Transfer of Control and Ownership Structure in Family Firms

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Abstract

This paper documents a novel channel of transfer of control in family firms. I provide evidence, from a natural experiment, that avoiding inheritance tax is the main motivation behind intra-group mergers. Due to tax reform that increases personal inheritance taxes by 25 percentage points, the firms burdened by a high personal inheritance tax are most likely to increase intra-group merger activities during post tax-reform period. This result suggests that firms with heavy inheritance tax burdens acquire smaller affiliates owned by the heirs. This way, heirs convert target shares to acquirer shares while avoiding inheritance tax. Among high tax burden firms, intra-group mergers are concentrated in "central firms" within a circular ownership chain allowing the heirs to consolidate their indirect control over the entire business. Because of these mergers, the ownership network among affiliates becomes distorted as central firms expand their boundaries in unnatural ways. Heirs do manage to avoid inheritance taxes, but minority shareholders suffer losses from these tax-motivated mergers that appear to have few operational synergies.

Keywords: Succession Tax, Intra-group Merger, Family Firm, Transfer of Control, Ownership Structure
JEL Codes: G30, G32, G34

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1 Introduction

> "In exchange for these financial contributions, prosecutors say, Ms. Choi colluded with Ms. Park to ensure government backing for several deals, most notably a controversial merger of two Samsung affiliates in 2015 that helped Mr. Lee consolidate his hold over Samsung Electronics. The merger changed Samsung's intricate cross-holding structure and, prosecutors said, allowed Mr. Lee to avoid a steep inheritance-tax bill as he sought to succeed his father at the top of the conglomerate." (*Wall Street Journal*, August 25, 2017)[1]

Family firms compose more than 80% of firms worldwide[2], and succession is the preeminent issue that determines the fate of those firms. Only 30% of family firms last into a second generation, 12% remain viable into a third, and 3% operate into a fourth generation or beyond (Family Firm Institute). Reflecting its importance in the family firms, succession has attracted attention in the recent literature[3]. Despite succession being studied from many angles, detailed evidence on the effect of personal inheritance tax is not studied much in the literature. The implication of different transfer of control processes on these family firms is also understudied.

I fill this gap by studying a particular channel of transfer of control, intra-group mergers. The heirs are exposed to ownership dilution risk due to heavy inheritance taxes when they transfer control through ownership inheritance. Thus, the controlling family is incentivized to use

[1] Eun-Young Jeong, "Samsung Heir Lee Jae-yong Convicted of Bribery, Gets Five Years in Jail." *Wall Street Journal*, August 25, 2017. Instead of intragroup merger, what if Mr. Lee tried to inherite his father's ownership stake in Samsung Electronics directly, he was expected to pay 2.8 billion dollars (=$165 billion dollars (market value of Samsung Electronics at the end of 2014) × 3.4% (chairman Lee's share) × 50% (inheritance tax rate)) in inheritance tax. Intra-group merger between two Samsung's group affiliates is detailed in Appendix B.

[2] Chase Peterson-Withorn, "New Report Reveals The 500 Largest Family-Owned Companies In The World." Forbes, April 20, 2015.

[3] Perez-Gonzalez (2006) and Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon (2007) document that family CEOs perform worse than non-family CEOs. Mehrotra, Morck, Shim, and Wiwattanakantang (2013) also show that non-consanguineous-heir-run firms outperform heir-run and professional-manager-run firms. Bunkanwanicha, Fan, and Wiwattanakantang (2013) show that a network marriage between a controlling family member and a member of a prominent business or political family is followed by increasing stock prices. Tsoutsoura (2015) shows the impact of succession taxes on firm investment decisions and transfer of control. Lee, Shin, and Yun (2016) shows the impact of succession tournaments on risk-taking in family firms.

tax minimizing succession vehicles to ensure the heirs preserve sufficient control over the entire business group. A common tax saving strategy to avoid taxes during transfer of control in business groups is firms with heavy inheritance tax burdens acquire smaller affiliates owned by the heirs. Then, heirs convert target shares to acquirer shares. Through this intra-group merger, they can obtain large controlling stakes in a key strategic firm owned by the controlling family while avoiding inheritance tax.

I provide causal evidence, from a natural experiment, that avoiding inheritance tax is the main motivation behind intra-group mergers. For this natural experiment, Korea's major tax reform initiative undertaken in 1999, which suddenly increased the maximum personal inheritance tax rate by 25 percentage points during the post-tax-reform period, was exploited. Given the raised inheritance tax burden, I examine how firms responded by transferring control shares based on difference-in-differences (DiD) estimations. Specifically, I compare how firms with high and low expected tax burden prior to the 1999 tax reform transferred control shares via intra-group mergers upon this personal tax shock right after the Asian financial crisis. This is necessary to examine because in doing so we can come to understand the change in controlling family's inheritance tax saving benefit and relevant transaction cost of undergoing an intra-group merger, and how the overall ownership structure of family firm is rebalanced through this process.

Using 2,422 firm-year observations from the top 24 largest Korean chaebols[4] from 1997 to 2004 (sample years), I first document a pattern of unusual surges in intra-group mergers with

[4] This family-owned large business conglomerates in Korea are generally called 'chaebol'. I empirically test based on Korean chaebol data because Korean chaebols have reported highly detailed inter-firm ownership information among their affiliates to Korean Fair Trade Commission since mid-1990s. Public access to this sort of information is limited in most countries, but available in South Korea. That is why I use Korean data. However, the story in my

high personal tax burdens. Next, using 1999 personal tax reform, I estimate the causal impact of the expected inheritance tax burden on intra-group merger waves. The result shows that the difference of intra-group merger activities between firms burdened by a high and low personal inheritance tax is three times more likely to increase upon this personal inheritance tax shock. I also find that among the firms with high tax burdens, intra-group mergers are concentrated in: 1) central firms[5], 2) firms located in the upper layer of the pyramid, and 3) firms within a circular ownership chain, i.e., the firms where the heirs can consolidate their indirect control over the entire business group. This result emphasizes that the ownership network of group affiliates determines the firms that initiate intra-group mergers among the firms with heavy inheritance tax burdens. I also find that this pattern is not relevant when it comes to non-intra-group merger activities.

To further identify the causal linkage that heavy inheritance tax burden leads to intra-group merger activities in pyramidal business groups, I test to see whether a reduction in personal tax burdens decreases intra-group merger activities. I find that intra-group mergers are rarely pursued by firms with heavy inheritance tax burdens that are indirectly owned by private foundations that are exempt from gift taxes. Finally, a difference-in-difference-in-differences (DiDiD) estimation of Korea's 1999 major tax reform drive confirms that unusual surges in intra-group mergers are primarily for tax arbitrage between ownership inheritance and intra-

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paper is never limited to Korea. Any family firm has such incentive to use tax minimizing succession strategy. Prior literature shows that controlling families siphon resources out of member firms for their private benefit. Similar personal tax saving effects implemented for the controlling family's benefit is likely to be observed in many alternative institutional contexts. For example, Asian casino king Stanley Ho implemented similar intra-group transactions to avoid inheritance tax.

[5] These companies are connected to many other member firms in the web of ownership, so that the controlling family can indirectly control affiliated firms through these key strategic firms in a pyramidal business group. Following Almeida et al. (2012), the centrality of firm *i* is measured as the average percentage difference in control rights of the controlling family across all group member firms except the firm itself after excluding a specific firm *i* from the group. Herein I refer to those firms with a high value of centrality as central firms.

group mergers. I also confirm that this sudden increase in intra-group mergers after tax reforms is not a consequence of the Asian financial crisis, either through the sudden shrinkage in the market value of Korea's capital market during the pre-crisis era or the post-crisis restructuring effect.

I then investigate the channel of ownership re-allocation by identifying characteristics of target firms relating to intra-group merger activities. I find that the heirs of chaebol families receive high level of dividends from their private firms where they already have large ownership stakes; these firms become the targets of intra-group mergers. Heirs can take these dividends because they have substantial voting rights, with which they can determine the corporate policy in those merger target firms. Thus, they prefer short-term wealth gains over long-term investment commitments. The same behavior is not necessarily seen in the male relatives in the current chair's generation, for whom the succession process is officially over. Overall, these results suggest that, to avoid inheritance tax burdens, the heirs might first prefer to own private firms where they can cash out corporate resources quickly, then try to reallocate their ownership to the central firms by expanding firm boundaries through intra-group mergers.

While the heirs of the controlling family are likely to benefit from such reshuffling, the ownership network within the business group becomes further distorted as central firms expand their boundaries with additional circular shareholding links. The minority shareholders suffer losses from these tax-motivated mergers that have few operational synergies. For instance, upon the announcement of an intra-group merger, the two-day cumulative abnormal return dropped 35.8% more compared to non-intra-group mergers. Overall, this new piece of evidence supports the tunneling hypothesis.

This paper is related to several strands of the literature. This paper contributes to the firm boundaries literature by providing a novel inheritance tax channel that reshapes firm boundaries other than hold up problems. Following Coase (1937), who argues that transaction costs define the boundaries of the firm, a large body of work has focused on transaction costs. Property rights theory (Grossman and Hart 1986, Hart and Moore 1990, Hart 1995) argues that the boundaries of the firm are responsive to solving hold-up problems. Recent empirical work shows that expanding a firm's boundaries can help it overcome incentive problems (Robinson 2008). Other studies also demonstrate how firm boundaries affect their R&D activities (Seru 2014) and business performance (Mullainathan and Scharfstein 2001, Beshears 2013). However, Zingales (2000) raises a key criticism: the firms that were the basis of those theories were the traditional business corporations that emerged in the 20th century. The boundaries of the firm constantly change as human capital, not physical assets, increasingly determines a firm's boundaries and thus the success of firms. Still, Korean chaebols, which are asset intensive, highly vertically integrated, and hold a tight, hierarchical control over their employees, are sufficiently similar to 20^{th} century firms that these theories do apply.

This paper also contributes to the literature on the effect of taxes on firms. The prior studies mainly emphasize the effects of corporate income taxes. Early studies focus on the effects of taxes on the right-hand side of the balance sheet, such as capital structure (Modigliani and Miller 1958, Miller 1963 and 1988) or dividend policy (Bradford 1981, Auerbach 1979, King 1974). More recent studies on tax effects explore topics such as the effects of the tax reforms on organizational forms (Desai and Hines 1999, Desai, Foley, and Hines 2004), or the effects of inheritance taxes (Tsoutsoura 2015). My paper connects these two recent works by deeper exploring the ownership networks among group affiliates as a key component of

inheritance tax channels that initiates intra-group mergers among the firms with heavy inheritance taxes, through which the ownership network of a business group would be manifested.

Finally, this paper concerns merger waves. The previous literature explains that merger waves result from industry shocks as a means to improve allocative efficiency (Gort 1969, Mitchell and Mulherin 1996, Maksimovic and Phillips 2001, Harford 2005, Eisfeldt and Rampini 2006). Other studies find the cause of merger waves in market misevaluation. Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) argue that merger waves are driven by the managerial timing of market overvaluation of firms. In addition, Ahern and Harford (2014) find that industry level network structure leads the formation and propagation of merger waves. I contribute to the literature by documenting a new kind of merger wave that stems from tax-motivated intra-group mergers. The presence of heavy tax burdens and the risk of ownership dilution encourage the controlling families of Korean chaebols to find alternative methods of business succession.

This paper is organized as follows: in Section 2, I introduce institutional background on inheritance tax reform and prediction. Section 3 contains a description of the data and sample summary statistics. Section 4 discusses the main result and the result analysis, and Section 5 concludes the paper.

2 Background

2.1 1999 Inheritance Tax Reform

Korea's inheritance tax laws and gift tax laws were first legislated in March and April of 1950, respectively. In November 1952, gift tax law was incorporated into inheritance tax law. In 1950, when the Inheritance Tax Act was first crafted, the system was progressive taxation, with 15 tax brackets and tax rates ranging from a minimum of 20% to a maximum of 90%. In the 1970s, the highest marginal tax rate remained high, at 75%, and these high rates of taxes brought about strong resistance among taxpayers, resulting in tax evasion. Over time, as the Korean economy grew more sophisticated, the inheritance laws were amended. In the 1980s, tax brackets decreased and tax rates were cut, and then, in the 1990s, various types of tax allowances were increased to help reduce the tax burden. The government gradually reduced the inheritance and gift tax rates to 67% in 1980 and finally to 40% in 1996, the lowest in history, while maintaining the business premium tax rate at 10%. Then, in 1996, the name of the law was officially changed to the Inheritance Tax and Gift Tax Act. As shown in Table 1, the cap of the inheritance tax rate was 55%, with 45% arising from the inheritance tax rate and 10% from the business premium tax, in 1997-1999, right before the tax reform.

[Table 1 around here]

However, this overall trend of decreasing inheritance tax rates suddenly shifted after the 1997-1998 Asian financial crisis. Soon after the first repayment of the IMF Supplemental Reserve Facility (SRF) in December 1998, President Kim announced special tax reform initiatives on the nation's Independence Day, 15th August 1999, laying out policy guidelines to prevent the tax-free inheritance of wealth. The tax reform initiative, driven by the President himself, lead to the adoption of a higher inheritance tax rate from the beginning of the year 2000[6].

[6] The gap between the reform's announcement and implementation is only three and half months. I find only four cases that the portion of family's ownership decreased during this period. After excluding these firms, the results are

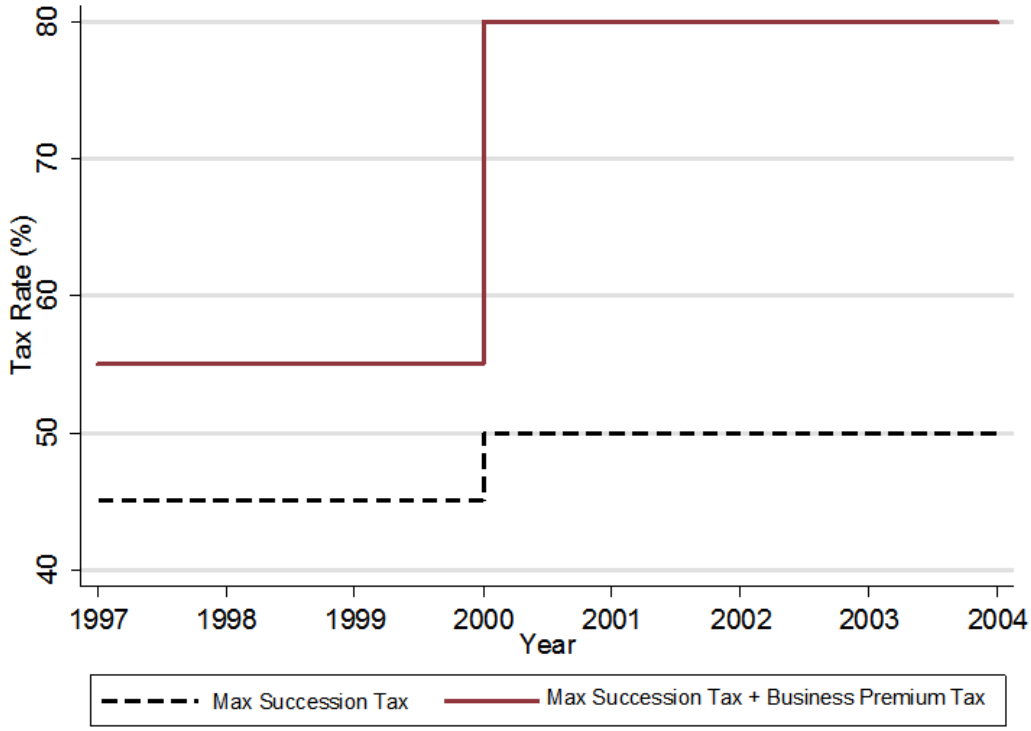

Figure 1: Tax Reform and the Maximum Succession Tax Rate

This figure summarizes the maximum succession tax rate and business premium tax rate in Korea before and after tax reforms. The full line represents the cap of the succession tax rate, and the gap between the full line and the dotted line represents the maximum business premium tax rate. The cap of the succession tax rate was as low as 45% from 1997-1999, with a constant 10% business premium tax. In 1999, right after the Asian financial crisis, the government undertook tax reform initiatives, laying out policy guidelines for "preventing tax-free inheritance of wealth," and, accordingly, in 2000 it began to apply a maximum succession tax rate of 80%, 50% of which comes from the succession tax rate and 30% from the business premium tax rate, which is the highest among OECD economies.

Accordingly, the threshold of the tax bracket subject to the marginal tax rate was lowered from five billion KRW to three billion KRW, and a maximum inheritance tax rate of 80%, composed of 50% from the inheritance tax rate and 30% from the business premium tax rate, was put in place from 2000; this is one of the highest inheritance tax rates among OECD economies[7]. In

robust, so we don't need to worry about the early inheritance of ownership right before this temporal shock. Overall this tax shock was unexpected and inheritance tax specific shock.

[7] The U.K. and France have a maximum tax rate of 40% and the U.S. and Germany impose a top rate of 35% and 30%, respectively. As skepticism about inheritance taxes began to surface in the late 1970s, many countries, including Canada, Australia, New Zealand, Italy, Portugal, and Sweden, abolished inheritance taxes altogether. In place of inheritance taxes, a form of taxation on capital gains is becoming the norm.

2002, the government sought to remove tax loopholes to prevent high-net-worth individuals from engaging in irregular succession and donation of wealth; the government expanded the coverage of irregular succession practices to include recapitalization or capital reduction. It also streamlined the securities evaluation system, as the share of financial assets among the total inherited or donated property was steadily increasing. In 2003, with a view to expand the scope of inheritance and gift taxes, the government shifted the tax regime from the negative system to the positive system.

As indicated in Figure 1, the major tax reform undertaken in 1999 applies a new tax rate that is 25 percentage points higher than that of the pre-reform period. If firms had anticipated the move with enough time to prepare, family firms would have implemented business succession and inheritance of family wealth before the tax reform to avoid the higher tax rates. However, with the tax reform in full swing and strong regulations in place in the wake of the financial crisis, only a very limited number of within-family transfers were observed in the sample year of 1999.

2.2 Tax Arbitrage and Prediction

Figure 2 shows the typical three-layer pyramidal structure of a Korean business group from Almeida et al (2012). A tax arbitrage opportunity exists between ownership inheritance (Scenario 1) and intra-group mergers (Scenario 2) in pyramidal business groups due to the different tax rates applied in each scenario.

In Figure 2, the controlling family is the largest shareholder of Firm A, with a 10% stake. An heir of the business group owns Firm C with a 51% stake and Firm H with a 62.5%

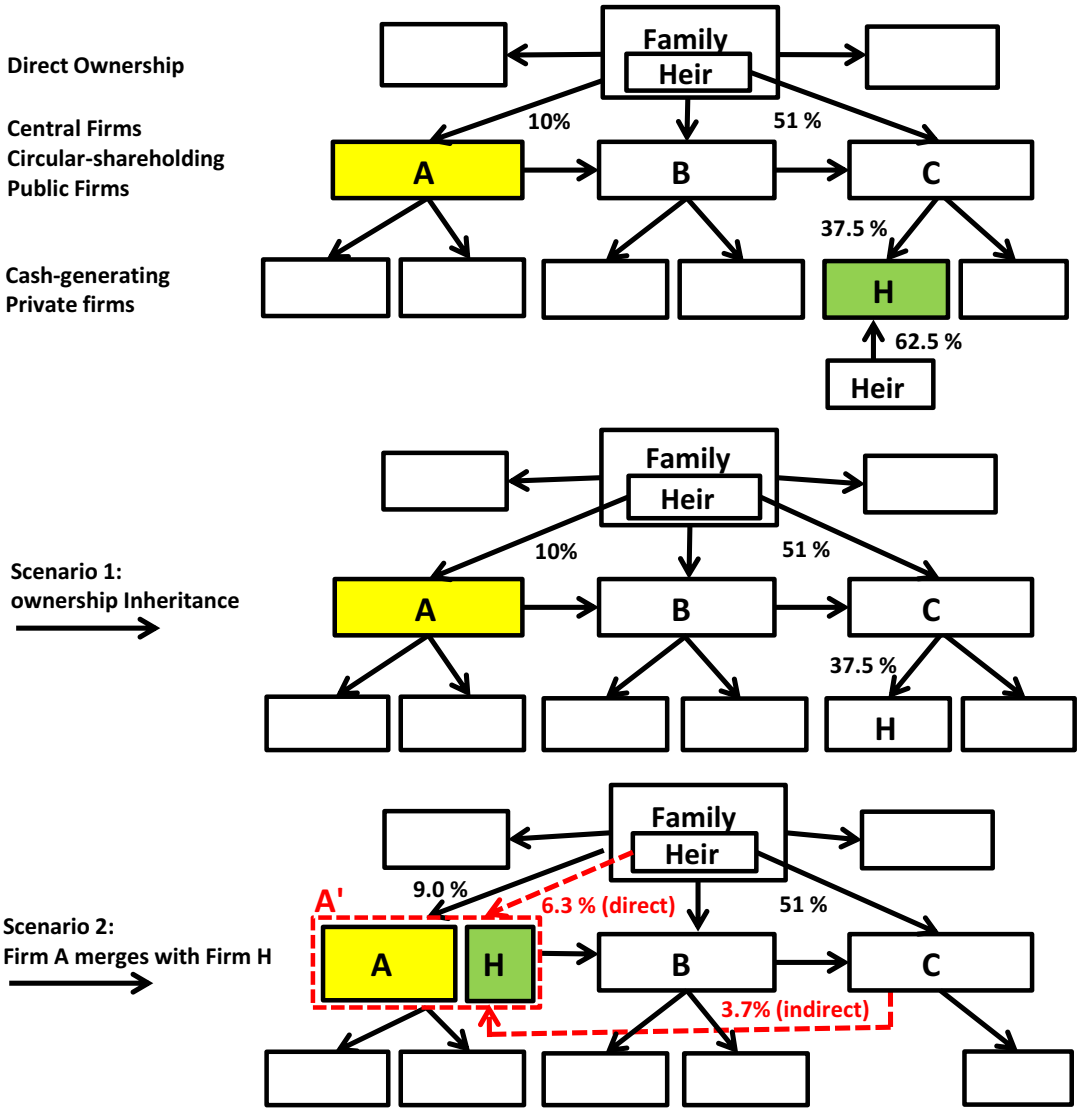

Figure 2: Tax Arbitrage Between Inheritance and Merging in Pyramids

This figure shows the arbitrage opportunity between ownership inheritance (Scenario 1) and intra-group mergers (Scenario 2) in pyramid business groups due to different tax rates applied in each scenario. The full arrows represent the ownership flow of a business group, while dotted arrows represent the newly created post-merger ownership flow. The dotted box represents the new firm created from the intra-group merger. The controlling family is the largest shareholder of Firm A, with a 10% stake. An heir of the business group owns Firm C with a 51% stake and Firm H with a 62.5% stake. Firm C owns Firm H with a 37.5% stake. The market value of Firm A is $1 billion and that of private Firm H is $112 million. The total inheritance tax rate of Firm A is 70%, composed of 50% from the inheritance tax rate and 20% from the business premium tax rate. In Scenario 1, the heir inherits 10% of Firm A's total stake after paying the $70 million inheritance tax ($1 billion×10%×70%) by selling their ownership in Firm H. In Scenario 2, Firm A merges with Firm H to create a new firm, Firm A', whose market value becomes $1.112 billion. No tax is applied, as there are no gains from the merger. The heir owns Firm A' with a total 10% ownership stake, of which 6.3% ($112 million×62.5%/$1.112 billion×100) is directly owned and 3.7% ($112 million× 37.5%/$1.112 billion×100) is an indirect ownership stake through Firm C. Firm H does not exist anymore, but the heir consolidates his power through additional circular-shareholding (A'→B→C→A'), while the controlling family maintains a 9% ownership stake ($1 billion×10% /$1.112 billion×100) in Firm A'. This figure, describing the pyramid structure, originates from Almeida et al. (2012).

stake. Firm C owns Firm H with a 37.5% stake. The market value of the central Firm A is $1 billion, and that of private Firm H at the bottom of pyramid is $112 million. If the family wants to transfer control over Firm A to the heir, a total of 70% inheritance tax rate is applied[8]. In Scenario 1, the heir inherits 10% of Firm A's total stake after paying the $70 million inheritance tax ($1 billion×10%×70%) by selling ownership in Firm H.

