [d] | | | -0.020 | | | -0.131 | | | -0.015 |
| | | | (0.015) | | | (0.252) | | | (0.012) |
| [b] × [c] | 0.234 | 0.124 | 0.004 | -0.295 | -0.014 | -0.310 | 0.014 | 0.340 | 0.270 |
| | (0.367) | (0.682) | (0.351) | (0.301) | (0.323) | (0.252) | (0.167) | (0.555) | (0.236) |
| [b] × [d] | | | -13.788*** | | | -5.148* | | | 0.786 |
| | | | (4.694) | | | (2.676) | | | (4.404) |
| [c] × [d] | | | -0.162 | | | -0.205*** | | | 0.100 |
| | | | (0.165) | | | (0.075) | | | (0.126) |
| [a] × [b] × [d] | | | 0.112* | | | 1.995*** | | | 0.068* |
| | | | (0.059) | | | (0.703) | | | (0.039) |
| [b] × [c] × [d] | | | -0.190 | | | 0.353 | | | -0.223 |
| | | | (0.710) | | | (0.367) | | | (0.654) |
| Constant | -1.879 | 3.527** | -2.248 | 0.310 | 3.374*** | -0.058 | -2.772*** | -0.231 | -1.701*** |
| | (2.539) | (1.626) | (2.592) | (1.107) | (0.787) | (0.740) | (0.642) | (0.276) | (0.405) |
| No of Observations | 328 | 483 | 811 | 411 | 524 | 935 | 135 | 220 | 355 |
| Within R-squared | 0.141 | 0.356 | 0.249 | 0.234 | 0.415 | 0.287 | 0.280 | 0.583 | 0.447 |

**Appendix**

This table shows definitions of the main variables examined in this study.

| Variables | Definition |
|---|---|
| Industry CAPEX Ratio | Industry median value of firm-level CAPEX ratios, calculated for three different sets of firms (business group firms, non-business group firms, and all firms combined) for a given industry $k$ in year $t$, expressed in percentage terms. CAPEX ratio of firm $i$ in year $t$ = $(CAPEX_{i,t}/Trailing\ Assets_{i,t})$, where $CAPEX_{i,t}$ is net capital expenditure for firm $i$ in year $t$ and $Trailing\ Assets_i$ is book value of firm $i$'s assets in year $t-1$ (adjusted for inflation using GDP deflator). |
| Industry Sales Growth | Industry median value of firm-level sales growth measures, calculated for all firms (both business group firms and non-business group firms) for a given industry $k$ in year $t$, expressed in percentage terms. Sales growth of firm $i$ in year $t = ln(Sales_{i,t}/Sales_{i,t-1})$, where $Sales_t$ and $Sales_{t-1}$ (adjusted for inflation using GDP deflator) are firm $i$'s total sales at fiscal year-end $t$ and $t-1$, respectively. |
| Industry Tobin's $q$ | Industry median value of firm-level Tobin's $q$ measures, calculated for all firms (both business group firms and non-business group firms) for a given industry $k$ in year $t$. Tobin' $q$ of firm $i$ in year $t$ = $(MVE_{i,t} + PS_{i,t} + DEBT_{i,t})/TA_{i,t}$, where $MVE$ is market value of common stocks, $PS$ is market value of preferred stocks, $DEBT$ is the book value of total debt, and $TA$ is the book value of total assets. |
| Industry Intangible Ratio | Industry intangible ratio for industry $k$ in year $t$ is defined as $(\sum_i Intangible\ Assets_i/\sum_i Trailing\ Assets_i)$, where $i$ denotes all firms within industry $k$ in year $t$, expressed in percentage terms. $Trailing\ Assets_i$ is adjusted for inflation using GDP deflator. This ratio is also calculated for all firms (both business group firms and non-business group firms) within industry $k$. |
| Industry Value Added Growth | Industry value added growth for industry $k$ in year $t$ is defined as $ln(Industry\ Value\ Added)_t - ln(Industry\ Value\ Added)_{t-1}$, expressed in percentage terms, where industry value added data come |

| Variables | Definition |
|---|---|
| | from United Nation's INDSTAT-3 for a subset of manufacturing industries (22 sectors). Lagged terms are adjusted for inflation using GDP deflator. This ratio is also calculated for all firms (both business group firms and non-business group firms) within industry $k$. |
| Business Group Strength and Dominance Index (BSDI) | The BSDI of industry $k$ in year $t = [\sum_i S_{itk} \times w_{it}/(\sum_i S_{itk} + \sum_j S_{jtk})]/BSDI^*$, where subscript $i\ (= 1, 2, \cdots, n)$ denotes business group (the Top 30 chaebol) firms present in industry $k$ in year $t$, and $j\ (= 1, 2, \cdots, m)$ denotes non-business group firms present in industry $k$ in year $t$. $S_{itk}(S_{jtk})$ equals total sales of firm $i(j)$ in industry $k$ in year $t$, and $w_{\mathrm{it}}$ equals $ICM_{\mathrm{it}}/ICM_t^*$, where $ICM_{\mathrm{i,t}}$ is the size of the business group's internal capital market (*ICM*), to which firm $i$ belongs, in year $t$ and $ICM_t^*$ is the sum of *ICM*s across all business groups in year $t$. Note that we compute $ICM_{\mathrm{it}}$ by adding book asset values of all the group members (excluding firm $i$). $BSDI^*$ is a constant scaling factor that equals the largest value of $[\sum_i S_{itk} \times w_{it}/(\sum_i S_{itk} + \sum_j S_{jtk})]$. |
| Industry EBITDA Ratio | Industry median value of firm-level EBITDA ratios, calculated for three different sets of firms (business group firms, non-business group firms, and all firms combined) for a given industry $k$ in year $t$, expressed in percentage terms. EBITDA ratio of firm $i$ in year $t = (EBITDA_{i,t}/Trailing\ Assets_{i,t})$, where $EBITDA_{i,t}$ is earnings before interest, taxes, depreciation, and amortization for firm $i$ in year $t$ and $Trailing\ Assets_i$ is book value of firm $i$'s assets in year $t-1$ (adjusted for inflation using GDP deflator). |
| Period Dummy | An indicator variable that takes a value of 0 during 1987–1996 (years before the Asian financial crisis) and a value of 1 during 1999–2010 (years after the crisis). |
| Firm Profitability | Profitability of firm $i$ in year $t = (EBITDA_{i,t}/Trailing\ Assets_{i,t})$ |
| Leverage | Leverage of firm $i$ in year $t = (Total\ Liabilities_{i,t}/Total\ Assets_{i,t})$. |
| Tangibility Ratio | Tangibility ratio of firm $i$ in year $t = (Tangible\ \ Assets_{i,t}/Trailing\ Assets_{i,t})$, where $Trailing\ Assets_i$ is book value of firm $i$'s assets in year $t-1$ (adjusted for inflation using |

| Variables | Definition |
|---|---|
| | GDP deflator). |
| Firm Size | Size of firm $i$ in year $t$ = ln($Total\ Assets_{i,t}$) |

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