In Scenario 2, Firm A merges with Firm H to create a new Firm A'; this firm's market value becomes $1.112 billion. No tax is applied as there are no gains from the merger. The heir owns Firm A' with a total 10% ownership stake, of which 6.3% ($112 million×62.5%/1.11 billion×100) is directly owned and 3.7% (($112 million×37.5%)/$1.112 billion×100) is indirectly owned through Firm C. Firm H no longer exists, but the heir further inflates their effective ownership in the enlarged Firm A' through additional circular-shareholding (A'→B→C→A'). In brief, the heir has a 10% of control over Firm A and Firm A' respectively in each scenario, while the controlling family only maintains a 9% ownership stake ($1billion×10%/$1.112billion ×100) in Firm A' in scenario 2 with the newly created circular-shareholding.

Based on the tax arbitrage opportunity illustrated in Figure 2, I predict that firms in pyramidal business groups would respond to an inheritance tax burden by expanding the boundaries of firms through intra-group mergers until the benefits of additional ownership accrued to the heirs exceed the associated costs, i.e., the destroyed economic values due to intra-group mergers with no synergy value or governance concerns arising from additional cross-shareholding in the pyramids. I also predict that a reduction in tax burdens would decrease intra-group merger activities. In certain jurisdictions, including Korea, private foundations, such as

[8] The 70% inheritance tax rate is composed of 50% as the inheritance tax rate and 20% as the business premium tax rate. According to Decree 63-3 of the Inheritance and Gift Tax Act, the business premium tax is applied to the largest shareholder's ownership from 1993.

charitable entities, are exempt from gift taxation and those foundations are often used as a preferred mechanism for succession. When an heir receives control of a foundation that owns family firms, the inheritance tax burden is relieved (Thomsen 1999, Villalonga and Amit 2009). Thus, I expect the firms owned by private foundations to have a reduced tax burden, which in turn means there is less incentive to initiate intra-group mergers.

Prediction 1: Firms burdened by a high (low) personal inheritance tax are more (less) likely to attempt intra-group mergers.

In Scenario 2 of Figure 2, heirs initially own private firms, such as Firm H, that would become merger targets. The heirs can cash out the resources of these firms quickly, as they have substantial holdings and managerial discretion. Eventually these target firms could be merged with the heavy tax burden firms that are directly owned by their parents. Through this channel of resource reallocation via intra-group mergers, the heirs can obtain shares in those heavy tax burden firms without paying inheritance tax. However, not all the firms with heavy tax burden initiate intra-group mergers. The ownership network among group affiliates in a family business group determines the inheritance tax channel that initiates the intra-group merger. To maximize their arbitrage profits by consolidating their indirect control over the entire business, I expect that the heirs' generation will reallocate their funds to accumulate stakes in central firms located in the upper layer of the pyramidal structure within circular shareholding chains.

Prediction 2:

[2-1] *Acquiring firms* should be (a) characterized by high centrality, (b) located in upper layer of the pyramid, and (c) connected to circular shareholding chains.

[2-2] *Target firms* should be characterized by (a) a high ownership stake held by the heirs' generation and (b) managerial myopia.

If an intra-group merger is intended only to meet the controlling family's need to increase the heirs' ownership stake without paying inheritance tax, the acquiring firm's investors who get frustrated with negative synergy gains (Moeller, Schlingemann, and Stulz 2005) from a merger (Morck, Shleifer, and Vishny 1990) initiated to grab an arbitrage opportunity will exit their stocks, and the consequent loss would be thrust on minority shareholders. In the Korean market environment, where the group-controlling family has almost complete control over all affiliated firms, an intra-group merger can take place even if it does not create any synergy value, and challenging a voting agreement via shareholders' meetings is very rare.

Prediction 3: Market responds negatively to the announcement of intra-group mergers.

3 Data

The main sample of our study consists of 2,422 family firms from the 24 largest business groups (controlled by 16 chaebol families) from 1997 to 2004 following the list made based on the Korean Fair Trade Commission's (KFTC, a Korean anti-trust authority) classification standards[9]. Since the mid-1990s, the KFTC has required leading Korean chaebols to report highly detailed ownership status information; public access to this sort of information is limited in most countries, but available in South Korea. This kind of aggregated firm-level ownership

[9] The 24 family business groups include Samsung, CJ, Shinsaegae, Hansol, Hyundai, Hyundai Motors, Hyundai Heavy Industry, Hyundai Department Store, Hyundai Industry Development, KCC, LG, SK, Hanjin, Lotte, Kumho, Hanhwa, Doosan, Dongbu, Hyosung, Daelim, Kolon, Youngpoong, Dongyang, and Taihan Electric. The pan-Samsung groups (Samsung, CJ, Shinsaegae, Hansol) share a family, as do the pan-Hyundai groups (Hyundai, Hyundai Motors, Hyundai Heavy Industry, Hyundai Department Store, Hyundai Industry Development, KCC).

data helps to identify the extent of control concentration in each chaebol. I find that a chaebol family controls the entire group of firms with disproportionately small but key control stakes. In the sample, chaebol family members directly own only 533 (479 public and 54 private) out of the 2,422 firm-year observations, indicating the common exploitation of Korean chaebols' uniquely deep pyramidal structure. I retrieve M&A data from Thomson Reuters SDC Platinum and collect firms' financial and market data using Data Guide Pro, a database managed by the leading Korean financial data provider, FnGuide[10]. The total amount of assets controlled by these chaebols represents more than 56% of the nominal GDP of the Korean economy at the end of the sample year (778.4 trillion KRW).

To further convey their structures, I build family trees[11] for the 16 chaebol families using a publication by the Institute for Participatory Society, *The Chaebol of Korea: The Management Structure and Personal Network of Korean Chaebol* (2005)[12]. Information concerning an individual family member's ownership position is collected from the repository of Korea's corporate filings, DART (Data Analysis, Retrieval, and Transfer System), which is operated by the Financial Supervisory Service. Under Article 2 of the decree of the Act on External Audit of Stock Companies, any public or private company obligated to have an external audit is legally mandated to submit a complete annual report containing ownership information, such as the chairperson's relatives (spouses, blood relatives within the eighth degree and relatives by

[10] The information in this database is approximately equivalent to the information reported in CRSP and Compustat for U.S. firms.

[11] A family tree starts with the founder's parents and includes the founder him/herself, their siblings and their spouses, and all direct and indirect (via marriage) descendants of the founder and the founder's siblings and their spouses. The generation of the founder's parents is coded as generation zero, the founder's as generation one, and so on. I allocate a unique ID to each family member in the family tree and collect detailed information on birth order, gender, direct or indirect (via marriage) descendants, marital status, presence (dead or living), and personal background.

[12] This book covers the family trees of the 30 largest Korean chaebols based on their total assets in 2004.

marriage within the fourth degree), and subsidiaries or foundations that are practically governed by the family.

[Table 2 around here]

Panel A of Table 2 summarizes the financial analysis of the sample firms. The analysis is based on data compiled as of the year end during the sample period. Succession tax burden refers to the maximum expected tax payment if the ownership of the current chair generation is passed to the next generation in a corresponding year[13]. The average succession tax burden for each firm is 2.3 billion KRW (1.93 million USD) and the maximal tax burden is 572 billion KRW (480 million USD)[14]. During the sample period, approximately 11% of chaebol firms initiated mergers, of which 27% are intra-group transactions between affiliates in the same business group. The financial characteristics of sample firms are comparable to those observed in previous studies that also focused on Korean chaebol firms (Bae et al. 2002; Almeida et al. 2011; Lee, Shin, and Yun 2016). Panel A also reports that 48% of the 2,422 firm-year observations in the sample are publicly listed firms, and the sample mean of firm age is 24.57 years.

In Panel B of Table 2, I summarize ownership variables, such as centrality, position[15], loop[16], cash-flow right, voting right, and discrepancy, to look at the pyramidal structures of

[13] Succession tax burden = Ownership fraction of current chair generation × Total equity value × Tax rate in 10 billions of KRW. Total equity value refers to market value for public companies and Max [[(total asset-total debt) ×2+[{(NIt-3)×1+(NIt-2)×2+(NIt-1)×3}/6]/10%]/5] or total asset] for private companies, following Article 63-1 and 63-2 of the Inheritance Tax and Gift Tax Act. Tax rate refers to the sum of the succession and business premium tax rates.

[14] The exchange rate at the end of 2004, 1USD = 1,192 KRW, is applied.

[15] Position measures the distance between the family owner and a firm in the group. If the controlling family's shares are all held directly, the value of position of the company is one. In a simple pyramid structure with two firms, the firm i in the upper layer (chain 1) has a value of one, while the firm j in the lower layer (chain 2) has a value of 2. In this case, the position of firm i can be measured by the weighted average of chain 1 and chain 2, whose importance is weighted by the cash flow the family receives – the direct cash flow from firm i and the indirect cash flow from firm i through chain 2. The group firms directly owned by the controlling family have a low

Korean business groups. I observe that the maximal centrality of a group is 42.29%, which suggests a chaebol family's control across all group firms could decrease by that amount after I exclude one specific firm from the group. The average centrality of public firms (4.38) is 6.3 times higher than that of private firms (0.69), suggesting that highly central firms are the public firms in pyramidal business groups. The public firms have, on average, a position of 1.94 away from the controlling family, while the average position of private firms is 2.31. These average positions imply that public firms are more likely than private firms to be directly owned by the controlling family. In addition, 53% of the public firms are inside the circular ownership chains, whereas most of the private firms (79%) are outside these chains. These ownership metrics confirm that there is typically a highly-concentrated control structure in chaebols (Almeida et al. 2012), where owning a small stake in one or two key central firms allows the owner of the stakes to be the ultimate controller of the entire business group.

In Panel C of Table 2, I report controlling families' ownership, control, and the discrepancy between ownership and control over the sample chaebol firms. The ultimate cash-flow right (17.85%), voting right (63.18%), and discrepancy (45.34%) during the post-tax-reform period are much higher than those (15.53%, 43.93%, and 28.40%, respectively) during the pre-tax-reform period. This implies that the ownership networks among group affiliates are more distorted in the post-tax-reform period, as controlling families consolidate their indirect control through circular-shareholding mechanisms.

In Panel D of Table 2, I summarize the results of a univariate analysis of our main variables for the 2,422 sample family firms. The number of intra-group mergers is positively

position value, while indirectly owned affiliates have a high position value. See Almeida et al. (2011) for more details of ownership metrics.

[16] Loop is an indicator that has a value of one if a firm is in a circular ownership chain, zero otherwise.

correlated with succession tax burden (0.08), centrality (0.28), and loop (0.07), but negatively related to position (-0.11). These results suggest that intra-group mergers are more likely to increase in firms with high succession tax burdens and central firms located in the upper layers of the pyramid within the circular ownership chains. These correlations are largely in line with my predictions.

[Table 3 around here]

Table 3 shows equity ownership involvement of different family members. I report the statistics separately for the current chairs' generations and the following current chair+1 generation. The number of observations is 128 chaebol family-years, and each chaebol family variable is computed as the arithmetic average across business groups. Analysis is based on data compiled as of the year end during the sample period. I find that, on average, 10.8 family members hold 62% of family ownership positions in the current chair's generation, while 7.06 family members hold 23% of the entire family ownership in the current chair+1 generation. For the current chair's generation, 7.26 male family members on average hold 53% of the total ownership held by family members, while 1.58 daughters hold just 5%. In-laws in the chair generation rarely hold ownership positions. For the current chair+1 generation, a similar pattern of predominance of male heirs in the direct bloodline was observed. Variable definitions are detailed in Appendix A.

4 Results

4.1 Succession Tax Burden and Intra-group Mergers

In Table 4, I test the main prediction to see how the burden of personal inheritance tax affects intra-group merger activities. As shown in Column 1 of Panel A, based on the Tobit model, I regress each firm's number of intra-group mergers on the Inheritance Tax Burden variable. I control for size (log of total assets), financial leverage (debt to equity ratio), and the number of each firm's affiliates, and then cluster the standard errors at the business group level since an intra-group merger takes place via group-level decision. All estimates include industry (2-digit SIC) and year indicator variables[17]. The estimated effect of the personal inheritance tax burden is both economically and statistically significant. The results shown in Column 1 imply that for every 334 billion KRW (277 million USD) increase in the personal inheritance tax in an affiliate, Korean chaebols initiate one additional intra-group merger (1=0.02997*33.4). Column 2 of Panel A shows the results of an identification test of the underlying economic stories. I count the number of non-intra-group mergers, which are irrelevant to arbitrage opportunities, as the heirs do not own the target firms of those mergers. I find that the estimated effect of non-intra-group mergers is negative (-0.00053) and statistically insignificant.

[Table 4 around here]

According to Prediction 2, I expect that to maximize their control over the entire business group, the heirs would be incentivized to reallocate their ownership to the central firms that are located in the upper layer of pyramid within circular ownership chains. In Columns 3 through 5 of Panel A, I extend the baseline model from Column 1 of Panel A to test the characteristics of acquirers. The right-hand-side (RHS) variable, Inheritance Tax Burden, is now decomposed into two, using the following dummy variables: (1) High Centrality vs. Low Centrality, (2) Upper

[17] While Korean chaebols are diversified, the central firms of each business group are specialized in specific industries driven by the government since 1960-70s centrally planned economic era. Including a group dummy in addition to industry fixed effects does not explain additional within-group variation.

Layer of Pyramid vs. Lower Layer of Pyramid, and (3) Loop vs. No Loop. To facilitate the economic interpretation of our results, all explanatory variables are standardized to have a mean of zero and a standard deviation of one, so their point estimates directly represent their economic significance.

In Column 3 of Panel A, I find that an intra-group merger is mainly driven by central firms. Inheritance Tax Burden × High Centrality (0.08630) is statistically significant at the 1% level, whereas the effect of the opposite case, Inheritance Tax Burden × Low Centrality (-0.33633), is negative. In Column 4 of Panel A, I further confirm that an intra-group merger is more likely to occur in firms directly owned by a controlling family. Inheritance Tax Burden × Upper Layer of Pyramid (0.08488) is statistically significant at the 1% level, whereas Inheritance Tax Burden × Lower Layer of Pyramid (-0.11790) is negatively significant. In Column 5 of Panel A, consistent with the prediction, the results show the effect of the personal inheritance tax burden on the circular ownership structure. Inheritance Tax Burden × Loop (0.07792) is statistically significant at the 1% level, and its economic magnitude is more than twice (2.3=0.07792/0.03358) as large as the effect of the opposite case, Inheritance Tax Burden × No Loop. This result emphasizes that the ownership network of group affiliates determines the firms that initiate intra-group mergers among the firms with heavy personal inheritance tax burdens.

In Panel B, I repeat the analyses from Columns 1 to 5 in Panel A using a linear model with the same empirical specification, and I find a similarly significant, increasing trend of intra-group mergers with succession tax burdens. The estimated marginal effects of the succession tax burden are smaller than those in Panel A because the probability that a firm initiates an intra-group merger is much less than one. Overall, the results in Table 4 reveal a pattern: a high

inheritance tax burden leads to intra-group merger waves in pyramidal business groups; this implies that such unusual surges in intra-group mergers are motivated by a desire for tax arbitrage between ownership succession and an alternative succession mechanism.

4.2 The Effect of Tax Reform on Intra-group Mergers

One concern about the baseline findings is whether there is a causal relationship between a high personal inheritance tax burden and intra-group mergers. To investigate this issue, in Table 5, I examine the 1999 tax reform in Korea that applied a maximum inheritance tax rate of 80%, which is 25 percentage points higher than in the pre-tax-reform period. Factoring in this exogenous event raising the inheritance tax burden, I use difference-in-differences (DiD) estimations to estimate the causal impact of the personal inheritance tax burden on the frequency of intra-group mergers. The pre-tax-reform period refers to the years from 1997 through 1999, and the post-tax-reform period runs from 2000 through 2004, when the increased tax rate was applied. The treatment group, High Inheritance Tax Burden, is made up of the firms whose succession burden is greater than that of the top 10% of directly owned chaebol firms during the pre-tax-reform period.

There are no differences between the treatment and control group in the pre-tax–reform period, and the treatment group and control group do not switch during the entire sample period. These high tax burden firms are the most tax burdened firms over the sample period, regardless of the change in the tax rate, equity value, or ownership fraction of the current chair's generation. And only ownership difference determines the treatment and control group. Thus, separating the treatment group and control group by degree of inheritance tax burden does not raise the selection bias issue. The average frequency of treatment group (0.07) and that of control group

(0.02) is statistically indifferent (p=0.16) during the pre-tax-reform period, while the average frequency of treatment group (0.37) and that of the control group (0.03) is statistically different (p=0.00) during the post-tax-reform period.

[Table 5 around here]

In Column 1 of Panel A, I regress each firm's number of intra-group mergers on an interaction term, High Inheritance Tax Burden × Post, and I find positive point estimates of 0.84602, significant at the 1% level. The coefficients imply that the differnce of intra-group merger activities between firms burdened by a high and low personal inheritance tax is three times (3.44= 0.84602/0.24610) more likely to increase during the post-tax-reform period. These are economically significant effects which suggest that high tax burden firms expand boundaries via initiating intra-group mergers during the post-tax-reform period because the tax saving benefits from increased boundaries cover relevant transaction costs.

In Columns 2 through 4 of Panel A, I repeat the conditional analysis from Columns 3 through 5 of Table 4. Using this additional layer of differences, I run a difference-in-differences and decompose (DiD-D) regression. The RHS variable, High Inheritance Tax Burden × Post, is now decomposed into two parts, using the following dummy variables: (1) High Centrality vs. Low Centrality, (2) Upper Layer of Pyramid vs. Lower Layer of Pyramid, and (3) Loop vs. No Loop. All the difference-in-differences and decompose (DiD-D) test for centrality, layer position, and loop confirm the earlier findings shown in Columns 2 to 4 of Table 4; the DiD-D effect of High Inheritance Tax Burden × Post × High Centrality (0.17605) is statistically significant at the 1% level, whereas I find an insignificant change in the number of intra-group mergers for low

centrality firms (0.02403). This result sharply identifies the effects of a personal inheritance tax burden on intra-group mergers in Korean chaebols.

However, the non-linear model does not capture the treatment effect when we interpret the interaction term in a difference-in-differences model. In Panel B, I repeat the analyses from Columns 1 to 4 in Panel A using a linear specification. The findings in Panel B, with OLS regression, confirm that the 1999 tax reform, which exogenously increased the inheritance tax burden, results in significant intra-group merger waves. This effect is likely causal.

4.3 Private Foundations and Tax Burden Reduction

To further identify causal evidence that a high inheritance tax burden leads to intra-group merger waves in pyramidal business groups, I test the alternative prediction to see whether a reduction in the tax burden decreases intra-group merger activities. The results are shown in Table 6. The inheritance tax burden is relieved through indirect shareholding by industry foundations (Thomsen 1999, Villalonga and Amit 2009). As charitable entities, the private foundations, which are often governed by the heirs who serve as board members, are exempt from gift taxation. Thus, I expect that a firm owned by a private foundation has its tax burden reduced, resulting in decreased motivation for the heirs to initiate intra-group mergers.

[Table 6 around here]

To examine the effects of private foundations, I employ the difference-in-difference-in-differences (DiDiD) analysis. In Column 1 of Panel A of Table 6, I extend the difference-in-differences (DiD) model of Table 5 by interacting the RHS variable, High Inheritance Tax

Burden × Post, with Foundation as a dummy variable. Foundation here refers to an indicator that has a value of one if a firm is owned by private foundations and zero otherwise. The point estimate of the interaction term (-12.12192) implies that the incentive to initiate an intra-group merger drops by a net 99.6% (=-12.12192/12.17065) when the firm is owned by a private foundation. The interaction effect is statistically significant at the 1% level.

In Columns 2 through 4 of Panel A, I repeat the same conditional analysis from Columns 2 to 4 of Table 5. The RHS variable, High Inheritance Tax Burden × Post × Foundation, is now decomposed into two, using the following dummy variables: (1) High Centrality vs. Low Centrality, (2) Upper Layer of Pyramid vs. Lower Layer of Pyramid, and (3) Loop vs. No Loop. To facilitate the economic interpretation of our results, all explanatory variables are standardized to have a mean of zero and a standard deviation of one, so their point estimates directly represent their economic significance. The results of tests for centrality, layer position, and loop re-confirm the findings shown in Tables 4 and 5. An intra-group merger is less likely in central firms that are located in the upper layer of the pyramid within circular ownership chains if the marginal benefit of tax arbitrage is likely to decrease. In Column 2 of Panel A, the effect of High Inheritance Tax Burden × Post × Foundation × High Centrality (-1.21219) is statistically significant at the 1% level, and its economic magnitude is more than twice (2.3=-1.21219/-0.52184) as large as that of the effect of the opposite case, i.e., High Inheritance Tax Burden × Post × Foundation × Low Centrality.

The Tobit model does not capture the treatment effect when we interpret the interaction term in a difference-in-difference-in-differences model. In Panel B, I repeat the analyses from Columns 1 to 4 in Panel A using an OLS model, and the results support the causal evidence that

a reduction in tax burden via a private foundation decreases intra-group merger activities. The causal evidence from Tables 5 and 6, taken together, highlight that intra-group mergers are primarily intended to seize arbitrage opportunities in the process of ownership succession.

4.4 Target Firms

In Table 7, I investigate the channel of ownership re-allocation by identifying the characteristics of firms targeted in intra-group mergers. The heirs in the chair+1 generation initially cash out corporate resources from their private firms, the targets of an intra-group merger, in which they already have high ownership stakes. They can take this pecuniary benefit since they have a substantial degree of managerial discretion with which they can control the dividend policy of the target private firm. Thus, they prefer short-term wealth gains over long-term investment commitments. Eventually, to maximize their control, the heirs in the chair+1 generation are willing to reallocate their funds to accumulate stakes in other strategically important firms within the business group. This behavior, though, is not necessarily anticipated for male relatives in the current chair's generation who already accumulated shares in those key firms.

[Table 7 around here]

Table 7 provides the results of analysis on target firms. The ownership stake and the managerial discretion on dividend policy are measured by the ownership fraction held by members of the current chair+1 generation (C+1) or current chairs' generation (C) (Columns 1 and 2) and voting rights (Column 3) of a controlling family. Short-term wealth gains are

estimated by the dividend payout ratio (Column 4). I use the long-term R&D ratio (Column 5) as a proxy value for long-term investment commitments. I create an indicator for target private firms and test whether the heirs pursue short-term pecuniary benefits in those private firms. Based on an OLS regression, other empirical specifications are the same as in the previous regression analyses.

In Columns 1 and 3, I find the target private firms have a positive correlation with the family ownership fraction in the current chair+1 generation (7.14141) and voting rights (20.37031), and those estimates are statistically significant at the 1% level. But, in Column 2, I find a negative, insignificant point estimate of -6.92086 for the ownership fraction in the current chair's generation. In Columns 4 and 5, the target private firms have a positive point estimate (7.19319) with the dividend payout ratio, but a negative point estimate (-11.04820) with the long-term R&D ratio. Those estimates are statistically significant at the 10% and 1% level, respectively. This result implies that in those target private firms where the current chair+1 generation's ownership (on average 7.2% higher than in the rest of the chaebol firms) and voting rights (on average 20.4% higher than in the rest of the chaebol firms) are highly concentrated, the heirs benefit from dividends 7.2% higher than in the rest of the chaebol firms, while avoiding long-term investment commitments when an intra-group merger is anticipated.

The results shown in Table 7 and previous tables for acquirers, put together, underline that intra-group merger waves help heirs to consolidate control by reallocating their ownership to firms with high centrality from private target firms that have fallen into families' private safes.

4.5 Returns on Intra-group Merger Announcements

Finally, I provide evidence of tunneling by looking at the stock market's response to intra-group merger announcements during the sample period. In Section 2, I predict that minority shareholders will exit their stocks upon the announcement of a tax-motivated intra-group merger with no synergy value, sustaining losses, while the controlling family relishes arbitrage profits from the merger.

[Table 8 around here]

The merger data I use to test the financial market's response to an intra-group merger is based on the announcement of the first merger that occurs in a firm in a given year. Event Date is the day a firm initially announces an intra-group merger. For each event, I calculate the CAR over the 250 trading day window using a market model. First, I regress returns on market returns to obtain estimates of the alpha and beta. Then I find the abnormal returns by subtracting alpha plus beta times the market return from daily stock returns. I report the median of merger event CARs for given subsamples. In parentheses, I report the P-values for a signed-rank test for the median of full samples (Panel A) and the post-Asian-financial-crisis subsample (Panel B). I focus on the results in the post-crisis period (Panel B) to avoid the confounding effects of merger announcements and market shrinkage from the macro shock.

In Column 4 of Panel B, variable CAR [0, 1] reports the mean of the cumulative abnormal return information for the event day and the following day. The point estimates of Intra-group Merger and Non-intra-group Merger are -1.60547 and -1.18191 and are significant at the 5% and 1% levels, respectively. This result indicates that, in response to the announcement of an intra-group merger, the two-day cumulative abnormal return dropped 35.8% more than it did in response to the announcement of a non-intra-group merger. This is economically significant

when I consider the two-day event window. The four-day cumulative abnormal return, CAR [0, 3], dropped 52.8% more than the average of total mergers and this trend weakens afterward. In Panel A of Table 7, with the full sample, I find a result similar to that shown in Panel B, but I only find a negatively significant result for non-intra-group mergers. However, the same significant negative results are not observed from other listed group affiliates interconnected by ownership with those merging firms.

The results in Table 7 show that minority shareholders sustain losses from intra-group mergers with few operational synergies, particularly when the controlling family aims to capture tax arbitrage between ownership succession and the intra-group merger. Overall, these findings represent a new piece of evidence for the tunneling hypothesis.

4.6 Robustness Test: Alternative Time Period

One of the important concerns is the implication of the Asian financial crisis, which led to (1) a sudden shrinkage in Korea's capital market,[18] and (2) post-crisis restructuring. The KOSPI Index, after dropping to one third of its pre-crisis level during the crisis, was still recovering to the pre-crisis level until early 1999, with the average personal inheritance tax burden reduced. If a chaebol heir suddenly inherited the ownership of the business group during the Asian financial crisis, during a time when the inheritance tax burden was somewhat relieved, an intra-group merger was therefore less likely to occur. Another concern about the crisis's distorted effect on the inheritance tax burden is that the market responses by individual firms to this macro-economic shock may vary greatly. To alleviate this concern, in Columns 1 through 3

[18] KOSPI Index: 651.22 (1996.12), 376.31(1997.12), 280.00 (1998.6), 562.45 (1998.12), 1,028.07 (1999.12).

of Table 9, I re-run my baseline analyses from the first columns of Tables 4, 5, and 6, by excluding 1997-1998, the period of the Asian financial crisis. As shown in Table 9, the results are similar to those of the baseline regression, indicating that a sudden shrinkage in market value does not lead to a pattern of decreasing intra-group mergers during the pre-tax-reform period.

[Table 9 around here]

Another important concern is the post-crisis restructuring effect. Since the post-crisis period (1999-2001),[19] when restructuring efforts were active and overlapped with the period of the post-tax-reform period (2000-2004), one may argue that these confounding factors have led to the result. If the rise in intra-group mergers during the post-tax-reform period is mainly driven by business group restructuring, the restructuring effect should be stronger early in the post-tax-reform period (2000-2001) than later in the period (2002-2004). To distinguish and separate the impact of these two different factors – the inheritance tax burden and business restructuring – on intra-group mergers, in Columns 4 through 6 of Table 9, I first re-run our baseline analyses from the first columns of Tables 4, 5, and 6, excluding all intra-group and non-intra-group mergers initiated by firms with no ownership by the current chair generation. Then, in Columns 7 and 8, I decompose the Post dummy into two: Early Post (2000-2001) vs Late Post (2002-2004). All explanatory variables are standardized to have a mean of zero and a standard deviation of one, so their point estimates directly represent their economic significance. In Column 7 of Panel A, the effect of High Inheritance Tax Burden × Post × Late Post (0.22744) is statistically significant at the 1% level, and its economic magnitude is slightly (1.1=0.22744/0.20758) larger than the effect of the opposite case, i.e., High Inheritance Tax Burden × Post × Early Post. Column 8 also shows

[19] After the first repayment of the IMF Supplemental Reserve Facility (SRF) in December 1998, the Korean government led restructuring efforts to meet the requirements imposed by the IMF. The IMF-supported financial program was terminated in August 2001.

a similar result with DiDiD estimations. As shown in Columns 4 through 8, the results are robust to the potential confounding factor, suggesting that restructuring efforts in the wake of the Asian financial crisis were mainly about selling or liquidating inefficient firms with labor adjustments, rather than mergers between group affiliates.

5 Conclusion

Transfer of control is a tremendously important issue in any organization. In this paper, I try to understand how controlling families transfer control to the heirs by identifying a novel channel of transfer of control in family firms. Specifically, I discovered the intra-group merger to be a particular channel of transfer of control in family firms, a practice that is understudied in previous literature. This paper provides causal evidence, in practice, that controlling families indirectly transfer control through intra-group mergers to avoid taxes during the transfer of control in family firms. Thus, this paper highlights a novel personal inheritance tax channel that reshapes firm boundaries – high tax burden firms initiate intra-group mergers during the post-tax-reform period because the taxes saving benefits from increased boundaries cover relevant transaction costs. The major costs of undergoing intra-group mergers are the resulting distortions in network structure among affiliates, and the negative market response to tax-motivated intra-group mergers.

This paper shows that shock from personal inheritance tax distorts the ownership network among affiliates, providing unique evidence that tax shock causes exogenous changes in network structure for a subset of family firms. Network structure is determined highly endogenously, and it is difficult to prove that the corporate outcome is impacted by network structure or other underlying factors that determine the network structure. Using personal inheritance tax as

instrument variable, future studies might identify the costs of the resulting distortions by personal tax shock on the network structure. The business groups with distorted ownership networks may be more vulnerable to potential risk, ongoing growth, or managerial quality. My work can be also extended to policy makers by raising new questions, such as the optimal succession tax policy to prevent the cost of using tax minimizing succession vehicles.

While the heirs of the controlling family benefit from personal tax savings, the minority shareholders suffer losses from these tax-motivated intra-group mergers, as they create few operating synergies causing investors to exit their stocks. This result introduces a new piece of evidence of tunneling caused by heavy inheritance tax burdens in a specific institutional setting. Prior literature shows that controlling families in business groups use both investment and financing decisions as instruments to siphon resources out of member firms for their private benefit (Bertrand et al. 2002, Bae et al. 2002, and Baek et al. 2006). Prior empirical evidence of tunneling in emerging markets suggest that similar distorted ownership allocation in pursuit of personal tax savings are likely to be observed in many alternative institutional contexts.

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Table 1: Time-series Variation in the Succession Tax Rate

This table summarizes the maximum succession tax rate and business premium tax rate in Korea before and after tax reforms. In the 1970s, the highest marginal tax rate was 75%; these high tax rates brought about strong psychological resistance among taxpayers, resulting in tax evasion. To address this, as shown in the table, the government gradually reduced the inheritance and gift tax rate to 67% in 1980 and finally to 40% in 1996, the lowest in history, while maintaining the business premium tax rate at 10%. The cap of the inheritance tax rate was 55%, with 45% from the inheritance tax rate and 10% from the business premium tax rate from 1997 to 1999, right before the tax reforms. Then, in 1999, after the Asian financial crisis, the government undertook tax reform initiatives, laying out policy guidelines for "preventing tax-free inheritance of wealth," and, accordingly, in 2000 it began to apply a maximum succession tax rate of 80% percent, 50% of which comes from the succession tax rate and 30% from the business premium tax rate, which is the highest among OECD economies.

	1993-1995	*1996*	*1997~1999*	*2000~2002*	*After 2003*	
					SME	***Chaebol***
Cap of Succession Tax Rate	50%	40%	45%	50%	50%	50%
Business Premium Tax Rate (Largest shareholder < 50%)	10%	10%	10%	20%	10%	20%
Business Premium Tax Rate (Largest shareholder > 50%)	10%	10%	10%	30%	15%	30%
Total Succession Tax Rate	60%	50%	55%	80%	65%	80%

Table 2: Summary Statistics

The sample consists of 2,422 firm-year observations from 1997 to 2004 of Korea's top 24 largest business groups, controlled by 16 chaebol families, designated by the Korean Fair Trade Commission (KFTC). Analysis is based on data compiled as of the year end of the corresponding year.

Panel A: Succession tax burden refers to the maximum expected tax payment if the ownership of the current chair's generation is inherited by the next generation in the corresponding year; it is calculated as Ownership Fraction of Current Chair Generation × Total Equity Value × Tax Rate (in 10 billions of KRW). Total equity value refers to the market value of public companies and Max [[(total asset - total debt) ×2+[{(NIt-3)×1+(NIt-2)×2+(NIt-1)×3}/6] /10%]/5] or total asset] for private companies, following Articles 63-1 and 63-2 of the Inheritance Tax and Gift Tax Act. Tax rate refers to the sum of the succession tax rate and the business premium tax rate. Number of total mergers refers to the total number of M&A transactions in a given year. Number of intra-group mergers refers to the total number of mergers with and acquisitions of other affiliates in a business group in a given year. Total merger transactions refers to the total amount of merger and acquisition transactions in millions of USD in a given year. Intra-group merger transactions refers to the total amount of merger and acquisition transactions in millions of USD between two affiliates in a business group in a given year. Log of total assets refers to the logarithm of a firm's total assets in millions of KRW. Log of sales refers to the logarithm of a firm's total sales in millions of KRW. Leverage refers to a debt ratio calculated as a firm's total debt divided by its total equity. ROA refers to the ratio of a firm's earnings before interest and tax (EBIT) divided by its total assets. Payout ratio refers to the ratio of a firm's net dividends paid divided by its net income. Public firm is an indicator variable that equals one if a firm is listed on the KOSPI or KOSDAQ exchange, and zero otherwise. Firm age is the age of a firm in a business group as of the corresponding year.

Panel B: Panel B shows the ownership structure of sample firms based on KFTC reports. Centrality refers to the average percentage decrease in control rights across all group firms other than the firm itself, after I exclude a specific firm from the group. Position refers to the distance between the family and a firm in a business group; a value of 1 indicates that the firm is directly controlled by the founding family. Loop refers to an indicator that has a value of one if a firm is in a circular ownership chain, and is zero otherwise.

Panel C: Panel C reports controlling families' ownership, control, and the discrepancy between ownership and control over sample firms. Cash-flow right refers to the sum of direct equity ownership held by the founding family after excluding treasury stocks and cross shareholdings. Voting right refers to the ratio of the maximum number of stocks that founding family members can use for voting divided by the total number of the group's outstanding stocks. Discrepancy refers to the gap between cash-flow rights and voting rights. The Pre-tax-reform period includes the years 1997 to 1999, whereas the Post-tax-reform period includes the years 2000 to 2004.

Panel D: Panel D reports correlations for the sample firms among the main variables, summarized in Panels A and B.

Panel A: Financial Characteristics	Number of firms	Mean	Std. Dev	Min	Median	Max
Succession tax burden	2,422	0.23	2.84	0	0	57.20
Number of total mergers	2,422	0.11	0.62	0	0	13.00
Number of Intra-group mergers	2,422	0.03	0.28	0	0	7.00
Total merger transactions	2,422	7.20	85.42	0	0	2903.41
Intra-group merger transactions	2,422	3.57	74.37	0	0	2903.41
Log of total assets	2,422	12.42	2.04	7.43	12.34	18.33
Log of sales	2,422	5.28	0.95	1.19	5.30	7.91
Leverage	2,422	3.31	9.59	0	1.63	279.46
ROA	2,422	0.06	0.09	-0.60	0.05	0.85
Payout ratio	1,607	0.09	0.48	-8.11	0	1.98
Cash holding/Total asset	1,607	0.06	0.08	0	0.04	0.76
Public firm (dummy)	2,422	0.48	0.50	0	0	1
Firm age	2,422	24.57	15.85	1	21	75

Panel B: Ownership Structure	Number of firms	Mean	Std. Dev	Min	Median	Max
Centrality (%)	1,667	2.66	5.61	0	0.00	45.33
Public	891	4.38	6.89	0	1.00	45.33
Private	776	0.69	2.42	0	0.00	20.13
Position	1,667	2.11	0.84	1	2.01	5.31
Public	891	1.94	0.82	1	1.98	5.31
Private	776	2.31	0.82	1	2.17	5.01
Loop	1,667	0.38	0.49	0	0	1
Public	891	0.53	0.50	0	1	1
Private	776	0.21	0.41	0	0	1

Panel C: Ownership and Control	Number of firms	Mean	Std. Dev	Min	Median	Max
Cash-flow right (%)	1,667	17.20	17.46	0	11.75	100
Pre-tax-reform period	497	15.53	17.22	0	9.08	100
Post-tax-reform period	1,169	17.85	17.51	0	12.49	100
Difference (post-pre)		2.32		t=2.48 (p=0.01)		
Voting right (%)	1,667	57.46	30.27	0	50.43	100
Pre-tax-reform period	497	43.93	28.99	0	33.00	100
Post-tax-reform period	1,169	63.18	28.98	0	60.40	100
Difference (post-pre)		19.25		t=12.40 (p=0.00)		
Discrepancy (%)	1,667	40.26	28.77	0	36.84	100
Pre-tax-reform period	497	28.40	26.88	0	18.01	100
Post-tax-reform period	1,169	45.34	28.01	0	43.52	98.43
Difference (post-pre)		16.93		t=11.42 (p=0.00)		

Panel D: Correlation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Succession tax burden	1.00								
(2) Number of Intra-group mergers	0.08	1.00							
(3) Centrality	0.23	0.28	1.00						
(4) Position	-0.13	-0.11	-0.36	1.00					
(5) Loop	0.08	0.07	0.17	-0.17	1.00				
(6) ROA	-0.01	0.04	-0.03	-0.07	-0.02	1.00			
(7) Log of total assets	0.17	0.23	0.45	-0.15	0.42	-0.10	1.00		
(8) Leverage	0.00	0.01	0.06	-0.03	0.08	-0.04	0.12	1.00	
(9) Payout ratio	0.03	0.00	0.05	0.02	0.05	0.05	0.04	-0.01	1.00

Table 3: Family Involvement in Ownership

The sample consists of 2,422 firm-year observations from 1997 to 2004 of Korea's top 24 largest business groups, controlled by 16 chaebol families, designated by the Korean Fair Trade Commission (KFTC). The number of observations is 128 chaebol family-years, and each chaebol family variable is computed as the arithmetic average across business groups. Analysis is based on data compiled as of the year end during the sample period.

Panel A: For the current chair's generation, male [female, married male, married female] family members indicate the current chair and the chair's brothers [sisters, brothers-in-law, sisters-in-law]. In that generation, the number of male [female, married male, and married female] family members with ownership refers to the total number of male [female, married male, and married female] family members with ownership in the group firms. Total number of members with ownership in the current chair generation refers to the sum of the number of male, female, married male, and married female members with ownership in at least one of the group firms. Fraction of family ownership held by male [female, married male, and married female] family members refers to the ratio of the portion of ownership held by male [female, married male, and married female] family members in the current chair and his/her siblings' generation divided by the entire portion of ownership held by family members. Total fraction of ownership held by current chair generation refers to the sum of the fraction of family ownership held by male, female, married male, and married female family members.

Panel B: Current chair+1 generation refers to the generation following that of the current chair's. For the current chair+1 generation, the number of sons [daughters, sons-in-law, and daughters-in-law] with ownership is the total number of sons [daughters, sons-in-law, and daughters-in-law] of the current chair and his/her siblings with ownership of the group firms. Total number of members with ownership in the current chair+1 generation refers to the sum of the number of sons, daughters, sons-in-law, and daughters-in-law with ownership in at least one of the group firms. Fraction of family ownership held by sons [daughters, sons-in-law, and daughters-in-law] refers to the ratio of the portion of ownership held by sons [daughters, sons-in-law, and daughters-in-law] of the current chair and his/her siblings divided by the entire portion of ownership held by family members. Total fraction of ownership held by the current chair+1 generation refers to the sum of the fraction of family ownership held by sons, daughters, sons-in-law, and daughters-in-law of the current chair and his/her siblings.

	N	Mean	Std. Dev	Min	Median	Max
Panel A: Current chair generation						
Total number of members with ownership in curent chair generation	128	10.80	5.99	2	12	21
Number of male family members with ownership	128	7.26	4.27	1	7	15
Number of female family members with ownership	128	1.58	1.99	0	1	7
Number of married male members with ownership	128	1.13	1.68	0	0	6
Number of married female members with ownership	128	0.84	1.24	0	0	5
Total fraction of ownership held by current chair generation	128	0.62	0.22	0.16	0.63	1.00
Fraction of family ownership held by male family members	128	0.53	0.27	0.001	0.53	1.00
Fraction of family ownership held by female family members	128	0.05	0.14	0	0	0.83
Fraction of family ownership held by married male members	128	0.03	0.08	0	0	0.57
Fraction of family ownership held by married female members	128	0.02	0.05	0	0	0.24
Panel B: Current chair+1 generation						
Total number of members with ownership in curent chair+1 generation	128	7.06	8.66	0	4	26
Number of sons with ownership	128	4.38	5.67	0	2	19
Number of daughters with ownership	128	1.99	2.31	0	2	8
Number of sons-in-law with ownership	128	0.31	0.85	0	0	3
Number of daugeters-in-law with ownership	128	0.38	1.46	0	0	6
Total fraction of ownership held by current chair+1 generation	128	0.23	0.26	0	0.07	0.84
Fraction of family ownership held by sons	128	0.20	0.25	0	0.01	0.73
Fraction of family ownership held by daughters	128	0.03	0.05	0	0.01	0.27
Fraction of family ownership held by sons in law	128	0.002	0.007	0	0	0.03
Fraction of family ownership held by daughters in law	128	0.001	0.003	0	0	0.01

Table 4: Succession Tax Burden and Intra-group Mergers

Each column of Panel A reports the coefficients from a Tobit regression with heteroscedasticity-robust standard errors. Each column of Panel B reports the coefficients from an OLS regression. Standard errors are clustered at the business group level and reported in parentheses under the coefficient estimates. In Columns three to five, all explanatory variables are standardized, so their point estimates represent the economic magnitude of their effects. The dependent variable is the number of intra-group merger transactions between two affiliates in a business group. In Column 2, the dependent variable is the number of non-intra group mergers, obtained by subtracting the number of intra-group mergers from the total number of mergers. Succession tax burden refers to the maximum expected tax payment if the ownership of the current chair's generation is inherited by the next generation in a corresponding year, which is calculated as Ownership Fraction of Current Chair Generation × Total Equity Value × Tax Rate (in 10 billions of KRW). Total equity value refers to the market value for listed companies and Max [[(total asset - total debt)×2 +[{(NIt-3)×1+(NIt-2)×2+(NIt-1)×3}/6]/10%]/5] or total asset] for private companies, following Articles 63-1 and 63-2 of the Inheritance Tax and Gift Tax Act. Tax rate refers to the sum of the succession and business premium tax rates. Centrality refers to the average percentage decrease in control right across all group firms other than the firm itself after I exclude a specific firm from the group. High centrality refers to an indicator that has a value of one if centrality is greater than the average for chaebol firms, and zero otherwise. Low centrality refers to an indicator that has a value of one if centrality is lower than average for chaebol firms, and zero otherwise. Position refers to the distance between the founding family and a firm in a group; a value of one indicates that the firm is directly controlled by the founding family. Upper layer of pyramid refers to an indicator that has a value of one if the position of a firm is smaller than average for chaebol firms, and zero otherwise. Lower layer of pyramid refers to an indicator that has a value of one if the position of a firm is greater than or equal to the average for chaebol firms, and zero otherwise. Loop refers to an indicator that has a value of one if a firm is in a circular ownership chain, and zero otherwise. No loop refers to an indicator that has a value of one if a firm is not in a circular ownership chain, and zero otherwise. Controls include the log of total assets (in millions of KRW), the leverage ratio, and the number of group affiliates. All estimates include industry (SIC-2 digit) and year indicator variables. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Tobit	***Dependent Variable: Number of Mergers***				
	(1)	(2)	(3)	(4)	(5)
Variables	Intra-group	Non-intra group	Intra-group Mergers		
Succession Tax Burden	0.02997***	-0.00053			
	[0.001]	[0.003]			
Sucession Tax Burden × High Centrality			0.08630***		
			[0.004]		
Sucession Tax Burden × Low Centrality			-0.33633***		
			[0.005]		
Sucession Tax Burden × Upper Layer of Pyramid				0.08488***	
				[0.004]	
Sucession Tax Burden × Lower Layer of Pyramid				-0.11790***	
				[0.003]	
Sucession Tax Burden × Loop					0.07792***
					[0.003]
Sucession Tax Burden × No Loop					0.03358***
					[0.004]
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422	2,422

Panel B: OLS	*Dependent Variable: Number of Mergers*				
	(1)	(2)	(3)	(4)	(5)
Variables	Intra-group	Non-intra group		Intra-group Mergers	
Succession Tax Burden	0.00517**	0.00393			
	[0.002]	[0.005]			
Sucession Tax Burden × High Centrality			0.01524**		
			[0.006]		
Sucession Tax Burden × Low Centrality			-0.00314***		
			[0.001]		
Sucession Tax Burden × Upper Layer of Pyramid				0.01477**	
				[0.006]	
Sucession Tax Burden × Lower Layer of Pyramid				-0.00237***	
				[0.001]	
Sucession Tax Burden × Loop					0.01470**
					[0.005]
Sucession Tax Burden × No Loop					0.00315
					[0.009]
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422	2,422
R-squared	0.073	0.096	0.074	0.073	0.073

Table 5: The Effect of Tax Reform on Intra-group Mergers

Each column of Panel A reports the coefficients from a Tobit regression with heteroscedasticity-robust standard errors. Each column of Panel B reports the coefficients from an OLS regression. Standard errors are clustered at the business group level and reported in parentheses under the coefficient estimates. In Columns two to four, all explanatory variables are standardized, so their point estimates represent the economic magnitude of their effects. The dependent variable is the number of intra-group merger transactions between two affiliates in a business group. High succession tax burden refers to an indicator that has a value of one if the average succession tax burden of a firm is greater than that of the top 10% of directly owned chaebol firms during the pre-tax-reform period. Post refers to a year dummy that has a value of one after the tax reforms, i.e., from 2000 to 2004, and has a value of zero otherwise. Centrality refers to the average percentage decrease in control right across all group firms other than the firm itself after I exclude a specific firm from the group. High centrality refers to an indicator that has a value of one if centrality is greater than the average of all chaebol firms, and zero otherwise. Low centrality refers to an indicator that has a value of one if centrality is lower than the average of all chaebol firms, and zero otherwise. Position refers to the distance between the founding family and a firm in a group; a value of one indicates that the firm is directly controlled by the founding family. Upper layer of pyramid refers to an indicator that has a value of one if the firm's position is smaller than that of the average chaebol firm, and is zero otherwise. Lower layer of pyramid refers to an indicator that has a value of one if the firm's position is greater than or equal to that of the average chaebol firm, and is zero otherwise. Loop refers to an indicator that has a value of one if a firm is in a circular ownership chain, and zero otherwise. No loop refers to an indicator that has a value of one if a firm is not in a circular ownership chain, and zero otherwise. Controls include the log of total assets (in millions of KRW), the leverage ratio, and the number of group affiliates. All estimates include industry (SIC-2 digit) and year indicator variables. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Tobit	***Dependent Variable: Number of Intra-group Mergers***			
Variables	(1)	(2)	(3)	(4)
High Succession Tax Burden × Post	0.84602***			
	[0.128]			
High Succession Tax Burden × Post × High Centrality		0.17605***		
		[0.005]		
High Succession Tax Burden × Post × Low Centrality		0.02403		
		[0.019]		
High Succession Tax Burden × Post × Upper Layer of Pyramid			0.26543***	
			[0.004]	
High Succession Tax Burden × Post × Lower Layer of Pyramid			-0.02304	
			[0.018]	
High Succession Tax Burden × Post × Loop				0.07836***
				[0.009]
High Succession Tax Burden × Post × No Loop				0.06659
				[0.016]
High Succession Tax Burden	0.24610**	0.04138*	0.04489*	0.03875
	[0.124]	[0.024]	[0.026]	[0.025]
Post	-1.18087***	-0.52434***	-0.52959***	-0.53559***
	[0.110]	[0.041]	[0.040]	[0.044]
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422

Panel B: OLS	*Dependent Variable: Number of Intra-group Mergers*			
Variables	(1)	(2)	(3)	(4)
High Succession Tax Burden × Post	0.24917***			
	[0.069]			
High Succession Tax Burden × Post × High Centrality		0.03169***		
		[0.006]		
High Succession Tax Burden × Post × Low Centrality		0.01519**		
		[0.008]		
High Succession Tax Burden × Post × Upper Layer of Pyramid			0.03377***	
			[0.007]	
High Succession Tax Burden × Post × Lower Layer of Pyramid			0.01233*	
			[0.007]	
High Succession Tax Burden × Post × Loop				0.02153***
				[0.006]
High Succession Tax Burden × Post × No Loop				0.02223***
				[0.008]
High Succession Tax Burden	-0.01028	-0.00556	-0.00574	-0.00598
	[0.053]	[0.013]	[0.013]	[0.013]
Post	-0.01283	-0.00162	-0.00165	-0.00164
	[0.029]	[0.008]	[0.008]	[0.008]
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422
R-squared	0.080	0.085	0.086	0.081

Table 6: Private Foundations and Tax Burden Reduction

Each column of Panel A reports the coefficients from a Tobit regression with heteroscedasticity-robust standard errors. Each column of Panel B reports the coefficients from an OLS regression. Standard errors are clustered at the business group level and reported in parentheses under the coefficient estimates. In Columns two to four, all explanatory variables are standardized, so their point estimates represent the economic magnitude of their effects. The dependent variable is the number of intra-group merger transactions between two affiliates in a business group. High succession tax burden refers to an indicator that has a value of one if the average succession tax burden of a firm is greater than that of the top 10% of directly owned chaebol firms during the pre-tax-reform period. Post refers to a year dummy that has a value of one after the tax reform, i.e., from 2000 to 2004, and a value of zero otherwise. Foundation refers to an indicator that has a value of one if a firm is owned by private foundations, and zero otherwise. Centrality refers to the average percentage decrease in control right across all group firms other than the firm itself after I exclude a specific firm from the group. High centrality refers to an indicator that has a value of one if a firm's centrality is greater than the average of all chaebol firms, and is zero otherwise. Low centrality refers to an indicator that has a value of one if a firm's centrality is lower than the average of all chaebol firms, and is zero otherwise. Position refers to the distance between the founding family and a firm in a group; a value of one indicates that the firm is directly controlled by the founding family. Upper layer of pyramid refers to an indicator that has a value of one if a firm's position is smaller than the average of all chaebol firms, and zero otherwise. Lower layer of pyramid refers to an indicator that has a value of one if a firm's position is greater than or equal to the average of all chaebol firms, and zero otherwise. Loop refers to an indicator that has a value of one if a firm is in a circular ownership chain, and zero otherwise. No loop refers to an indicator that has a value of one if a firm is not in a circular ownership chain, and zero otherwise. Controls include the log of total assets (in millions of KRW), the leverage ratio, and the number of group affiliates. All estimates include industry (SIC-2 digit) and year indicator variables. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Tobit	*Dependent Variable: Number of Intra-group Mergers*			
Variables	(1)	(2)	(3)	(4)
High Succession Tax Burden × Post	12.17065***	1.59187***	1.61527***	1.57221***
	[0.179]	[0.031]	[0.030]	[0.019]
High Succession Tax Burden × Post × Foundation	-12.12192***			
	[0.227]			
High Succession Tax Burden × Post × Foundation × High Centrality		-1.21219***		
		[0.032]		
High Succession Tax Burden × Post × Foundation × Low Centrality		-0.52184***		
		[0.005]		
High Succession Tax Burden × Post × Foundation × Upper Layer of Pyramid			-1.19890***	
			[0.030]	
High Succession Tax Burden × Post × Foundation × Lower Layer of Pyramid			-0.58378***	
			[0.005]	
High Succession Tax Burden × Post × Foundation × Loop				-1.13900***
				[0.014]
High Succession Tax Burden × Post × Foundation × No Loop				-0.70902***
				[0.011]
High Succession Tax Burden × Foundation	10.41217***	1.56291***	1.59078***	1.54175***
	[0.193]	[0.037]	[0.036]	[0.023]
Post × Foundation	0.43627***	0.12470***	0.12411***	0.12188***
	[0.085]	[0.030]	[0.029]	[0.026]
Foundation	0.64235***	0.23220***	0.22933***	0.22911***
	[0.082]	[0.040]	[0.040]	[0.034]
Post	-1.18295***	-0.56019***	-0.54747***	-0.53256***
	[0.106]	[0.045]	[0.045]	[0.048]
High Succession Tax Burden	-10.25434***	-1.82810***	-1.86184***	-1.79194***
	[0.170]	[0.041]	[0.039]	[0.026]
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422

Panel B: OLS	*Dependent Variable: Number of Intra-group Mergers*			
Variables	(1)	(2)	(3)	(4)
High Succession Tax Burden × Post	0.56673***	0.06760***	0.06762***	0.06761***
	[0.127]	[0.015]	[0.015]	[0.015]
High Succession Tax Burden × Post × Foundation	-0.52949***			
	[0.153]			
High Succession Tax Burden × Post × Foundation × High Centrality		-0.04451***		
		[0.014]		
High Succession Tax Burden × Post × Foundation × Low Centrality		-0.03019***		
		[0.009]		
High Succession Tax Burden × Post × Foundation × Upper Layer of Pyramid			-0.04223***	
			[0.013]	
High Succession Tax Burden × Post × Foundation × Lower Layer of Pyramid			-0.03360***	
			[0.009]	
High Succession Tax Burden × Post × Foundation × Loop				-0.05279***
				[0.013]
High Succession Tax Burden × Post × Foundation × No Loop				-0.01779*
				[0.010]
High Succession Tax Burden × Foundation	0.10927	0.01470	0.01468	0.01462
	[0.115]	[0.015]	[0.015]	[0.015]
Post × Foundation	0.11181***	0.03114***	0.03115***	0.03113***
	[0.034]	[0.009]	[0.009]	[0.009]
Foundation	0.00015	0.00009	0.00012	0.00026
	[0.028]	[0.010]	[0.010]	[0.010]
Post	-0.02856	-0.01296	-0.01299	-0.01319
	[0.030]	[0.014]	[0.014]	[0.014]
High Succession Tax Burden	-0.07712	-0.01220	-0.01216	-0.01218
	[0.095]	[0.015]	[0.015]	[0.015]
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422
R-squared	0.094	0.094	0.094	0.097

Table 7: Target Firms

Each column reports coefficients from an OLS regression with heteroscedasticity-robust standard errors. Standard errors are clustered at the business group level. The standard errors are reported in parentheses under the coefficient estimates. In Column one, the dependent variable is the fraction of ownership held by current chair+1 generation, which refers to the ratio of the portion of ownership held by sons, daughters, sons-in-law, and daughters-in-law of the current chair and his/her siblings divided by the entire portion of ownership held by family members in a particular firm in a business group. In Column two, the dependent variable is the fraction of ownership held by the current chair generation, which refers to the ratio of the portion of ownership held by male, female, married male, and married female family members in the current chair and his/her siblings' generation divided by the entire portion of ownership held by family members in a particular firm in a business group. In Column three, the dependent variable is voting right, which refers to the ratio of the maximum number of direct and indirect number of shares that founding family members can use for voting divided by the total number of the group's outstanding stocks. In Column four, the dependent variable is payout ratio, which refers to the ratio of a firm's net dividends paid divided by its net income. In Column five, the dependent variable is the long-term R&D ratio, which refers to the firm's long-term research and development (R&D) expenses divided by its total R&D expenses. Private target firm is an indicator that has a value of one if a private firm is the target of an intra-group merger in a given year, and is otherwise zero. Controls include log of total assets (millions of KRW), leverage ratio, number of group affiliates. All estimates include industry (SIC-2 digit) and year indicator variables. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent Variable				
	C+1 gen Ownership Fraction (×100)	***C gen. Ownership Fraction (×100)***	***Voting Right (×100)***	***Payout Ratio(×100)***	***Long-term R&D Ratio (×100)***
Variables	(1)	(2)	(3)	(4)	(5)
Private Target Firm	7.14141***	-6.92086	20.37031***	7.19139*	-11.04820***
	[1.932]	[5.34]	[5.397]	[3.542]	[2.359]
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	2,422	2,422	2,422	2,422	2,422
R-squared	0.0574	0.186	0.363	0.008	0.149

Table 8: Intra-group Merger Announcement Returns

Each column reports the median of merger event CARs expressed in percentage terms for given subsamples. The p-values for a simple signed-rank test (against a null hypothesis of zero median) are reported in parentheses under the coefficient estimates. For each event I calculate the CAR over the trading window using a market model. First, I regress returns on market returns to obtain estimates for the alpha and beta. Then, abnormal returns are obtained by subtracting alpha plus beta times market return from daily stock returns. Event date is the day a firm initially announces the intra-group merger. I only include the first announcement if a firm has multiple intra-group mergers in a given year. In Column four, for example, the dependent variable CAR [0,1] reports cumulative abnormal return information for the event day and the following day. Intra-group mergers represent all the merger events between two affiliates in a business group. Non-intra-group mergers includes all other merger and acquisition events. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent Variables:	***CAR [-3,0]***	***CAR [-2,0]***	***CAR [-1,0]***	***CAR [0,1]***	***CAR [0,2]***	***CAR [0,3]***
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full sample						
Intra-group Mergers	0.89817	0.22496	0.73584	-0.39388	-1.17390*	-2.09000**
	[0.3536]	[0.5609]	[0.1926]	[0.9062]	[0.0962]	[0.0477]
Non-intra-group Mergers	-0.57477	-0.12802	0.06290	-0.39930	-0.78328	-0.92715
	[0.7429]	[0.4952]	[0.7860]	[0.5231]	[0.4721]	[0.5782]
Total Mergers	-0.18298	-0.09047	0.40594	-0.39387	-0.79640	-1.06570
	[0.8376]	[0.8031]	[0.5956]	[0.5869]	[0.1398]	[0.1219]
Panel B: Post Asian Crisis						
Intra-group Mergers	0.59106	-0.15197	0.50815	-1.60547**	-1.53925**	-2.79603***
	[0.9094]	[0.8199]	[0.9274]	[0.0476]	[0.0382]	[0.0094]
Non-intra-group Mergers	-0.51923	-0.33417	-0.19902	-1.18191*	-0.99923	-1.45705
	[0.2882]	[0.1598]	[0.0534]	[0.0689]	[0.1863]	[0.1273]
Total Mergers	-0.27109	-0.23830	-0.00121	-1.33366**	-1.20189**	-1.82957***
	[0.4129]	[0.1849]	[0.1062]	[0.0108]	[0.0251]	[0.0063]

Table 9: Robustness Test: Alternative Time Period

In Columns one to three, I exclude the period of 1997-1998 to avoid the effects of sudden market shrinkage during the Asian financial crisis. In Columns four to six, I exclude all mergers initiated by firms that are not at least partially owned by the current chair generation in order to test the post-crisis restructuring effect. Each column of Panel A reports the coefficients from a Tobit regression with heteroscedasticity-robust standard errors. Each column of Panel B reports the coefficients from an OLS regression. Standard errors are clustered at the business group level and reported in parentheses under the coefficient estimates. The dependent variable is the number of intra-group merger transactions between two affiliates in a business group. High succession tax burden refers to an indicator that has a value of one if the average succession tax burden on a firm is greater than that of the top 10% of directly owned chaebol firms during the pre-tax-reform period. Post refers to a year dummy that has a value of one after the tax reform (which includes the years 2000 to 2004), and is zero otherwise. Early post refers to a year dummy that has a value of one for the first two years after the tax reforms, i.e., in 2000 and 2001, and is zero otherwise. Late post refers to a year dummy that has a value of one for the three years right after the early post-reform period (2002 to 2004), and is zero otherwise. Foundation refers to an indicator that has a value of one if a firm is owned by private foundations, and is zero otherwise. Centrality refers to the average percentage decrease in control right across all group firms other than the firm itself after I exclude a specific firm from the group. High centrality refers to an indicator that has a value of one if a firm's centrality is greater than the average of all chaebol firms, and is zero otherwise. Low centrality refers to an indicator that has a value of one if a firm's centrality is lower than the average of all chaebol firms, and is zero otherwise. Position refers to the distance between the founding family and a firm in a group; a value of one indicates that the firm is directly controlled by the founding family. Upper layer of pyramid refers to an indicator that has a value of one if a firm's position is smaller than the average of all chaebol firms, and is zero otherwise. Lower layer of pyramid refers to an indicator that has a value of one if a firm's position is greater than or equal to the average of all chaebol firms, and is zero otherwise. Loop refers to an indicator that has a value of one if a firm is in a circular ownership chain, and is zero otherwise. No loop refers to an indicator that has a value of one if a firm is not in a circular ownership chain, and is zero otherwise. Controls include the log of total assets (in millions of KRW), the leverage ratio, and the number of group affiliates. All estimates include industry (SIC-2 digit) and year indicator variables. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: Tobit	*Dependent Variable: Number of Inter-group Mergers*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Market Shrinkage During Asian financial crisis			Restructuring Effect after Asian Financial Crisis				
Succession Tax Burden	0.02862***			0.09457***				
	[0.002]			[0.004]				
High Succession Tax Burden × Post		0.59626***	12.37471***		2.60543***	13.49572***		1.91204***
		[0.124]	[0.167]		[0.227]	[0.302]		[0.039]
High Succession Tax Burden × Post × Foundation			-12.76909***			-22.02351***		
			[0.212]			[0.338]		
High Succession Tax Burden × Post × Early Post							0.20758***	
							[0.009]	
High Succession Tax Burden × Post × Late Post							0.22744***	
							[0.030]	
High Succession Tax Burden × Post × Foundation × Early Post								-1.72317***
								[0.012]
High Succession Tax Burden × Post × Foundation × Late Post								-2.14809***
								[0.035]
High Succession Tax Burden × Foundation			11.10128***			19.90398***		3.31894***
			[0.208]			[0.342]		[0.047]
Post × Foundation			-0.14373***			11.75059***		3.67164***
			[0.087]			[0.272]		[0.072]
Foundation			1.18878***			-9.80145***		-4.10631***
			[0.086]			[0.283]		[0.093]
Post		-1.236***	-0.84339***		-3.17279***	-4.52701***	-3.10565***	-1.91936***
		[0.125]	[0.107]		[0.201]	[0.242]	[0.207]	[0.062]
High Succession Tax Burden		0.85627**	-10.52751***		-0.61368**	-10.68611***	-0.09750**	-2.10453***
		[0.144]	[0.177]		[0.251]	[0.310]	[0.039]	[0.050]
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,089	2,089	2,089	2,338	2,338	2,338	2,338	2,338

Panel B: OLS	*Dependent Variable: Number of Inter-group Mergers*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Market Shrinkage During Asian financial crisis			Restructuring Effect after Asian Financial Crisis				
Succession Tax Burden	0.00475**			0.00781***				
	[0.002]			[0.001]				
High Succession Tax Burden × Post		0.19538**	0.57434***		0.33487***	0.59652***		
		[0.093]	[0.168]		[0.042]	[0.075]		
High Succession Tax Burden × Post × Foundation			-0.61660***			-0.39676***		0.07135***
			[0.203]			[0.092]		[0.009]
High Succession Tax Burden × Post × Early Post							0.04013***	
							[0.004]	
High Succession Tax Burden × Post × Late Post							0.01887***	
							[0.004]	
High Succession Tax Burden × Post × Foundation × Early Post								-0.01252*
								[0.006]
High Succession Tax Burden × Post × Foundation × Late Post								-0.04184***
								[0.007]
High Succession Tax Burden × Foundation			0.20330			0.09184		0.01222
			[0.172]			[0.069]		[0.009]
Post × Foundation			0.09907**			0.03256		0.00839
			[0.045]			[0.022]		[0.006]
Foundation			0.00705			-0.02855*		-0.00964*
			[0.041]			[0.017]		[0.006]
Post		-0.01297	-0.02043		-0.01950	-0.02724	-0.00772	-0.01149
		[0.032]	[0.033]		[0.018]	[0.018]	[0.008]	[0.008]
High Succession Tax Burden		0.04798	-0.09500		-0.00188	-0.05200	-0.00037	-0.00830
		[0.079]	[0.143]		[0.032]	[0.057]	[0.005]	[0.009]
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,089	2,089	2,089	2,338	2,338	2,338	2,338	2,338
R-squared	0.079	0.085	0.098	0.055	0.090	0.102	0.103	0.113

Appendix A: Variable Definitions

Variables Related to Succession Taxes

Succession tax burden – the maximum expected tax payment if the ownership of the current chair's generation is inherited by the next generation in a corresponding year; this is calculated as Ownership Fraction of Current Chair Generation × Total Equity Value* × Tax Rate** (in 10 billions of KRW).

**Total equity value* – the market value for public companies and Max [[(total asset - total debt)×2 +[{(NIt-3)×1+(NIt-2)×2+(NIt-1)×3}/6]/10%]/5] or total asset] for private companies, following Articles 63-1 and 63-2 of the Inheritance Tax and Gift Tax Act.

**Tax rate – the sum of the succession business premium tax rates imposed on the largest shareholders.

Pre – a year dummy that has a value of one before the tax reform (1997-1999), and zero otherwise.

Post – a year dummy that has a value of one after the tax reform (2000-2004), and zero otherwise.

Early post – a year dummy that has a value of one for the first two years after the tax reform (2000-2001), and zero otherwise.

Late post – a year dummy that has a value of one for the three years following the early post period (2002-2004), and zero otherwise.

Foundation – an indicator that has a value of one if a firm is owned by private foundations, and zero otherwise.

Firm Characteristics Variables

Number of intra-group mergers – the total number of mergers and acquisitions between two affiliates in a business group in a given year.

Intra-group merger transactions – the total amount of merger and acquisition transactions in millions of USD between two affiliates in a business group in a given year.

Number of total mergers – the total number of M&A transactions in a given year.

Total merger transactions – the total amount of merger and acquisition transactions in millions of USD in a given year.

Log of total assets – the logarithm of total assets of each firm in millions of KRW.

Log of sales – the logarithm of total sales of each firm in millions of KRW.

Leverage – the debt ratio, calculated by total debt divided by total equity.

ROA – the ratio of earnings before interest and tax (EBIT) divided by total assets.

Payout ratio – the ratio of a firm's net dividends paid divided by its net income.

Long-term R&D ratio – the ratio of a firm's long-term research and development (R&D) investment divided by its total R&D investment. Long-term R&D expenses only include long-term R&D investments, which are regarded as assets on the balance sheet, and exclude short-term R&D investments, which are regarded as expenses on the balance sheet.

Public firm – an indicator variable that equals one if a firm is listed on the KOSPI or KOSDAQ exchange, and zero otherwise

Firm age – the age of each firm in a business group in the corresponding year

Ownership Structure Variables

Centrality – the average percentage difference in the control rights of the controlling family across all group member firms other than the firm itself, after excluding a specific firm *i* from the group. The key strategic member companies that the controlling family uses to set up and control new firms in a business group have a high value of centrality because those firms are connected to many other member firms in the web of ownership. See Almeida et al. (2011) for more details on ownership metrics.

High centrality – an indicator that has a value of one if a firm's centrality is greater than the average of all chaebol firms, and zero otherwise.

Low centrality – an indicator that has a value of one if a firm's centrality is lower than the average of all chaebol firms, and zero otherwise.

Position – the distance between the controlling family and a firm in a group. A value of one indicates that the firm is directly controlled by the founding family. In a simple pyramid structure with two firms, the firm *i* in the upper layer (chain 1) has a position value of one, while the firm *j* in the lower layer (chain 2) has a position value of two. In this case, the position of firm *i* can be measured by the weighted average of chain 1 and chain 2, whose importance is weighted by the cash flow the family receives – the direct cash flow from firm *i* and the indirect cash flow from firm j through chain 2. The group firms that are directly owned by the controlling family have a low position value, while indirectly owned affiliates have a high position value. See Almeida et al. (2011) for more details on ownership metrics.

Upper layer of pyramid – an indicator that has a value of one if a firm's position is smaller than the average of all chaebol firms, and zero otherwise.

Lower layer of pyramid – an indicator that has a value of one if a firm's position is greater than or equal to the average of all chaebol firms, and zero otherwise.

Loop – an indicator that has a value of one if a firm is in a circular ownership chain, and zero otherwise.

No loop – an indicator that has a value of one if a firm is not in a circular ownership chain, and zero otherwise.

Cash-flow right – the sum of direct and indirect equity ownership held by the founding family after excluding treasury stocks and cross shareholdings.

Voting right – the ratio of the maximum number of stocks that the founding family can use for voting divided by the total number of stocks outstanding. This includes direct and indirect voting shares held by the founding family, subsidiaries, senior managers in special relationships, and non-profit organizations.

Discrepancy – the difference between cash-flow rights and voting rights.

Family Involvement Variables

(Current chair's generation)

Total number of members with ownership – the sum of the number of male, female, married male, and married female members with ownership of the group firms.

Number of male [female, married male, and married female] family members with ownership – the total number of male [female, married male, and married female] family members in the current chair's generation with ownership in at least one of the group firms.

Total fraction of ownership held by current chair generation – the ratio of the portion of ownership held by male, female, married male, and married female family members in the current chair and his/her siblings' generation divided by the entire portion of ownership held by family members.

Fraction of family ownership held by male [female, married male, and married female] family members – the ratio of ownership held by male [female, married male, and married female] family members in the current chair's generation divided by the entire ownership held by family members.

(Current chair+1 generation)

Total number of members with ownership – sum of the number of sons, daughters, sons-in-law, and daughters-in-law with ownership of the group firms.

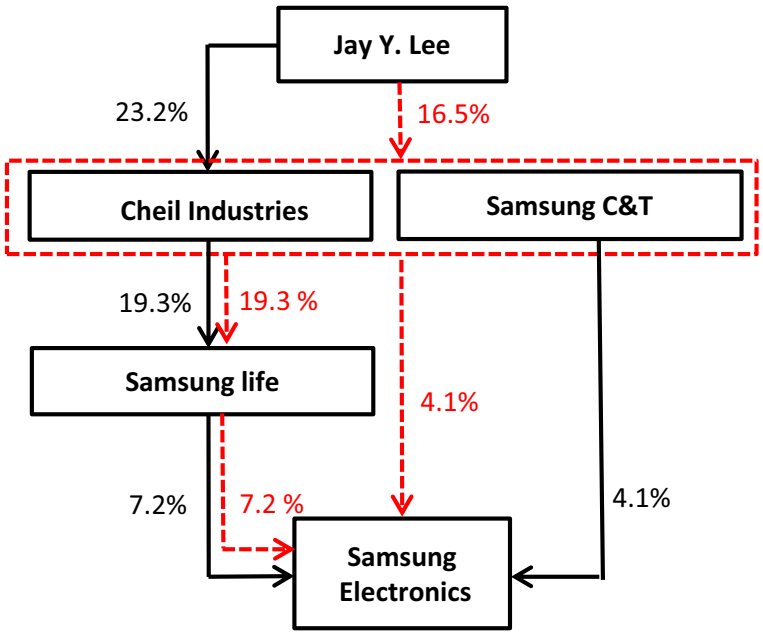
Number of sons [daughters, sons-in-law, and daughters-in-law] with ownership – total number of sons [daughters, sons-in-law, and daughters-in-law] of the current chair and the chair's siblings with ownership in at least one of the group's firms.

Total fraction of ownership held by current chair+1 generation – the ratio of the portion of ownership held by sons, daughters, sons-in-law, and daughters-in-law of the current chair and his/her siblings divided by the entire portion of ownership held by family members.

Fraction of family ownership held by sons [daughters, sons-in-law, and daughters-in-law] – the ratio of ownership held by sons [daughters, sons-in-law, and daughters-in-law] of the current chair and the chair's siblings divided by the entire ownership held by family members.

Appendix B: Merger Between Cheil Industries and Samsung C&T

The figure below shows how the intra-group merger of two Samsung affiliates, Cheil Industries and Samsung C&T, increases Jay Y. Lee's control over Samsung Electronics, the conglomerate's flagship unit, through indirect stake holdings, without Lee ever paying inheritance tax. The full lines represent the pre-merger ownership flow, while the dotted lines represent the post-merger ownership flow. The dotted box represents the new firm created from the intra-group merger.



An anecdote of an intra-group merger within the Samsung Group illustrates how intra-group mergers are used as a tax minimizing succession mechanism. The Lee family merged Samsung's de facto holding company, Cheil Industries, the textile firm, with Samsung C&T, the group's construction and trading arm, creating a new company with annual revenue of 31 billion USD. Before the merger, the heir apparent, Jay Y. Lee, controlled Samsung Electronics, the group's crown jewel, mainly through Cheil Industries, in which he held a 23.2% stake[20]. Cheil Industries was instrumental to the Lee family's control over 70 Samsung affiliates in the group's unique circular shareholding structure. Among Cheil Industries' most valuable holdings was Samsung Life, which had a 7.2% stake in Samsung Electronics. Cheil Industries held a 19.3% stake in Samsung Life. After the intra-group merger, Jay Y. Lee became the largest shareholder in the newly created company, with a 16.5% stake. This merger allowed Jay Y. Lee to achieve an

[20] Jay Y. Lee and Kun-Hee Lee directly owned shares of Samsung Electronics at 0.57% and 3.38%, respectively, before the merger between Cheil Industries and Samsung C&T.

additional channel of control, albeit indirectly, over Samsung Electronics without paying an inordinate amount in inheritance tax, as Samsung C&T has a 4.1% stake in the company. (*Wall Street Journal*, May 26, 2015)[21].

[21] Min-Jeong Lee and Jonathan Cheng, "Samsung Heir Apparent Jay Y Consolidates Power with Merger." *Wall Street Journal*, May 26, 2015

The Impact of Corporate Social Responsibility on CEO relative leverage

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The Impact of Corporate Social Responsibility on CEO relative leverage

Abstract

We empirically investigate how U.S. firms' corporate social responsibility (CSR) engagement affects CEO relative leverage. Using a sample period from 2006 to 2008, we find that CSR engagement positively affects CEO relative leverage after controlling for various firm and board characteristics. This finding suggests firms that are more socially responsible pay out debt-like compensation to motivate CEOs to resolve conflicts between stakeholders. We also find a positive association between employee relations and CEO relative leverage. Using 2SLS and PSM methods, we discover that our results are robust to the correction for endogeneity. Overall, consistent with Cai, Jo, and Pan (2011), our results support the conflict–resolution hypothesis based on stakeholder theory rather than the CSR overinvestment argument based on agency theory.

Introduction

In spite of an increasing number of firms that engage serious efforts to integrate CSR into various aspects of their business, defining CSR is still a controversial issue. According to Friedman (1970), business is "to make as much money as possible while conforming to the basic rules of society, both those embodied in the law and those embodied in ethical custom." This statement indicates that generating profits, obeying to the law, and following ethical custom embrace three areas including economic, legal, and ethical aspects of the corporate social performance. Also, Carroll (1991) argues that four types of social responsibilities constitute total CSR: economic, legal, ethical, and philanthropic. In other words, socially responsible firms should maximize profit, conform to the law, be ethical, and be a good corporate citizen. Therefore, socially responsible firms positively influence the society that includes people, communities, and environment in ways that go beyond the law and financial support. Overall, CSR is an extension of a firm's efforts to foster sustainability via sound business practices.

A large body of literature has attracted much recent attention by the sharp increase in CEO debt-like compensations. For instance, Anantharaman, Fang, and Gong (2013) report that the accumulated pension and deferred compensation benefits of S&P 1500 firms in the United States amounted to around 25% of their equity-based compensation in 2007 and 43% in 2008. The CEO debt-like compensations can be an alternative solution to resolve the widening pay disparity that has raised both ethical concerns and economic questions from investors and regulators in past decades since it is considered as long-term compensation (Edmans and Liu 2010). According to Jensen and Meckling (1976), CEO debt-like compensations can alleviate conflicts between shareholders and debtholders because the compensation policy motivates managers to lean toward the interest of debtholders, rather than that of shareholders, thereby lowering the risk-taking behaviors.

Prior literatures have acknowledged empirical firms' impact of CSR involvement on executive compensations. Cai, Jo, and Pan (2011), for instance, take two representative explanations—overinvestment based on agency theory versus conflict-resolution based on stakeholder theory—to determine their relative importance in CSR-executive compensation relations. Under the overinvestment hypothesis, investing in CSR could potentially harm firm value, while under the conflict–resolution hypothesis, firms optimally invest in CSR to maximize value by mitigating the potential conflicts among various stakeholders. The results show that the lag of CSR adversely affects both total compensation and cash compensation. Their estimates indicate that an interquartile increase in CSR is followed by a 4.35% decrease in total compensation and 2.78% decrease in cash compensation.

In this article, we ask if socially responsible firms have more tendencies to pay CEO relative leverage to resolve conflicts between stakeholders than socially irresponsible ones. To extend Cai, Jo, and Pan (2011)'s work, we empirically investigate how the U.S. firms' CSR engagement affects CEO's debt-like compensation policy. However, their definition of total compensation is quite complicated and vague since it consists of summation from all different types of compensation such as salary, bonus, total value of restricted stock granted that year, and long-term incentive payouts. To avoid complexity that comes from all sorts of compensation, we are focusing on the CEO's relative leverage, which is constructed as the CEO's debt-to-equity ratio scaled by the firm's debt-to equity ratio. Supporting conflict-resolution hypothesis, we believe that firms that are socially responsible pay out higher inside debt for CEOs compared to firms that are not.

Using a sample of 1,038 firm-year observations during the period of 2006–2008, our results show that firms that are more socially responsible pay more CEO relative leverage than those that are socially irresponsible after controlling for various firm and corporate governance characteristics. In addition, we find that the observed positive association between CSR and CEO relative leverage mostly comes from employee relations. The positive associations between CEO relative leverage and lagged CSR as well as employee relations' dimension in CSR remain statistically significant even when we control for potential endogeneity using 2SLS and PSM approaches.

The contributions of this research are as follows. First, our new CSR-compensation causation can shed additional light on the issue of how socially responsible firms determine their executive compensation differently from socially irresponsible firms. To the best of our knowledge, this is the first paper that has ever investigated a robust positive relation between lagged CSR and CEO relative leverage. Second, our findings emphasize that socially responsible firms put devotion by paying out CEO relative leverage. It is to reduce compensation disparity between executive and employee and to increase employees' job satisfactions. Finally, similar to Cai, Jo, and Pan (2011), the positive relations between CEO relative leverage and lagged CSR support the conflict–resolution hypothesis.

The remainder of the paper is organized as follows. The following section provides an overview of literature review and our hypothesis developments. Our measurements and research design will be in the next section. Then, we present the empirical results and robustness checks. The final section presents a discussion of our findings and summarizes the key findings.

Literature review and Hypotheses

CSR and Stakeholder theory

Alliance with stakeholders through CSR activities is one of the key components of firm's

future growth (Donaldson and Preston 1995; McWilliams and Siegel 2001). For instance, Jones (1995) enhances the stakeholder theory by developing model that integrates economic theory and ethics, and find that firms conducting stakeholder's trust commit to ethical behaviors achieve a competitive advantage. Based on the stakeholder theory, the extension of CSR literatures supports conflict-resolution hypothesis. According to McWilliams and Siegel (2001), managers continually encounter pressures from multiple stakeholder groups including customers, employees, suppliers, community groups, governments, and institutional shareholders, to devote resources to CSR to solve conflict between stakeholders.

Similar to McWilliams and Siegel (2001), for sustaining the reputational capital, the managers are less likely to engage in aggressive earning management (Chih, Shen, and Kang 2008), executive's Securities Exchange Commission (SEC) violation, and their excess compensations (Kim, Park, and Wier 2012; Ferrell, Liang, and Renneboog 2016), and release better quality of non-financial information than non-CSR firms (Dhaliwal et al. 2011; Gao and Zhang 2015; Lys, Naughton, and Wang 2015). For instance, socially responsible firms improve corporate transparency through frequent voluntary disclosure, reduce the information asymmetry between insiders and outsiders, discourage managerial self-dealings, and therefore, enhance firm value (Jo and Kim 2007, 2008).

Furthermore, the effective external monitoring mechanisms, together with CSR engagement, will lead to better firm performance and value through reduced agency costs and reduced conflict of interests among various stakeholders. Because of external pressures from CSR engagement, institutional investors and analysts following are necessary to motivate managers to maximize firm value instead of pursuing managerial objectives (Aguilera et al. 2007; Jensen and Meckling 1976). Institutional investors are more willing and able to monitor corporate management than are smaller and more diffuse investors. Also, Chung and Jo (1996) indicate that security analysts play important roles as corporate monitors in reducing agency costs and motivating managers. Thus, institutional investors and analysts following have strong incentive to monitor managers (Demsetz and Lehn 1985; Shleifer and Vishny 1986). Thus, to the extent that institutional investors and security analysts provide effective external monitoring regarding the information transparency of CSR engagement, the CSR activities will have positive effects on firm value.

Role of Inside Debt

Jensen and Meckling (1976) indicate that there is a conflict of interest between shareholders and debtholders. This conflict arises because shareholders and managers can expropriate wealth from debtholders in several ways such as claim dilution, underinvestment, and asset substitution or risk

shifting. According to agency theory, inside debt in CEO compensation contracts can align interests of shareholders and debtholders. The argument is that the presence of inside debt potentially acts as a check on managers' incentives to take actions that transfer wealth from debtholders to shareholders, thereby lowering the cost of debt capital to the firm (Edmans and Liu 2010; Jensen and Meckling 1976).

In 2006, the Securities Exchange Commission (SEC) mandates detailed disclosure of executive compensation structure to include pension and deferred compensation holdings at the public. According to Wei and Yermack (2011), manages who hold large portions of pension and deferred compensation holdings takes the similar default risk that is faced by a company's other unsecured creditors. In other words, if the firm becomes bankrupt, the manager's pension and deferred compensation receive the same recovery rates as the debts of other unsecured lenders. In practice, Federal Pension Benefit Guaranty Corporation (PBGC) insure only a minor amount of a CEO's pension and executive pension plans are funded and secured only up to modest limits. Therefore, executives who are due lifetime pension benefits stand in line and should negotiate alongside other unsecured creditors when the firms are having serious financial troubles.

Due to incentive benefits from CEO relative leverage, many empirical studies in recent years have been focused the impacts of managerial inside debt on riskiness of firm investments. For instance, Sundaram and Yermack (2007) document that the firm's default risk decreases with the level of inside debt, consistent with higher inside debt leading managers to take on lower risk. Also, they found that mangers who hold large CEO relative leverage tend to reduce risks from increasing portfolio diversification and asset liquidity. Wei and Yermack (2011) examine the disclosure of CEO-firm relative debt-to-equity ratio, following the SEC regulation in 2006, led to bond prices rising significantly and stock prices falling. Cassell et al. (2012) documents that CEO relative leverage is negatively associated with future stock returns, R&D expenditures, and financial leverage, which are widely used as proxies for risk-taking activities. Similarly, Anantharaman, Fang, and Gong (2013) find that firms whose CEOs have higher inside debt holdings have lower borrowing rates and fewer debt covenants. Furthermore, large portion of CEO relative leverage promotes high financial reporting quality (He 2015). As can be seen above, inside debt exposes the CEO to bankruptcy risk just as if the CEO held a piece of the firm's risky unsecured debt. Thus, inside debt motivates managerial incentives toward bondholders and balance the conflicts interests of stockholders and bondholders.

CSR and Compensation

Prior research on CSR and executive compensation has considered whether separate

components of executive compensation are associated with CSR. For instance, opportunistic executives prefer compensation contracts that minimize firm specific risk and maximize their self-interest at the expense of society and other stakeholders (Jensen and Meckling 1976). Also, using 90 Canadian firms, Mahoney and Thorne (2005) find that total CSR is positively related to higher levels of longer term compensation and CSR weakness is negatively related to higher long-term compensation. This in turn suggests that executive long-term compensation can be an effective tool in aligning executives' welfare with that of the ''common good'', which results in more socially responsible firms.

Recently, empirical literatures investigate how firms' CSR engagement affects CEO compensation. Cai, Jo, and Pan (2011) indicate that the new CSR-compensation causation can sheds additional light on the issue of how socially responsible firms determine differently their executive compensation compare to that of socially irresponsible firms. As a result, they found that CSR engagement is negatively associated with executive's cash and total compensation, which is consistent with the conflict-resolution hypothesis based on stakeholder theory. According to Cai, Jo, and Pan (2011), CEOs of socially responsible firms will take relatively lower pay than those of socially irresponsible firms in following reasons: First, executive's excessive compensation may result potential conflicts of interests among managers and other stakeholders due to the fairness concern of a wealth distribution issue. Second, CEO with high social and ethical standards desire a more modest pay because top management in socially responsible firms should consider firms' fiduciary and moral responsibilities toward stakeholders (Aguilera et al. 2007; Jensen 2002; Potts 2006). Third, socially responsible firms generally face a lower level of firm risk (such as labor strikes and managerial turnover) due to a smaller degree of conflict of interest between top management and stakeholders than socially irresponsible firms, resulting in a lower CEO compensation.

Although Cai, Jo, and Pan (2011) find that CSR adversely affects total compensation, the definition of total compensation is quite complicated and vague since it consists of summation from all different types of compensations such as salary, bonus, the total value of restricted stock granted that year, and long-term incentive payouts. To extend Cai, Jo, and Pan (2011), we are focusing on the CEO's relative leverage, which is constructed as the CEO's debt-to-equity ratio scaled by the firm's debt-to equity ratio. Supporting conflict-resolution hypothesis, we believe that firms that are socially responsible pay out higher inside debt for CEOs compared to firms that are not. In summary, we expect the following:

H1: Firms that are socially responsible tend to have higher CEO relative leverage than those that are not after controlling for confounding factors.

Following Cai, Jo, and Pan (2011), the executive's compensation is directly associated with employee relations since huge gap between employee's own pay and executive compensation may increase their jobs' dissatisfactions (Potts 2006). Card et al. (2012) empirically show the effect of disclosing information on peers' salaries on workers' job satisfaction and job search intentions. The results represent an asymmetric response to the information about peer salaries: workers with salaries below the median, particularly for those in the lowest pay quartile, for their pay unit and occupation report lower pay and job satisfaction, while those earning above the median report no higher satisfaction. Also, below-median earners report a significant increase job turnover frequency, while above-median earners are unaffected. Thus, job satisfaction depends on relative pay comparisons, and this relationship is nonlinear. The findings indicate that employers have a strong incentive to impose pay secrecy rules and the disclosure of salary information results in a decline in job and pay satisfaction, concentrated among the lowest-earning workers. These literatures represent the positive relationship between compensation disparity and employee's job dissatisfactions.

Since employee satisfaction is significantly correlated with firm's profitability, innovation activities, and equity price, the huge compensation gap between executive and employee may bring firms to serious financial constraints. For instance, using sample of "100 Best Companies to Work For in America', Edmans (2011) show that firms are more aligned with employee relations benefit average 2.1% higher stock return, more positive earnings surprises and announcement returns, compare to firms that are not. Chang et al. (2015) find that non-executive employee stock options have positive effects on corporate innovation. This positive effect is more pronounced in firms where employees' input to innovation is more important and in firms where free-riding among employees is weaker. As shown above, resolving conflicts between executive and non-executive is critical for firm's future growth.

Under the conflict resolution hypothesis, better employee relations is the result of higher CEO's relative leverage. From firm's perpective, firms that are socially responsbile pay out debt-like compensation to motivate CEOs to resolve conflicts from huge compensation disparity. From CEO's perpective, CEOs of socially repsonsbile firms do not allow them to demand excessive compensation and to reduce potentical conflicst between employees and exeuctives. Therefore, expect an postive association between employee relations and CEO's relative leverage under the conflict–resolution hypothesis.

H2: According to the conflict-resolution hypothesis, strong employee relations positively affect the CEO relative leverage.

3. Sample, Variables, and Descriptive Statistics

3.1 Sample Selection

We collect data CEO relative leverage data from Standard and Poor's ExecuComp database for the sample period. The ExecuComp database provides yearly data on executive compensation such as salary, bonus, stock options, restricted stock grants, and accumulated stock and option holdings for the top executives of firms in the Standard and Poor's (S&P) 500, It is the most widely used compensation database by accounting, economics, finance, and management scholars. Starting from August 29, 2006, the Securities and Exchange Commission (SEC) required public firms to disclose detailed information about the computation and value of executive pension benefits and deferred compensation. Thus, our sample period ranges from 2006 to 2008 since prior to 2006, firms were required to disclose annual pension benefits payable at retirement but not the present value of accumulated benefits.

We retrieve data on CSR scores from the Kinder, Lydenberg, and Domoni (KLD) database, which is the most comprehensive and widely used data for CSR research (Jo and Harjoto 2011; Mattingly and Berman 2006), for the sample period. The KLD has exclusionary screens relating to social ratings from involvement with alcohol, gambling, nuclear power, tobacco and the military. Since exclusionary screens only have negative social ratings, we only employ the inclusive screens relating to social ratings, which covers social rating criteria approximately 80 strength and concern ratings in seven major qualitative issue areas. We report a list of strength and items of concern in the KLD social ratings in Appendix A.

We merge CEO relative leverage data with KLD ratings in the previous fiscal year, and firm-specific accounting variables are obtained from Compustat, and CRSP. We exclude firms in the financial service industries in which liquidity is hard to assess (Standard Industrial Classification (SIC) codes 6000–6999) and in the utility sector due to their special regulatory status (SIC codes 4900–4999). We require our sample firm-years to have non-missing ExecuComp, Compustat and CRSP data to compute the variables used in our analyses. Finally, this matching procedure produces a total of 1,038 firm-year observations for testing the impact of firm's CSR activities on the ratio of CEO relative leverage.

3.2 Variable Measurement

Measurement of Relative Leverage

Following prior literatures, we measure managerial incentives linked to inside debt via the CEO's personal debt-to-equity ratio (inside leverage) relative to the firm's debt-to-equity ratio (firm leverage) (Edmans and Liu 2010; Jensen and Meckling 1976; Sundaram and Yermack 2007). If the

ratio is larger than one, CEO incentives are more aligned with debt holders than with equity holders and CEO will display lower levels of risk seeking behaviors. (Cassell et al. 2012).

The CEO personal leverage is defined as the value of inside debt holdings divided by the value of CEO equity holdings. The CEO's inside debt holding is the sum of the actuarial present value of accumulated benefits under defined-benefit pension plans and the total balance in the deferred compensation plans by the fiscal year-end. The CEO's equity holding includes the sum of the value of CEO equity holdings (including restricted stock) and the Black–Scholes value of stock options (Black and Scholes 1973). The firm leverage is calculated as the sum of long-term debt and debt in current liabilities divided by market value of stockholder equity at the fiscal year end.

CSR Measures

We include five qualitative issues such as Community Relations, Employee Relations, Environmental Issues, Product Quality, and Workplace Diversity. We exclude the Human Rights category in our CSR index because ratings in the human rights area were assigned mostly from Non-U.S. Operations category. We also exclude the Corporate Governance scores from the KLD since it may yield a different result to the GIM index used by Gompers, Ishii, and Metrick (2003). Following Cui, Jo, and Na (2016), we assign the value range from -1 to +1 and set zero, if not yet rated to construct net strength and net concern. Our CSR index is constructed by the sum of net strength and net concern The Net CSR of each category for firm-year observation is

$$Net\ CSR\ = \sum_{s} C_{ist} - \sum_{c} C_{ict}$$

Where C_{ist} represents an indicator variable of CSR for firm *i* with strength *s* for year *t*; C_{ict}represents an indicator variable of CSR for firm *i* with concern *c* for year *t.*

Control variables

Control variables include CEO characteristics, other compensations and corporate governance. Following Sundaram and Yermack (2007), we control for CEO age and tenure since CEOs who have longer work experience in the firm are positively associated with the amount of pension benefits. To control CEO's risk-taking incentives, CEO salary and bonus (Anantharaman, Fang, and Gong 2013; Duru, Mansi, and Reeb 2005) are included. Also, we use CEO portfolio delta, which measures the change in CEO wealth for a 1% change in stock and CEO option vega, which represents 0.01 change in stock return volatility (Anantharaman, Fang, and Gong 2013; Cassell et al. 2012; Gormley, Matsa, and Milbourn 2013). In addition, we control for firm characteristics; growth opportunities measured with the market-to-book ratio, firm size measured by the natural log of total assets (SIZE), asset tangibility (TANGI), which is calculated as$(0.715 \times \text{Receivables} + 0.547 \times$

Inventory + 0.535 × Property Plant and Equipment) + Cash)/Total Assets (Almeida and Campello 2007) and default risk measured with the Altman (2000) Z score. Finally, we use Fama-French 12- industry classification to control year and industry effects.

Empirical Results

Univariate Tests

Table 1 provides descriptive statistics for the variables used in our analyses. We report the means, median, standard deviations, CEO relative leverage compensation, and control variables including firm and CEO characteristics. Similar to Anantharaman, Fang, and Gong (2013) and Wei and Yermack (2011), we find that the distribution of CEO's relative leverage is right-skewed with mean (median) of 1.63 (0.42). Since pays of some CEOs in our sample are extraordinarily large, our CEO relative leverage has large positive skewness.

[Insert Table 1]

Table 2 Panel A compares the means of CEO relative leverage for the subsample of firms with active CSR, if firm's CSR score is bigger than 0 and those with inactive CSR, if firm's CSR score is equal or less than 0 to explore the potential impact of CSR on CEO relative leverage. Similar to Panel A, Panel B excludes sample if firm's CSR is equal to zero. CEO relative leverage is significantly higher for firms with active CSR in both Panel A and B.

[Insert Table 2]

Table 3 presents the pairwise correlation matrix for CSR measure, CEO relative leverage, and firm and CEO characteristics. We notice that most of firm and corporate governance characteristics, which have been verified to impact CEO relative leverage also have significant correlation coefficients with our CSR measures. Thus, we use a multivariate test to examine the incremental effect of CSR on CEO relative leverage.

[Insert Table 3]

Multivariate Tests

Considering industry and year fixed effects, we run the following regressions to examine the impact of CSR on CEO relative leverage:

$$\begin{aligned} CEO\ relative\ leverage_{i,t} &= \beta_0 + \beta_1 CSR_{i,t-1} + \beta_2 \ln(Tenure_{i,t} + 1) + \beta_3 \ln(Salary_{i,t} + 1) + \beta_4 \ln(Bonus_{i,t} + 1) \\ &+ \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} + \beta_9 Leverage_{i,t-1} + \beta_{10} BM\ ratio_{i,t-1} \\ &+ \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} + Year\ dummies + Industry\ dummies + \varepsilon_{it} \end{aligned}$$

Except CEO characteristics, we apply all lagged control variables including firm and corporate governance characteristics in the regression model to rule out potential reverse causality issue between CEO relative leverage and CSR (Anantharaman, Fang, and Gong 2013).

Our results are summarized in Table 4. In contrast to Cai, Jo, and Pan (2011), we find that on average, CEO relative leverage is higher for larger firms. Also, CEO relative leverage is higher when firms lead to less risky investment choice, as measured by delta (Gormley, Matsa, and Milbourn 2013) and tends to be lower default risk, as measured by AltmanZ score. Controlling for these firm, CEO and governance characteristics, our result presents that CSR index variable always has a positive and statistically significant coefficient, suggesting that CEO relative leverage is on average higher in socially responsible firms. Thus, consistent with the conflict–resolution hypothesis, our result supports hypothesis 1.

[Insert Table 4]

Instrumental Variable Approach (CSR Index)

Previous studies on CSR (Cui, Jo, and Na 2016; Jo and Harjoto 2011, 2012) indicate that CSR engagement is an endogenous variable. To address endogeneity concerns, we use the two-stage least squares method (2SLS) to alleviate the concern about omitted variables. Our instrumental variables (IV) are lagged CSR_index_industry-median (CSR_IDX). In our sample, our unreported results suggest that the correlation coefficient between firm-level Net CSR and its industry-median value is statistically significant while there is no statistically significant correlation between CSR_IDX, which confirms the validity of the three variables as IV. In the first stage, we regress CSR_IDX based on Fama and French (1993) 12industry classification in that year as an instrument. In the second stage, we use the predicted values estimated from the first stage and run regressions. We employ a two-stage least squares analysis (2SLS) as follows;

$$
\begin{aligned}
1st\ Stage{:}\ & CSR_{i,t-1} \\
&= \beta_0 + \beta_1 CSR\_index\_industry\ median_{i,t-1} + \beta_2 \ln(Tenure_{i,t}+1) + \beta_3 \ln(Salary_{i,t}+1) \\
&+ \beta_4 \ln(Bonus_{i,t}+1) + \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} + \beta_9 Leverage_{i,t-1} \\
&+ \beta_{10} BM\ ratio_{i,t-1} + \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} + Year\ dummies \\
&+ Industry\ dummies + \eta_{it}
\end{aligned}
$$

$$
\begin{aligned}
2nd\ Stage{:}\ & CEO\ relative\ leverage_{i,t} \\
&= \beta_0 + \beta_1 \widehat{CSR}_{i,t-1} + \beta_2 \ln(Tenure_{i,t}+1) + \beta_3 \ln(Salary_{i,t}+1) + \beta_4 \ln(Bonus_{i,t}+1) \\
&+ \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} + \beta_9 Leverage_{i,t-1} + \beta_{10} BM\ ratio_{i,t-1} \\
&+ \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} + Year\ dummies + Industry\ dummies + \varepsilon_{it}
\end{aligned}
$$

Table 5 presents our results from 2SLS IV estimations of CEO relative leverage. We report both first-stage and second-stage results. The first two columns present results with Net CSR

without industry dummies, and the last two columns include both year and industry effects. As reported in Column 1 and 3 Table 5, CSR_IDX is highly statistically significant at the 1%, even after controlling for all other firm and corporate governance characteristics. Even after mitigating endogeneity concerns, column 2 and 4 show that the impact of CSR on CEO relative leverage still remains positive and statistically significant at the 5% level.

[Insert Table 5]

CSR Employee relations

Our second hypothesis predicts positive association between employee relations and CEO relative leverage according to the conflict resolution hypothesis. Using CSR subcategory, Employee relations, we run the following regressions to examine the impact of CSR Employee relations on CEO relative leverage:

$$\begin{aligned} &CEO\ relative\ leverage_{i,t} \\ &\quad = \beta_0 + \beta_1 CSR\_Employee_{i,t-1} + \beta_2 \ln(Tenure_{i,t} + 1) + \beta_3 \ln(Salary_{i,t} + 1) + \beta_4 \ln(Bonus_{i,t} + 1) \\ &\quad + \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} + \beta_9 Leverage_{i,t-1} + \beta_{10} BM\ ratio_{i,t-1} \\ &\quad + \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} + Year\ dummies + Industry\ dummies + \varepsilon_{it} \end{aligned}$$

In table 6, the Employee relations variable has a positive coefficient of 0.352, statistically significant at the 5% level. Firms that are aligned with Employee relations pay out debt-like compensation to motivate CEOs and employee themselves to resolve conflicts between each other. Our results are consistent with this argument, and support the conflict–resolution hypothesis.

[Insert Table 6]

Instrumental Variable Approach (Employee)

Our conclusion with industry-median Employee relations is similar to Table 5. We employ a two-stage least squares analysis (2SLS) as follows;

$$\begin{aligned} &1st\ Stage:\ CSR\_Employee_{i,t-1} \\ &\quad = \beta_0 + \beta_1 CSR\_index\_Employee\_industry\ median_{i,t-1} + \beta_2 \ln(Tenure_{i,t} + 1) \\ &\quad + \beta_3 \ln(Salary_{i,t} + 1) + \beta_4 \ln(Bonus_{i,t} + 1) + \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} \\ &\quad + \beta_9 Leverage_{i,t-1} + \beta_{10} BM\ ratio_{i,t-1} + \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} \\ &\quad + Year\ dummies + Industry\ dummies + \eta_{it} \end{aligned}$$

$$\begin{aligned} &2nd\ Stage: CEO\ relative\ leverage_{i,t} \\ &\quad = \beta_0 + \beta_1 \widehat{CSR\_Employee}_{i,t-1} + \beta_2 \ln(Tenure_{i,t} + 1) + \beta_3 \ln(Salary_{i,t} + 1) + \beta_4 \ln(Bonus_{i,t} + 1) \\ &\quad + \beta_5 Vega_{i,t} + \beta_6 Delta_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 ROA_{i,t-1} + \beta_9 Leverage_{i,t-1} + \beta_{10} BM\ ratio_{i,t-1} \\ &\quad + \beta_{11} Tangibility_{i,t-1} + \beta_{12} AltmanZ\_score_{i,t-1} + Year\ dummies + Industry\ dummies + \varepsilon_{it} \end{aligned}$$

Column 1 Table 7 shows that the industry-median Employee relations has a coefficient of 8.57 that is statistically significant at the 1% level and the associated t-stat is 6.908. Consistent with table 5, column 2 and 4 in table7 show that the impact of CSR on CEO relative leverage remains

positive and statistically significant at the 5% level after mitigating endogeneity concerns.

[Insert Table 7]

Robustness tests

Alternative measurement of CSR

We use alternative proxy for measuring CSR, CSR indicator, to support our hypothesis that the positive relation between CSR and CEO relative leverage. CSR indicator is a dummy variable which equals to one if a firm has engaged in CSR activities, and zero otherwise. As a result, column 8 of Table 8 presents the CSR dummy is significantly and positively associated with CEO relative leverage after controlling year and industry effects. The results from table 8 remain qualitatively similar to our previous findings.

[Insert Table 8]

Propensity score matching (PSM)

In order to examine the different treatment effect of CSR on CEO relative leverage in U.S. firms, we calculate propensity score based CSR index_industry median. We separate our sample by propensity score that has value from 0 to 1, and we matched the most similar observation in same year and same industry. After matching by propensity score, we analyze the difference between treatment group and control group on the effect of CSR on CEO relative leverage, and check the significance level by using t-statistics. As a result, Panel A show the results of logit regression by each dummy variables, and the coefficient of CSR index_industry median We predict propensity score from the logit regression, and matched samples in 0.01 level. The result of Panel B presents that the differences are 0.726 and 1.10 in both dummies and significant at 5% level. It means that treatment group pay more CEO relative leverage than control group in the whole sample.

[Insert Table 9]

Conclusion & Discussion

Paying CEO with inside debt has increased sharply over the last decade. As a result, it has become one of the hottest topics of great interest for shareholders, government regulators, and academic researchers. Due to incentive benefits from CEO relative leverage, many empirical studies in recent years have been focused the impacts of managerial inside debt on riskiness of firm investments. However, there is a limited research on how socially responsible firms should influence to their executive compensation packages, in particular CEO relative leverage.

In this article, we investigate the empirical impact of firms' CSR engagement CEO relative leverage using a sample of the U.S. firms from 2006 to 2008. We find that lagged CSR is positively associated with CEO's relative leverage after controlling for various firm and corporate governance characteristics. Also, we find that the observed positive association between CSR and CEO relative leverage mostly comes from employee relations. Our results hold up well even when we control for potential endogeneity using the IV approach. This finding suggests firms that are more socially responsible increase CEO relative leverage to motivate CEOs to resolve conflicts between stakeholders, supporting the conflict–resolution hypothesis based on stakeholder theory. For the robustness tests, we employ CSR indicator, as an alternative proxy of the CSR, to investigate the robust positive relation between CSR and CEO relative leverage. Our findings remain consistent with the main results and still support the conflict-resolution hypothesis. Also, we conduct propensity score matching to examine the different treatment effect of CSR on CEO relative leverage in U.S. firms. We matched treatment and control groups by CSR dummy in same year and same industry and find that treatment group pay more CEO relative leverage, resulting higher CEO relative leverage, than control group.

The contributions of this research are as follows. First, most studies have focused on how managerial debt-like compensation influences the policy choices of firms such as R&D expenditures, firm leverage, and stock volatility (Cassell et al. 2012). Therefore, our new CSR-compensation causation can shed additional light on the issue of how socially responsible firms determine their executive compensation differently from socially irresponsible firms. To the best of our knowledge, this is the first paper that has ever investigated a robust positive relation between lagged CSR and CEO relative leverage. Second, our findings emphasize that socially responsible firms put devotion by paying out CEO relative leverage. It is to reduce compensation disparity between executive and employee and to increase employees' job satisfactions. These findings also show that firms that are more aligned with employee relations cause stronger corporate performances through improved employee motivation, according to Edmans (2011). Finally, similar to Cai, Jo, and Pan (2011), we have made contribution to the literature on CSR's role that resolves conflicts among stakeholders. The positive relations between CEO relative leverage and lagged CSR support the conflict–resolution hypothesis. Overall, our results suggest that socially responsible firms are more prudent in determining their CEOs' compensation levels.

Table 1. Descriptive statistics

This table presents the descriptive statistics of sample. The sample consists of 1,038 U.S. non-financial firm-year observations over the 2006-2008 period.

Variables	N	Mean	Standard deviation	25% quantile	Median	75% quantile
CEO relative leverage	1038	1.627086	4.165465	.0275425	.4172234	1.31202
CSR	1038	-.3179191	2.527589	-2	0	0
CSR_Employee	1038	-.2418112	.9880215	-1	0	0
Tenure	1038	1.668683	.8509398	1.098612	1.609438	2.197225
Salary	1038	6.715118	.3954501	6.457554	6.742915	6.979217
Bonus	1038	1.47237	2.696167	0	0	0
Vega	1038	.2531408	.3633745	.0391437	.1072224	.3029999
Delta	1038	.1239641	.2146169	.0270955	.0566942	.1187691
Size	1038	8.130005	1.529193	6.959031	7.97007	9.182661
ROA	1038	.0642779	.0638914	.0341839	.0600006	.0964836
Leverage	1038	.5546859	.1678111	.4441274	.5559285	.6713105
BM ratio	1038	.4267644	.2314116	.2558178	.3817621	.5597354
Tangibility	1038	.3173547	.2293581	.1350931	.2503292	.4885086
AltmanZ	1038	3.774322	2.133953	2.14201	3.891359	4.980743

Table 2. Univariate analysis of CEO relative leverage

This table presents the result of univariate analysis where the dependent variable is CEO relative leverage that measured by relative ratio of CEO leverage and firm leverage. T-test and Wilcoxon test are used, and t-statistics and z-statistics are reported in parentheses. The null value for CEO relative leverage is one rather than zero. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Panel A: Pooled

CEO relative leverage	Total	Active CSR (CSR > 0)	Inactive CSR (CSR ≤ 0)	Difference
Mean	1.6271***	2.8369***	1.2392**	1.5977***
	(4.850)	(4.574)	(2.199)	(5.369)
Median	0.4172***	0.6850	0.3533***	0.3317***
	(-6.612)	(0.273)	(-7.906)	(3.387)
Observations	1038	252	786	

Panel B: Excluding sample with CSR=0

CEO relative leverage	Total	Active CSR (CSR > 0)	Inactive CSR (CSR < 0)	Difference
Mean	1.7787***	2.8369***	1.1990	1.6379***
	(4.691)	(4.574)	(1.5894)	(4.791)
Median	0.4783***	0.6850	0.3988***	0.2862***
	(-4.404)	(0.273)	(-5.863)	(2.630)
Observations	712	252	460	

Table 3. Correlation matrix

This table presents pairwise correlation coefficients between the regression variables. The sample consists of 1,038 U.S. non-financial firm-year observations over the 2006-2008 period. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	CEO relative leverage	CSR	CSR_Employee	Tenure	Salary	Bonus	Vega	Delta	Size	ROA	Leverage	BM ratio	Tangibility	AltmanZ
CEO relative leverage	1.0000													
CSR	0.1347***	1.0000												
	(0.0000)													
CSR_Employee	0.1228***	0.5415***	1.0000											
	(0.0001)	(0.0000)												
Tenure	-0.0812***	-0.0276	0.0328	1.0000										
	(0.0089)	(0.3741)	(0.2915)											
Salary	0.1103***	0.0742*	0.0145	0.1177***	1.0000									
	(0.0004)	(0.0167)	(0.6410)	(0.0001)										
Bonus	-0.0538*	-0.0613**	0.0297	0.0115	-0.0418	1.0000								
	(0.0829)	(0.0482)	(0.3399)	(0.7102)	(0.1788)									
Vega	0.1494***	0.2194***	0.1144***	0.1515***	0.5188***	-0.0164	1.0000							
	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0000)	(0.5972)								
Delta	-0.1051***	0.0510	0.0556*	0.2692***	-0.0350	0.0511	0.1269***	1.0000						
	(0.0007)	(0.1003)	(0.0736)	(0.0000)	(0.2604)	(0.1002)	(0.0000)							
Size	0.1359***	0.0374	0.0624**	-0.0602*	0.7337***	-0.0114	0.5394***	0.0306	1.0000					
	(0.0000)	(0.2282)	(0.0444)	(0.0527)	(0.0000)	(0.7144)	(0.0000)	(0.3252)						
ROA	0.1376***	0.1587***	0.1169***	0.0543*	0.1037***	-0.0255	0.1848***	0.1096***	0.0755**	1.0000				
	(0.0000)	(0.0000)	(0.0002)	(0.0802)	(0.0008)	(0.4115)	(0.0000)	(0.0004)	(0.0150)					
Leverage	-0.0959***	-0.1297***	-0.0854***	-0.0261	0.2613***	-0.0110	0.0202	-0.0511	0.3587***	-0.3147***	1.0000			
	(0.0020)	(0.0000)	(0.0059)	(0.4014)	(0.0000)	(0.7244)	(0.5154)	(0.1001)	(0.0000)	(0.0000)				
BM ratio	-0.0989***	-0.2067***	-0.1014***	-0.0335	-0.1758***	0.0361	-0.2515***	-0.1544***	-0.1014***	-0.4023***	-0.1016***	1.0000		
	(0.0014)	(0.0000)	(0.0011)	(0.2807)	(0.0000)	(0.2458)	(0.0000)	(0.0000)	(0.0011)	(0.0000)	(0.0011)			
Tangibility	-0.0719**	-0.2612***	-0.0933***	0.0889***	0.0377	0.1223***	-0.0669**	0.0158	0.2305***	-0.0107	0.2343***	0.0856***	1.0000	
	(0.0205)	(0.0000)	(0.0026)	(0.0042)	(0.2247)	(0.0001)	(0.0310)	(0.6122)	(0.0000)	(0.7299)	(0.0000)	(0.0058)		
AltmanZ	0.1944***	0.1556***	0.1025***	-0.0265	-0.1260***	0.0032	0.0097	0.0273	-0.2913***	0.4340***	-0.6929***	-0.1601***	-0.3694***	1.0000
	(0.0000)	(0.0000)	(0.0009)	(0.3935)	(0.0000)	(0.9176)	(0.7557)	(0.3797)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	

Table 4. The effect of CSR: OLS estimation

This table presents the result from cross-sectional OLS regressions where the dependent variables are CEO relative leverage. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	(1) CEO relative leverage	(2) CEO relative leverage	(3) CEO relative leverage	(4) CEO relative leverage	(5) CEO relative leverage	(6) CEO relative leverage	(7) CEO relative leverage	(8) CEO relative leverage
CSR	0.2238***	0.1735***	0.1406**	0.1322**	0.2337***	0.1944***	0.1561**	0.1507**
	(3.036)	(2.775)	(2.236)	(2.217)	(3.207)	(3.018)	(2.512)	(2.526)
Tenure		-0.3660***		-0.1294		-0.3729***		-0.1370
		(-2.652)		(-1.138)		(-2.619)		(-1.199)
Salary		0.4157		-0.6457		0.3623		-0.6168
		(1.088)		(-1.357)		(0.892)		(-1.323)
Bonus		-0.0578		-0.0667		-0.0702*		-0.0630
		(-1.388)		(-1.581)		(-1.685)		(-1.514)
Vega		1.4836***		0.5712		1.3978**		0.5698
		(2.616)		(0.951)		(2.464)		(0.901)
Delta		-2.0055***		-2.5303***		-1.9700***		-2.4903***
		(-6.806)		(-7.228)		(-6.255)		(-6.816)
Size			0.5462***	0.5911***			0.5037***	0.5437***
			(4.427)	(3.150)			(4.203)	(2.692)
ROA			0.0691	0.4023			0.5479	0.6798
			(0.028)	(0.169)			(0.210)	(0.270)
Leverage			0.1443	0.0152			0.0815	0.1575
			(0.172)	(0.016)			(0.088)	(0.161)
BM ratio			-0.4138	-0.7136			-0.4438	-0.6818
			(-0.797)	(-1.272)			(-0.808)	(-1.222)
Tangibility			-0.1571	0.0484			-0.4121	-0.3567
			(-0.290)	(0.080)			(-0.590)	(-0.504)
AltmanZ			0.4655***	0.4588***			0.4780***	0.4776***
			(4.716)	(4.551)			(4.114)	(4.041)
Constant	1.8268***	-0.4265	-4.1605***	0.4534	1.8127***	-0.0241	-3.7893***	0.5639
	(7.638)	(-0.172)	(-4.111)	(0.174)	(7.692)	(-0.009)	(-2.816)	(0.217)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038
Adj. R-squared	0.0161	0.0501	0.0805	0.0981	0.0224	0.0529	0.0819	0.0983

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Table 5. The effect of CSR: 2SLS estimation

This table presents the result from two-stage-least-square regressions where the dependent variables are CEO relative leverage. We use the instrument variable as industry median value of CSR index. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	(1) 1st stage: CSR	(2) 2nd stage : CEO relative leverage	(3) 1st stage: CSR	(4) 2nd stage : CEO relative leverage
CSR		0.3986**		0.4176**
		(2.322)		(2.268)
CSR index_industry median	39.1301***		37.4577***	
	(9.671)		(8.760)	
Tenure	-0.1467*	-0.0926	-0.0933	-0.1149
	(-1.788)	(-0.786)	(-1.155)	(-0.989)
Salary	-0.1497	-0.6138	-0.3186	-0.5489
	(-0.536)	(-1.302)	(-1.104)	(-1.191)
Bonus	-0.0189	-0.0605	0.0006	-0.0627
	(-0.637)	(-1.451)	(0.019)	(-1.513)
Vega	1.1523***	0.2552	0.8811**	0.3313
	(3.183)	(0.404)	(2.452)	(0.504)
Delta	0.1536	-2.5761***	0.0864	-2.5192***
	(0.429)	(-7.299)	(0.244)	(-6.800)
Size	0.0383	0.5852***	0.1428	0.5129**
	(0.354)	(3.130)	(1.305)	(2.523)
ROA	1.9056	-0.1760	2.9884**	-0.1915
	(1.227)	(-0.072)	(1.963)	(-0.071)
Leverage	-1.4836**	0.4844	-1.0062	0.4673
	(-2.284)	(0.482)	(-1.444)	(0.464)
BM ratio	-1.4442***	-0.2960	-1.1637***	-0.3398
	(-3.960)	(-0.493)	(-3.201)	(-0.586)
Tangibility	-2.4147***	0.7105	-0.7563**	-0.1558
	(-6.312)	(0.963)	(-2.014)	(-0.220)
AltmanZ	-0.0447	0.4774***	-0.0165	0.4848***
	(-0.863)	(4.594)	(-0.290)	(4.052)
Constant	2.5622*	-0.2737	1.7504	0.1296
	(1.652)	(-0.105)	(1.066)	(0.051)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	No	No	Yes	Yes
Observations		1,038		1,038
Adj. R-squared	0.176	0.0950	0.208	0.0938
Spearman's Rho		0.0851***		0.0440

Table 6. The effect of CSR_Employee: OLS estimation

This table presents the result from cross-sectional OLS regressions where the dependent variables are CEO relative leverage. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	(1) CEO relative leverage	(2) CEO relative leverage	(3) CEO relative leverage	(4) CEO relative leverage	(5) CEO relative leverage	(6) CEO relative leverage	(7) CEO relative leverage	(8) CEO relative leverage
CSR_Employee	0.5195***	0.4911***	0.3426**	0.3575**	0.5107***	0.4902***	0.3459**	0.3622**
	(3.090)	(3.160)	(2.411)	(2.551)	(3.105)	(3.149)	(2.432)	(2.573)
Tenure		-0.4079***		-0.1727		-0.4097***		-0.1717
		(-2.888)		(-1.486)		(-2.843)		(-1.484)
Salary		0.4291		-0.5237		0.3824		-0.5629
		(1.129)		(-1.111)		(0.951)		(-1.210)
Bonus		-0.0723*		-0.0751*		-0.0791*		-0.0688*
		(-1.735)		(-1.777)		(-1.888)		(-1.652)
Vega		1.6039***		0.6870		1.5082**		0.6664
		(2.691)		(1.118)		(2.567)		(1.038)
Delta		-1.9935***		-2.5088***		-1.9521***		-2.4816***
		(-6.874)		(-7.263)		(-6.233)		(-6.781)
Size			0.5483***	0.5470***			0.5137***	0.5242***
			(4.383)	(2.987)			(4.199)	(2.617)
ROA			0.1274	0.4313			0.8155	0.8886
			(0.052)	(0.182)			(0.313)	(0.355)
Leverage			-0.0015	-0.0777			-0.0473	0.0712
			(-0.002)	(-0.083)			(-0.050)	(0.072)
BM ratio			-0.5813	-0.8144			-0.5946	-0.7946
			(-1.118)	(-1.455)			(-1.087)	(-1.433)
Tangibility			-0.4297	-0.1098			-0.4597	-0.3711
			(-0.815)	(-0.185)			(-0.661)	(-0.526)
AltmanZ			0.4530***	0.4454***			0.4642***	0.4639***
			(4.681)	(4.514)			(4.069)	(3.997)
Constant	1.8613***	-0.4094	-3.8638***	0.2711	1.8477***	-0.0718	-3.6569***	0.5695
	(7.462)	(-0.166)	(-4.032)	(0.104)	(7.472)	(-0.028)	(-2.748)	(0.220)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038
Adj. R-squared	0.0128	0.0530	0.0805	0.0994	0.0188	0.0540	0.0807	0.0983

Table 7. The effect of CSR_Employee: 2SLS estimation

This table presents the result from two-stage-least-square regressions where the dependent variables are CEO relative leverage. We use the instrument variable as industry median value of CSR employee dimension index. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	(1) 1st stage: CSR_Employee	(2) 2nd stage : CEO relative leverage	(3) 1st stage: CSR_Employee	(4) 2nd stage : CEO relative leverage
CSR_Employee		1.1691***		1.2465**
		(2.604)		(2.421)
CSR index_Employee_industry median	9.0637***		8.5696***	
	(7.528)		(6.908)	
Tenure	0.0410	-0.2296**	0.0350	-0.2260**
	(1.142)	(-2.007)	(0.957)	(-1.986)
Salary	-0.3744***	-0.2108	-0.2790**	-0.3377
	(-3.180)	(-0.430)	(-2.229)	(-0.722)
Bonus	0.0144	-0.0871**	0.0147	-0.0824*
	(1.121)	(-2.016)	(1.130)	(-1.916)
Vega	0.1055	0.5935	0.0930	0.5738
	(0.762)	(0.962)	(0.640)	(0.888)
Delta	0.0172	-2.5116***	0.0194	-2.5002***
	(0.115)	(-7.285)	(0.127)	(-6.793)
Size	0.1249***	0.4405**	0.1059**	0.4344**
	(3.022)	(2.306)	(2.357)	(2.127)
ROA	0.6755	-0.1545	0.7669	0.1971
	(1.262)	(-0.064)	(1.393)	(0.076)
Leverage	-0.3087	0.2402	-0.1698	0.2873
	(-1.146)	(0.247)	(-0.599)	(0.288)
BM ratio	-0.2902**	-0.5724	-0.2126	-0.5988
	(-2.001)	(-1.011)	(-1.430)	(-1.085)
Tangibility	-0.4655***	0.2771	-0.2747	-0.1291
	(-3.108)	(0.435)	(-1.563)	(-0.183)
AltmanZ	0.0126	0.4358***	0.0226	0.4403***
	(0.592)	(4.453)	(0.982)	(3.846)
Constant	1.5155**	-0.9623	0.8313	-0.0154
	(2.381)	(-0.361)	(1.252)	(-0.006)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	No	No	Yes	Yes
Observations		1,038		1,038
Adj. R-squared	0.111	0.0982	0.120	0.0970
Spearman's Rho		0.0015		-0.0035

Table 8. Robustness test: OLS estimation for CSR dummy

This table presents the result from cross-sectional OLS regressions where the dependent variables are CEO relative leverage. CSR dummy is equal to one if firm's CSR score is greater than zero, otherwise zero. t-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Variables	(1) CEO relative leverage	(2) CEO relative leverage	(3) CEO relative leverage	(4) CEO relative leverage	(5) CEO relative leverage	(6) CEO relative leverage	(7) CEO relative leverage	(8) CEO relative leverage
CSR dummy	1.6195***	1.3180***	0.9857***	0.9584***	1.6575***	1.4272***	1.0349***	1.0295***
	(3.858)	(3.605)	(2.866)	(2.841)	(4.096)	(3.903)	(3.076)	(3.082)
Tenure		-0.3577***		-0.1407		-0.3645**		-0.1487
		(-2.590)		(-1.222)		(-2.575)		(-1.293)
Salary		0.2800		-0.6552		0.2306		-0.6328
		(0.747)		(-1.382)		(0.585)		(-1.363)
Bonus		-0.0483		-0.0597		-0.0601		-0.0561
		(-1.173)		(-1.423)		(-1.450)		(-1.350)
Vega		1.4876**		0.6413		1.4051**		0.6430
		(2.516)		(1.048)		(2.408)		(1.005)
Delta		-2.0687***		-2.5448***		-2.0431***		-2.5112***
		(-6.803)		(-7.158)		(-6.291)		(-6.765)
Size			0.5106***	0.5467***			0.4721***	0.5032***
			(4.284)	(3.032)			(4.067)	(2.582)
ROA			0.0696	0.4094			0.6042	0.7357
			(0.028)	(0.172)			(0.231)	(0.292)
Leverage			0.1658	0.0782			0.0935	0.2000
			(0.188)	(0.082)			(0.098)	(0.201)
BM ratio			-0.4285	-0.7047			-0.4467	-0.6691
			(-0.832)	(-1.274)			(-0.815)	(-1.212)
Tangibility			-0.1629	0.0644			-0.3709	-0.3092
			(-0.317)	(0.112)			(-0.531)	(-0.438)
AltmanZ			0.4569***	0.4504***			0.4635***	0.4632***
			(4.689)	(4.510)			(4.033)	(3.955)
Constant	1.3865***	0.1067	-4.1153***	0.5888	1.3625***	0.4506	-3.7886***	0.7110
	(6.908)	(0.043)	(-4.115)	(0.226)	(6.760)	(0.176)	(-2.826)	(0.275)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038
Adj. R-squared	0.0254	0.0569	0.0832	0.101	0.0317	0.0603	0.0840	0.101

Table 9. Robustness test: Propensity Score Matching (PSM)

This table presents the result from propensity score matching. Panel A reports the result of logit regression where dependent variable is CSR dummy that used in Table 8. We estimate CSR dummy by the industry median value of CSR index and firm characteristic control variables. z-statistics are reported in parentheses. Panel B reports the result of PSM where dependent variable is CEO relative leverage. First row in panel B reports the difference of treatment group and control group that matched by CSR dummy in same year. Second row in panel B reports the difference of treatment group and control group that matched by CSR dummy in same year and same industry which classified Fama-French 12-industry classification. Number of observations are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Panel A: Logit regression

Variables	CSR dummy
CSR index_industry median	69.8030***
	(3.853)
Size	0.3688***
	(6.492)
ROA	2.1250
	(1.269)
Leverage	-1.9357***
	(-2.736)
BM ratio	-1.8157***
	(-3.892)
Tangibility	-2.6910***
	(-6.093)
AltmanZ	-0.0121
	(-0.212)
Constant	-1.6984**
	(-2.284)
Observations	1,038
Pseudo. R-squared	0.161

Panel B: Propensity score matching

	Treated	Controls	Difference	t-statistic
CSR dummy	2.0441	1.3182	0.7259	1.965**
for same year	(n=214)	(n=661)		
CSR dummy	2.3804	1.2777	1.1027	2.079**
for same year and same industry	(n=167)	(n=363)		

Appendix A. List of the strength and concern items in the KLD database

KLD inclusive social ratings		
Category	Strength items	Concern items
Community	Generrous giving	Investment controversies
	Innovative giving	Negative economic impact
	Support for Housing	Indigenous people relations (2000-2001)
	Support for education (added 1994)	Other concern
	Indigenous people relations (added '00, moved '02)	
	Non-U.S. charitable giving	
	Other strength	
Environment	Beneficial products & services	Hazardous waste
	Pollution prevention	Regulatory problems
	Recycling	Ozone depleting chemicals
	Alternative fuels	Substantial emissions
	Communications (added '96)	Agricultural chemicals
	Property, plant, and equipment(ended 1995)	Climate change (added 1999)
	Other strength	Other concern
Diversity	CEO	Controversies
	Promotion	Non-representation
	Board of Directors	Other concern
	Family benefits	
	Women/minority contracting	
	Employment of the disabled	
	Progressive gay & lesbian policies	
	Other strength	
Employee Relations	Strong union relations	Poor union relations
	No layoff policy (ended '94)	Health safety concern
	Cash profit sharing	Workforce reductions
	Employee involvement	Pension/benefits (added 1992)
	Strong retirement benefits	Other concern
	Health and safety strength (added 2003)	
	Other strength	

Product quality and safety	Quality	Product safety
	R&D/ innovation	Marketing/contracting controversy
	Benefits to economically disadvantaged	Antitrust
	Other strength	Other concern

Appendix B. The definition of variables

Variable name	Definition	Source
CEO relative leverage	The ratio of CEO's debt-to-equity ratio to the firm's leverage ratio: CEO to firm leverage = (CEO relative leverage / CEO equity holding value) / (Firm debt / Firm Equity). CEO relative leverage is the sum of present value of accumulated pension benefits and deferred compensation; CEO equity holding value is the sum of stock value and stock option value by Black and Scholes (1973)option formula; Firm debt is the sum of long-term debt and debt in current liabilities; Firm equity is the market value of equity.	Calculation based on Execucomp and Compustat
CSR Composite Index	CSR index calculated as $CSR_{idx} = \frac{\sum_s C_{is} - \sum_c C_{ic}}{C_s + C_c}$ where C_{is} is CSR strength, C_{ic} is CSR concerns, C_s is the maximum number of CSR strength in the industry, and C_c is the maximum number of CSR concerns in the industry.	KLD
Net CSR	Difference between the number of all strength items a firm has engaged in and the number of all concern items it has	KLD
CSR_Employee	Difference between the average STR_ EMP and CON_ EMP	KLD
Tenure	The natural logarithm of the sum of CEO's tenure and one.	Execucomp
Salary	The natural logarithm of the sum of CEO's salary (in thousands $) and one.	Execucomp
Bonus	The natural logarithm of the sum of CEO's bonus (in thousands $) and one.	Execucomp
Vega	The sensitivity of CEO's option value for a one-percent change in stock price volatility.	Calculation based on Execucomp
Delta	The sensitivity of CEO's option value for a one-percent change in stock price.	Calculation based on Execucomp
Size	The natural logarithm of firm's total assets (in millions $).	Compustat
ROA	The ratio of firm's net income to total assets.	Compustat
Leverage	The ratio of firm's total liabilities to total assets.	Compustat
BM ratio	Book-to-Market ratio; the ratio of firm's total book value of equity to market value of equity.	Compustat
Tangibility	The ratio of firm's tangible assets to total assets; tangible assets are net property, plant, and equipment.	Compustat
AltmanZ	Altman's Z score, calculated by the method of Hillegeist et al. (2004) and Altman (2000).	Calculation based on Compustat
Industry dummies	Fama-French industry classification by twelve categories.	Fama and French (1993)

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The Effect of Investor Horizons on Corporate Investment Horizons*

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Abstract

Using new patent-based industry-level measures of the horizons and values of corporate investment, I find that in response to an increase in long-term institutional ownership firms reallocate their capital toward divisions with long product life-cycle *and* high innovation value, which leads to longer corporate investment horizons and higher investment values at firm level. To disentangle investors' effects from spurious correlations, I employ a widely-adopted identification strategy based on the discontinuity in long-term ownerships around Russell 1000/2000 index thresholds. The effects are strongest among firms with more undervaluation. I also document a possible channel through which investors affect corporate investment horizon - the managerial incentive channel. These results are consistent with the horizon alignment hypothesis that long-term investors could mitigate inefficient corporate short-termisms in real investment decisions among undervalued firms.

Keywords: Corporate investment horizon, Investor horizon, Incentive horizon, Institutional investors, Undervaluation, Regression discontinuity design

JEL classification: G23, G30, G31, G32, G34

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What determines firms' choices of investment project horizons? This has long been a central question in the world of corporations.[1]. While it is controversial whether short-termism is socially bad or not, corporate short-termism could be inefficient for the firms in certain circumstances, especially when managers choose short-term investment projects over more valuable long-term ones. In the real world, firms manage several projects at the same time and a corporation can be thought of as a portfolio with multiple investment projects with different horizons and values. Therefore, the more specific question would be as following: what affects within-firm capital reallocations across investment projects (or divisions) with different horizons and intrinsic values, thereby the overall horizon and value of corporate investments as well?

This study focuses on investor horizon as the main determinant of corporate investment horizons. Short-term trading behaviors by investors have been suspected to be one of the main causes of short-termisms among firms, if any. For example, the literature has shown that short-term investors pressure firms to temporarily cut R&D expenditures to meet short-term earnings goals (Bushee (1998) and Cremers, Pareek, and Sautner (2016)). Froot, Perold, and Stein (1992) also attempt in their cross-country study to prove this belief on short-term trading practices as a driving force that shortens corporate investment horizons. In this context, it has been proposed that lengthening investor horizons could mitigate such short-term preferences by corporations on investment decisions.[2]

Empirically testing this proposition is challenging mainly because researchers do not observe investment projects within a company, thereby being unable to measure corporate investment horizons. I detour this difficulty using a patent-citation-based product life-cycle length index by industry for the sample of U.S. diversified firms with multiple segments. To measure the product life-cycle length for each industry, I follow Bilir (2014) and pick the median average

[1]For example, the National Academy of Sciences, Engineering, and Medicine published a book in 1992 where discussed are the potential causes of short-term preferences by U.S. firms in deciding among many technological innovation opportunities and possible solutions to such short-termism problems (National Academy of Engineering (1992))

[2]For instance, Hillary Clinton proposed U.S. corporate tax reforms in July 2015 that include doubling the short-term holding period from one year to two years, which could eventually have resulted in a sharp increase in the U.S. capital gains tax rates for investments held for fewer than two years.

forward citation lags across all patents in the industry, where the average forward citation lag for each patent is defined as the average of time lapse between the cited patent's grant date and a subsequent citation across all citing patents. This industry-level product life-cycle length measures the life-span of a new technology and is used as the proxy for investment horizon for each division based on the division's industry. As a firm's overall investment horizon, I use the asset-weighted average of product life-cycle length across all divisions. This firm-level corporate investment horizon varies across time by firms reallocating their capitals across divisions within firm. For the measure of investor horizon, I follow the literature (e.g., Derrien, Kecskes, and Thesmar (2013)) and use the widely-used turnover-based long-term institutional ownership.

Using these investment horizon measures of firms and investors for a panel of firm-year observations of the U.S. conglomerates over a period of 20 years, I find that long-term institutional ownership is positively associated with corporate investment horizon: a one-standard-deviation increase in long-term ownership is associated with eight months and two weeks increase in the average product life-cycle length, which is approximately 49.8% of its standard deviation. I also document a positive relationship between long-term ownership and the value of corporate investment: a one-standard-deviation increase in long-term ownership is associated with an increase in corporate investment value by 4.7%.[3]

I next examine a channel through which investors can influence managers' decisions on investment horizons. If corporate managers' compensations are associated more with short-term performance of their firms, the managers would care more about divisions with short-term investment projects. Therefore, long-term investors could mitigate this short-termism by affecting the managers' compensation structures. To test this implication, I explore grant-level data on CEO compensation. More specifically, I develop a firm-year-level (CEO-year-level) measure of incentive horizon based on the vesting periods of each performance-based grant and repeat the baseline tests replacing the dependent variable with this incentive horizon measure.

[3]I proxy the value of corporate investment by the asset-weighted average of industry-level economic value of innovation across all divisions of the firm, where the industry-level innovation value is the average of Kogan, Papanikolaou, Seru, and Stoffman's (2017) announcement-return-based measure of patent's economic values across all patents in each industry.

The results support the aforementioned implication. For example, a one-standard-deviation increase in long-term ownership is associated with a lengthened CEO incentive horizon by four months and two weeks, which is approximately 53% of the standard deviation of the incentive horizon.

The evidence from these panel regressions is, however, subject to endogeneity issues: either may there be omitted factors that affect both long-term ownership and corporate investment horizon, or it may be the reverse causality that drives the documented horizon alignment effects between investors and firms, that is, long-term investors may actively choose their portfolio stocks of which corporate investment horizons are expected to be long.

To address this endogeneity concern and establish a causal inference on the effect of long-term ownership, I employ an identification strategy based on the sharp discontinuity in long-term institutional ownership around the Russell 1000/2000 indexes threshold. Every year, the largest 3000 stocks are ranked by the Russell based on market capitalization, and the first 1000 and the following 2000 stocks are assigned to the Russell 1000 and 2000 indexes, respectively. Then within each index, the stocks are assigned their index weights based on the market capitalization ranking. Hence, the firms of their stocks on the top of the Russell 2000 index have sharply larger index weights than those of their stocks on the bottom of the Russell 1000 index. On the other hand, there is no significant difference in all other metrics including market capitalization among those firms in a narrow bandwidth around the Russell 1000/2000 threshold. Finally, since the Russell indexes are the most widely-adopted indexes by quasi-indexing institutional investors who are long-term investors at the same time, long-term institutional ownership is sharply higher for the firms slightly below the threshold than those slightly above it. This discontinuity around the index threshold existing only in long-term institutional ownership enables the Russell 2000 index membership to satisfy the exclusion restriction and hence makes it possible to identify the causal effect of long-term institutional ownership.

With this strategy, the results from two-stage least square (2SLS) regressions, by instrument-

ing the long-term institutional ownership by the Russell 2000 index membership and confining the sample to a narrow bandwidth (±100) around the Russell 1000/2000 threshold, support the causal effects of long-term ownership on both corporate investment horizon and the value of corporate investment: a one-standard-deviation increase in long-term ownership not only leads to six months and three weeks increase in the average product life-cycle lengths, but also results in an increase in the firm's average economic value of innovative projects by 4.1%, which are approximately 54% and 20% of the standard deviations of the average product life-cycle lengths and the corporate investment value, respectively, for the sample used in these 2SLS specifications. Therefore, long-term institutional investors indeed have positive and (both statistically and economically) significant influence on corporate investment horizons and values. I also document the causal effect of investor horizon on CEO's incentive horizon, which confirms the possible workings of incentive horizon channel: a one-standard-deviation increase in long-term ownership is followed by an increase in the average vesting period of the CEO's performance-based grants by three months and two weeks.

A cross-sectional analysis using several proxies for undervaluation based on residual book-to-markets or future excess returns shows that all these effects become much stronger or even only exist for highly undervalued firms. Moreover, test results from segment-level specifications provide further evidence that firms increase their overall horizons and values of corporate investments in response to an increase in long-term ownerships by raising capital expenditures of divisions with long product life-cycles *and* high innovation values, while reducing those of divisions with short product life-cycles *and* low innovation values, which suggests an internal capital market channel through which managers of multi-segment firms dynamically adjust the horizons and values of investment projects. Finally, I repeat the same 2SLS regressions, but this time decomposing long-term ownership into block and non-block ownerships and instrumenting long-term block ownership by the Russell 2000 index membership, and find that the same positive causal effects hold, which reinforces the plausibility of long-term investors' real effects on managers' incentive plans and their choices of investment projects.

Combined altogether, these results provide empirical evidence that is loosely consistent with implications from a theoretical model developed by Shleifer and Vishny (1990) (SV hereafter). The efficient market hypothesis suggests that horizons should not matter because a firm's stock price is always equal to its fundamental value regardless of the horizons of investments. Therefore, SV's model assumes *misvaluation*: an underpricing of long-term projects takes longer to be eliminated and hence long-term projects are exposed to more noise trader risk than short-term projects. Then, the main prediction from the model is that, to eliminate underpricing and realize their returns as soon as possible, short-term investors funded by liabilities with short maturities prefer short-term investment projects even if long-term projects have higher fundamental values, which in turn, in equilibrium, leads to larger mispricing for long-term projects funded mostly by short-term investors for the costs of arbitrage for short-term and long-term projects to be equal. Then corporate managers whose compensations are partly associated with short-run (stock) performance would choose short-term projects because the stock price being underpriced for a long period of time would hurt their payoffs or even threaten their jobs. This equilibrium short-termism by investors and firms can be mitigated by long-term investors because long-term projects funded by long-term investors would be less mispriced and hence corporate managers would be able to keep pursuing long-term profitable projects without being distracted by pressure for short-term performance.[4]

Furthermore, recent studies have shown that institutional investors influence corporate policies such as governance choices (Appel, Gormley, and Keim (2016)) and payout policies (Crane, Michenaud, and Weston (2016)). Also, Derrien, Kecskes, and Thesmar (2013) and Harford, Kecskes, and Mansi (2016) find that long-term institutional investors affect corporate governance and managerial misbehaviors as well as corporate policies such as investment and financ-

[4]The model implication by Shleifer and Vishny (1990) is consistent with a popular belief among practitioners that long-term investment could be a good way to make profits even though it requires more commitment with higher opportunity costs and takes longer to realize the returns, for example, "*Numerous market players concur with this view. For instance, CalPERS (California Public Employees' Retirement System pension fund) published its 10 investment beliefs; among them is the belief that "a long term investment horizon is a responsibility and an advantage" that leads them to "favor investment strategies that create long-term, sustainable value.""* (Roberge, Flaherty, Jr., Almeida, Jr., and Boyd (2016))

ing decisions. These studies all provide consistent evidence that investors influence management through active monitoring and governance mechanisms. Therefore, my empirical findings are consistent with a new hypothesis combining the aforementioned prediction from SV's model on investors' horizon preferences and managerial short-termism behaviors, and the recent empirical evidences on institutional investors as active owners: in the presence of underpricing corporate managers would increase the horizons of their firms' real investments by reallocating capitals across divisions with different investment horizons in response to an increase of long-term institutional ownership in their firms, because institutional investors with long investment horizons would prefer long-term more valuable investment projects and hence try to mitigate the effect of speculative components in stock prices on managers' biased investment decisions toward short-term projects, subsequently resulting in greater overall economic values of corporate investments. Throughout the paper, I call this hypothesis the *horizon alignment hypothesis*.

While some related studies examine the effects of pressures by short-term investors on managerial choices between short-term earnings management and investments in R&D or tangible assets (e.g., Bushee (1998), Bolton, Scheinkman, and Xiong (2006), and Cremers, Pareek, and Sautner (2016)), the effects of CEO contractual protection on those managerial choices (e.g., Chen, Cheng, Lo, and Wang (2015)), the differential responsiveness to changes in investment opportunities between publicly listed firms and privately held firms due to short-termist pressures by stock markets (Asker, Farre-Mensa, and Ljungqvist (2015)), or the effects of long-term investors on corporate investments and innovations (e.g. Harford, Kecskes, and Mansi (2016)), yet has been attempted to measure the horizons of firms' real investments and sort investments or innovations into short-term or long-term ones. For the following reasons, it is critical to measure the horizons of real corporate investments, which have not been successful in the existing body of literature. First, the existing amount-based measures of long-term investments such as capital expenditures or R&D expenditures cannot tell anything about the actual horizons of the investment projects: it is not always the case that longer-term projects require larger

investments than shorter-term projects. Therefore, an increase (decrease) in the amount of such investments cannot be deemed as a lengthened (shortened) corporate investment horizon. Second, the short-term earnings management, often used as a proxy for short-term investment projects, may be a consequence of managers' endogenous intentions to create mispricing. Therefore, comparing short-term earnings management with R&D or capital expenditures cannot correctly test the predictions from SV's model that assumes the presence of mispricing.

This paper is related to the growing literature on managerial short-termism. Bebchuk and Stole (1993) propose theoretical predictions that in the presence of imperfect information managerial short-term objectives could lead to either underinvestment or overinvestment depending on the characteristics of the imperfect information. Milbradt and Oehmke (2015) develop a model predicting that higher cost of external financing for long-term projects could induce managers to make inefficient investment decisions toward short-term projects, thereby generating an equilibrium inefficient short-termism. On the other hand, Thakor (2016) shows that short-termism could be an efficient decision in that it could limit managerial rent-seeking behavior and reveal managerial ability faster. A recent empirical study by Budish, Roin, and Williams (2015) documents an evidence of short-termism by showing that private investments in cancer research are distorted away from long-term projects due to the structure of the patent system where firms file patents at the time of invention rather than commercialization. Chen, Cheng, Lo, and Wang (2015) also document an empirical evidence on the effect of CEO contractual protection on managerial short-termism. My paper differs from these papers because I examine investor horizon as the determinant of managerial horizon on investment decisions while others investigate either consequences of short-termism or other factors such as financing frictions and CEO contracts as the determinants of managerial investment horizons.

This paper is also closely related to the literature on the role of investor horizons in stock markets and corporate policies. However, the previous studies in this literature investigate the effects of investor horizons on variables other than corporate investment horizons: for example, M&A deals and post-merger performance (Gaspar, Massa, and Matos (2005) and

Chen, Harford, and Li (2007)), amplification of negative shocks in the aftermath of the financial crisis (Cella, Ellul, and Giannetti (2013)), catering behaviors by corporate managers (Derrien, Kecskes, and Thesmar (2013)), CEO horizon incentives (Cadman and Sunder (2014)), and investment choices by venture capitals on the life-cycles of innovative firms (Barrot (2016)).

My paper differs from other papers that use quasi-indexed institutions as the source of exogenous variation in institutional ownerships of firms. Unlike Aghion, Van Reenen, and Zingales (2013), Boone and White (2015), Appel, Gormley, and Keim (2016), Crane, Michenaud, and Weston (2016) that use the index membership as an instrumental variable for institutional ownership, it is long-term institutional ownership that I instrument by the index membership. Basically though, what other papers actually instrument by the index membership is also institutional ownership by long-term investors because quasi-indexers are classified into long-term investors (Bushee (1998)).

The rest of the paper is organized as follows. Section I develops the hypotheses. Section II describes the data and the variables used in empirical tests. Section III reports my empirical results from the baseline specifications. Section IV elaborates my identification strategy for causal inference. Section V presents the empirical results from the instrumental variable analysis. Section VI concludes.

I. Hypotheses Development

In this section, I develop hypotheses that I test using my data in this study. In short, I extend and combine the implications from the model in Shleifer and Vishny (1990) (SV hereafter again) and the well-documented empirical evidence in the literature.

Consider a conglomerate which consists of two divisions: a division that has a long-term project and the other division that has a short-term project. This firm dynamically adjust the overall investment horizon at firm level by reallocating its capital across these two divisions. Suppose there are three types of investors in the stock market: short-term smart investors (arbitrageurs), long-term investors, and noise traders, which implicitly assumes that the market

is not perfectly efficient at least to some degree. I only consider the case of underpricing here as the other case for overvaluation is symmetric.[5] The key assumption of SV's model is that for short-term investors the cost of arbitrage is higher for long-term investment projects than for short-term investment projects: both fundamental and noise trader risks for short-term investors are more crucial for long-term projects of which the elimination of underpricing takes longer because there is more time for negative news or pessimism among investors to arrive, [6] and these risks cannot be completely shared in the market because the existence of information asymmetry between short-term arbitrageurs and outside lenders imposes credit constraints on short-term investors for borrowing rates, amount, and maturities. Furthermore, due to such credit constraints, short-term investors are additionally subject to opportunity costs of their capital being tied up for long-term projects. In a related context, short-term investors might inherently have shorter maturities of their liabilities from the beginning.[7]

Then the main implication on investors' side from SV's model due to this higher cost of arbitrage and the resulting credit and maturity constraints imposed on short-term investors is that, in order to eliminate underpricing sooner and realize their returns from arbitraging as soon as possible, short-term arbitrageurs would prefer short-term projects even if long-term projects have higher fundamental values.

In equilibrium, the returns to arbitrage on the long-term project and the short-term project must be the same. Since the cost of arbitrage is greater for the long-term project, short-term investors require the long-term project to be more underpriced. Then another implication from SV's model on the side of corporate managers is that the managers would choose the short-term less valuable- over the long-term more valuable investment project because in practice the

[5] As a matter of fact, the case of overvaluation is irrelevant to consider in this model framework because both short-term and long-term investors would immediately liquidate their shares of undervalued firms, hence they are not differentiated.

[6] 'Fundamental risk' means that the fundamental value could actually fall before the completion of the project and the elimination of the undervaluation. 'Noise trader risk' implies that the underpricing could become even larger tomorrow than today, so investors would lose money if they liquidate their positions tomorrow.

[7] "For example, pension funds have long-term liabilities and thus long investment horizons whereas mutual funds are subject to large short-term redemptions and thus their investment horizons are also short-term." (Derrien, Kecskes, and Thesmar (2013))

compensation of managers is in part linked to short-term equity performance and hence the managers would want to avoid the stock price to be underpriced for a long time. Therefore, long-term investors could mitigate such inefficient corporate short-termisms, either through corporate manager's observation of longer holding period by equity investors, thereby being less pressured by short-run stock performance, or through a lengthened managerial incentive horizon by activist shareholders with long-term investment horizon affecting executive compensation structures. This leads to the following hypothesis:

- An increase in the long-term ownership of a conglomerate is followed by a lengthened compensation horizon of the firm's manager.
- Such increase in long-term ownership is subsequently followed by within-firm capital reallocations from short-term less valuable to long-term more valuable investment projects.
- Such capital reallocations result in an increase of the overall investment horizon as well as the overall fundamental value of the firm.
- This horizon alignment effect is stronger for firms with greater undervaluation.

In what follows, I directly test these implications through a battery of empirical specifications. I first construct the measures of corporate investment horizon, the value of corporate investment, managerial incentive horizon, and investor horizon. Then I show that the first three measures are positively correlated with the measure of investor horizon, respectively. I establish the causality of those positive relationships by instrumenting the long-term institutional ownership by its discontinuity around the Russell 1000/2000 index threshold and show that the causal relationship is stronger for firms with greater undervaluation. I also show that those effects are the consequences of within-firm capital reallocations.

II. Data and Variables

In this section, I describe how to construct the sample from various data sources, discuss the main variables used in this study, and report summary statistics of them.

A. Data Sources and Sample Construction

The data for this study are compiled from several sources. Firm-level accounting information is obtained from Compustat and data on stock come from the Center for Research in Security Prices (CRSP). Divisional data for U.S. publicly listed firms are acquired from Compustat Historical Segments Data. Patent data used to measure industry-level product life-cycle lengths are collected from the National Bureau of Economic Research (NBER) Patent Citations Data file. Data on the dollar value of each patent are collected from Noah Stoffman's website on patent data.[8] Grant-level data used to calculate the horizons of performance-related CEO compensations are gathered from the Incentive Lab database. Data on institutional common stock holdings are obtained from Thomson Reuters.

The sample construction starts at segment level by excluding all other types of segments except business segments. For the sake of measuring product life-cycle length, I keep only segments where patent data are available for their industries. I also drop segment-years with missing values for capital expenditures or identifiable total assets. Then at firm level, since I concentrate on U.S. conglomerates in this study, among all publicly traded U.S. firms between 1990 and 2010 only those with at least two segments operating in different industries are kept in the sample.[9] I merge the resulting data file with annual firm characteristics from Compustat. Finally, I merge these data with institutional ownership data from Thomson Reuters and drop firm-year observations with missing values for institutional ownership. The final sample for baseline analyses consists of 6,619 firm-year and 21,170 segment-year observations.

[8]https://iu.app.box.com/v/patents

[9]Since companies typically look back three years and review all the information again when reporting segments data, there are occasions that some already recorded entries are updated within three years. To keep any unfinalized data from polluting the test results and to be as conservative as possible by having safety margins, I exclude recent years from the sample.

B. Variables and Summary Statistics

B.1. Corporate Investment Horizons

One of the most challenging parts in empirically testing the horizon alignment hypotheses is to measure corporate investment horizons. Two most critical features of such measure to be desired are: 1) it should measure the actual time horizon of real investments because otherwise there would be no comparative advantage of using it compared to examining managerial choices between short-term earnings management and spending on R&D, and we would be unable to directly test the implications derived from Shleifer and Vishny's (1990) model; 2) it should measure *ex ante* required or expected time length for an investment to come to fruition at the moment of a managerial investment decision rather than *ex post* actual time taken until the fruition of the investment because the question of interest is whether investor horizons influence corporate investment decisions, not the outcome of corporate investments.

To meet such desired features, I use an industry-level technology-based measure of product life-cycle length as the proxy for investment time horizon of each industry. Following Bilir (2014), I measure an industry's product life-cycle length using the NBER Patent Citation Data as follows: 1) for each pair of cited and citing patents, I calculate the time lapse between the cited patent's grant date and the citing patent's citation date, which is called the *forward citation lag* by Bilir (2014); 2) for each patent, I compute the average of the forward citation lags across all subsequent citing patents; 3) then for each three-digit SIC industry, I collect all patents filed for the industry and pick the median of the average forward citation lags which is the measure of product life-cycle length of that industry.

This product life-cycle length varies from approximately six to thirteen years across industries. Table I reports the complete list of product life-cycle lengths for SIC three-digit codes where at least 1,000 patents have been granted over the past forty years. For example, the non-electric heating equipment industry is the one with the longest product life-cycle of approximately thirteen years, and the electronic machinery industry is the one with the shortest product life-cycle of approximately six years. What this industry-level product life-cycle length

actually measures is the economic lifetime of a patented technology rather than that of a specific version of a product which a product turnover measure based on product level data, if any, would proxy.[10]

TABLE I ABOUT HERE

This measure of industry-level product life-cycle length satisfies the two desired features above of a corporate investment horizon measure. First, it measures the actual time horizon in years rather than just whether a corporate decision is of short-term or long-term view. Second and more importantly, it measures the *ex ante* required or expected time length until an investment starts generating outcomes. Consider an example where there are two industries, that is, one industry with a long product life-cycle of thirteen years and the other industry with a short product life-cycle of six years. Then, on average, the thirteen-year product life-cycle length implies that once a company achieves a patented technology in this industry, it can expect a secured cash-flow-generating time period of thirteen years while the six-year product life-cycle length means such time period of only six years. This equivalently means that the company operating in the long product life-cycle industry can have, on average, longer time for developing a new technology than companies operating in the short product life-cycle industry.

To help better understand how this measure of product life-cycle length based only on cross-sectional variations across industries is used for measuring corporate investment horizons at firm-year level, consider again a diversified firm consisting of two segments as exemplified in Section I: a segment that operates in an industry with long product life-cycle and the other segment that operates in another industry with short product life-cycle.[11] The product life-

[10] "*As an illustration of this product definition, consider the example of automobiles. New car models within an automobile product line are introduced annually (termed the model cycle in Bils 2009), but the technological overlap across successive models is substantial... Successive versions of the Honda Accord, for example, are so similar that the BLS substitutes new versions for old (e.g., the 2012 Honda Accord LX is substituted for the 2011 Honda Accord LX, with minimal adjustment) to establish price comparisons underlying official US inflation indexes (Bils 2009).*", Bilir (2014)

[11] Among many other examples of such a diversified firm is Procter & Gamble Co. (P&G) which is a U.S. multinational conglomerate giant manufacturing mainly cleaning agents and personal care products. P&G largely has three major segments where patent data are available: one is its oldest and biggest home-care segment that produces, for instance, dishwashing liquid and laundry detergent brands such as Dawn, Tide, and

cycle length for each industry is exogenously given and time-invariant. Each segment reports its own total assets which dynamically change every year. Then the overall investment horizon of a conglomerate firm for each year is calculated as the asset-weighted average of product life-cycle lengths across segments, that is, simply

$$\textit{Corporate Invetment Horizon}_{i,t} = \textit{Avg. PLC}_{i,t} = \frac{\sum_{j=1}^{2} ias_{j,t} \cdot PLC_j}{AT_{i,t}}.$$

Avg. PLC stands for average product life-cycle length. PLC_j is the product life-cycle length of the segment j's industry and $AT_{i,t}$ denotes total assets of firm i for the year t. $ias_{j,t}$ denotes identifiable total assets of segment j for the year t which is the main source of cross-sectional and time-series variations in this firm-level corporate investment horizon measure and changes every year as a result of within-firm capital allocations across segments. Another source of time-series variations in the corporate investment horizon is corporate restructuring such as mergers and acquisitions, divestitures, spin-offs, etc. which occur infrequently though, hence is not closely examined in this paper.

B.2. Economic Value of Corporate Investment

Another challenging part in an empirical study on the horizon alignment hypotheses is measuring the fundamental value of corporate investment. Successful execution on this is critical because the horizon should not matter in the first place unless the long-term investment projects have greater fundamental values than short-term projects. This task is extremely difficult because researchers do not directly observe values of corporate investment projects.

Since my measure of corporate investment horizon is based on the industry-level innovation activities, I also use the patent data to measure the values of corporate investment. More specifically, I use the data on economic value of each patent that Kogan, Papanikolaou,

Downy, of which industry has approximately eight years of short product life-cycle; another is the health-care and pharmaceutical segment that produces, for example, cough and cold products such as Vicks or medicines for minor digestive system upset such as Pepto-Bismol, whose industry has approximately ten years of long product life-cycle; and the third is its grooming segment which was recently formed from the acquisitions of Gillette and Braun that manufactures razors and blades of which industry has 11.69 years of very-long product life-cycle.

Seru, and Stoffman (2017) (KPSS hereafter) create in their recently published paper using the announcement-day stock return of each patent. They develop a model that derives the dollar value (deflated to 1982 dollars) of each patent implied from the stock market reaction to the announcement of granting the patent. For each industry, I collect all patents over the six-year period prior to each year and take the average of their KPSS measures of economic value.[12] Then for each conglomerate, I compute the asset-weighted average of this industry-level patent economic value across all segments, which I define as the firm's economic value of investment.

It is worth noting that the patent economic value varies significantly across industries and over time. In addition, at industry-level, the patent economic values of long product life-cycle industries are not necessarily greater than those of short product life-cycle industries. Furthermore, the overall ranking of industries in product life-cycle length and patent economic value does not apply to within-firm rankings in the same manner. For example, the SIC industry '367' for 'Electronic Components and Accessories' has relatively short product life-cycle length of 7.39 years and low average patent economic value of $9.65 million in 1982 dollars. However, its product life-cycle length and average patent economic value are long and high compared to the SIC industry '383' for 'Electronics Machinery' which has product life-cycle length of 5.99 years and average patent economic value of $1.6 million in 1982 dollars. Therefore, for a conglomerate operating in both industries, the 'Electronic Components and Accessories' industry is deemed as a long-term valuable industry. These together imply that I need a cross-sectional analysis to see whether long-term investors influence managers to reallocate capitals toward divisions with long-term profitable investment projects, instead of simply checking whether long-horizon industries systematically have greater economic values of investments.

B.3. Managerial Incentive Horizon

To investigate whether long-term investors attempt to make any changes on a firm's executive compensation structure so that the manager of the firm can pursue long-term profitable

[12]When measuring both corporate investment horizon and the value corporate investment, I use the USPTO-SIC concordance to aggregate the USPTO-class-level data at each three-digit SIC.

investment projects without pressures for short-term performance, I explore grant-level data on executive compensation collected from the Incentive Lab. In particular, I focus on CEOs and performance-related incentive plans in their compensation packages to create a firm-level measure of incentive horizon. A CEO's compensation package consists of a number of grants that vary in many dimensions such as the composition of performance targets, vesting schedule, payment method, and so forth. Then each grant again comprises multiple awards that vary in performance metric, evaluation period, payout structure, etc.

I first calculate the average vesting period (or performance evaluation period) for each award and year. More specifically, I compute the exponentially-weighted average of vesting months between the start and the end of the award vesting period, i.e.,

$$Average\ Vesting\ Period = \frac{\sum_{n=1}^{N} M_n e^{-(N-n)\ln 2/h}}{\sum_{n=1}^{N} e^{-(N-n)\ln 2/h}}.$$

M_n is the nth month between the start month and the end month of the award vesting period. For example, if the start month and the end month of an award are 12th month and 36th month, respectively, 6th month is the 17th month. h denotes the half-life that makes the month that lie h months in the past weigh half as much as the end month. I choose the half life of 6 month assuming that managers would care more about the performance goal as the end of vesting period approaches and they especially would do so most during the last 6 months.[13]

Then at grant level, I compute the value-weighted average of vesting period across all awards in a grant for each year. And finally, I again compute the value-weighted average of this grant-level vesting period across all grants in a compensation package for a CEO, which is my firm-level measure of managerial incentive horizon in months. This measure captures the average time period over which the firm performance is evaluated and hence likely how far in the future a manager whose incentives are tied to the firm performance would care about the success of the firm's investment projects.

[13]When I pick other choices of the half life such as 9 month or 12 month, the results remain largely the same.

B.4. Long-term Institutional Ownership

The main explanatory variable of interest in this study is investor horizon. This paper focuses on investment horizons of institutional investors because their ownerships in stocks have been increased over time, especially more in recent years, and so has been the importance of institutional investors.[14] Many ways to measure investor horizons of institutional investors have been introduced in the literature. Among others, there are two most recently introduced approaches to measure investor horizon: the first one is the measure based on portfolio turnover by institutional investors (e.g., Bushee (1998), Barber and Odean (2000), Gaspar, Massa, and Matos (2005), Polk and Sapienza (2009), and Derrien, Kecskes, and Thesmar (2013)), and the other one is the measure based on stock holding duration (Cremers, Pareek, and Sautner (2016)). The main difference between these two approaches is that the former aggregates all stock holdings at the investor level first and then aggregates the investors at the stock level while the latter only aggregates investors at the stock level without an aggregation at the investor level. This difference enables the latter to look into the holding duration of each stock in an investor's portfolio and allow any investor to be short-term in some stocks and long-term in others, while making the former focus more on the trading patterns of the investor over all stocks in her portfolio. Since both measures of investor horizon have their own pros and cons, one needs to carefully pick a measure that best fits the research design.

For the best interest of the research design in this paper, I choose the turnover-based ownership measure over the stock duration measure. First, the ownership measure based on share turnovers works better for the identification strategy in the later section based on discontinuity around the Russell 1000/2000 index threshold. The exclusion restriction for the IV-2SLS estimations using this identification strategy is based on passive investments by quasi-indexers who do not have controls over the selection of stocks in their portfolios. While it is straightforward that the indexing by long-term quasi-indexers should lead to discontinuity in long-term institutional ownership around the Russell 1000/2000 threshold because stocks in Russell indexes

[14] See Figure 1 in Cremers, Pareek, and Sautner (2016).

are ranked based solely on market capitalizations and those on the top of Russell 2000 are assigned sharply greater index weights than those on the bottom of Russell 1000, it is not clear whether such passive indexing should lead to discontinuity in stock duration of firms around the threshold for the following reasons: there could exist short-term indexers as well, at least to some degree, and stocks that are newly added to Russell 2000 are indeed subject to a reduction rather than an increase in stock duration because they happen to be just included in an indexer's portfolio.[15]

Second, long-term institutional ownership measure fits better the focus of this study, that is, the role of long-term institutional investors as owners of firms rather than arbitrageurs. The main interest of this study is whether monitoring by long-term institutional investors alleviates the negative effect of underpricing on corporate investment horizon, that is, the amplification of short-termism that pressures corporate managers to forgo long-term profitable projects. Stock duration measure is not ideal for this purpose because it tells us little about inherent characteristics of each institutional investor and hence we cannot judge whether any empirical results come from actual intentions of the investors.

To measure long-term institutional ownership at firm level, I follow Derrien, Kecskes, and Thesmar (2013).[16] Using the quarterly data from 13F filings on institutional holdings, I first look back three years, i.e., twelve quarters, and calculate portfolio turnover for each institutional investor, which is the fraction of shares that are no longer held after three years of their purchases. For a given quarter, I compute the mean of this portfolio turnover during the most recent four quarters to keep one extreme quarter from distorting the portfolio turnover. Then I classify each institutional investor as long-term or short-term investor depending on whether the portfolio turnover is less or greater than 35% (cf. Froot, Perold, and Stein (1992)).

[15] As a matter of fact, it is extremely challenging to justify the use of stock duration measure as an exogenous variable in any empirical studies. An investor's decision on the duration of holding a specific stock is fully endogenous and stock duration dynamically varies at investor-stock level. Due to this endogeneity and the complexity in the source of variations, it has been unsuccessful in the literature to come up with an identification strategy that explores exogenous variations in the stock duration.

[16] For the complete procedure to measure long-term institutional ownership step by step, refer to Section III.B of Derrien, Kecskes, and Thesmar (2013).

Finally, for each firm and for a given quarter, I calculate the fraction of shares held by the long-term institutional investors out of the firm's total shares outstanding to come up with the measure of long-term institutional ownership at firm level. Short-term institutional ownership, by construction, can be obtained by subtracting long-term institutional ownership from total institutional ownership of a firm.

The investor-level portfolio turnover represents an investor characteristic, that is, the average turnover across all shares in an institutional investor's portfolio, by looking upon the portfolio as a bundle instead of separately looking into each stock in the portfolio. And Derrien, Kecskes, and Thesmar (2013) show that this investor portfolio turnover is stable over time[17]: each quarter, they sort all institutional investors whose holdings data are available from 13F filings into quartiles based on their portfolio turnovers, calculate the mean portfolio turnovers over the following quarters up to five years, and show that investors remain in their original quartiles over all twenty quarters, which means that short-term investors stay short-term and long-term investors stay long-term over time, and there is no such dramatic conversion that short-term investors become long-term or vice versa. Therefore, the long-term institutional ownership measure based on the investor portfolio turnover implicitly regards institutional investors as having time-invariant investment horizons regardless of which stocks they hold, and this feature is what makes it possible to examine the role and effect of long-term institutional investors while the measure does not separately look into holding duration of each stock in their portfolios.

B.5. Other Variables and Summary Statistics

The definitions of other firm-level variables used in the baseline specifications are as follows. Total institutional ownership (*Institutional ownership*) is defined as the sum of shares held by institutional investors divided by shares outstanding. Blockholder ownership (*Block ownership*) is defined as the sum of shares held by institutional investors with an ownership stake of greater than or equal to 5%. Sales growth (*Sales growth*) is the sales growth rate, which is defined as

[17]See Figure 1 in the paper.

sales minus lagged sales divided by lagged sales. Cash flow (*Cash flow*) is earnings before interest and taxes plus depreciation divided by total assets. Leverage (*Debt*) equals total debt over total assets. Firm size (*Size*) is equal to the natural logarithm of total assets. Tobin's Q (Q) is total assets minus book value of equity plus market value of equity over total assets. Investment (*Investment*) is defined as capital expenditure over total assets and R&D expenditure ($R\&D$) is defined as research and development expense divided by total assets. The segment-level cash flow is defined in a slightly different manner as operating profit over total segment assets. All variables are winsorized at the 1% and 99% levels in all analyses.

Table II summarizes both the firm-level (Panel A) and the segment-level (Panel B) data for the sample periods (1990 to 2010) used in my analyses. The mean average product life-cycle (PLC) length at firm level is 9.64 years with the standard deviation of 1.44 years. Long-term institutional ownership is 32.3% on average with the standard deviation of 22.6% and total institutional ownership is 47.2% on average with the standard deviation of 32.1%. It can be observed by comparing with those reported in other work measuring long-term ownership from 13F institutional holding data (e.g., Derrien, Kecskes, and Thesmar (2013)) that the sample means of long-term ownership and institutional ownership in this paper are greater, which indicates that institutional investors, especially those with long investment horizons, are on average more likely to hold stocks of diversified conglomerates.

TABLE II ABOUT HERE

III. Baseline Results

To examine the relationship between investor horizon and corporate investment horizon, I estimate the following firm-level baseline specification using ordinary least squares (OLS) regressions:

$$\begin{aligned} AveragePLCLength_{i,t} &= \alpha + \beta Long\text{-}termOwnership_{i,t-1} \\ &+ \gamma InstitutionalOwnership_{i,t-1} + \eta' \cdot \mathbf{X}_{i,t-1} + \varphi_i + \tau_t + \varepsilon_{i,t} \end{aligned}$$

where i indexes firms, t indexes years, $\mathbf{X}$ is a vector of control variables based on firm characteristics, φ_i denotes firm fixed effects to control for unobserved time-invariant firm heterogeneity, and τ_t denotes year fixed effects to control for unobserved market-wide shocks for each year. To minimize the risk of simultaneity to bias our estimation results, all explanatory variables lag the data on average product life-cycle length by one year. The coefficient of interest here is β which estimates the marginal changes in the average product life-cycle length in years in response to a one-unit increment in long-term institutional ownership. To solely focus on the effect of investor horizon, total institutional ownership is included in all specifications.

The estimation results are reported in Table III, columns (1) and (2). Consistent with the primary implication of the horizon alignment hypothesis developed in Section I, I find a positive and statistically significant relationship between long-term institutional ownership and corporate investment horizon proxied by average product life-cycle length. For example, in column (2) with both firm and year fixed effects, given that the sample standard deviation of long-term institutional ownership is 23%, a one-standard-deviation increase in long-term institutional ownership is associated with an increase in average product life-cycle length of 0.715 years which is approximately eight months and two weeks. This effect is economically significant as it is approximately 49.8% of the standard deviation of average product life-cycle length.

To investigate the relationship between investor horizon and the value of corporate investments, I repeat the baseline analyses replacing the average product life-cycle length with the average patent economic value (*Average PEV*) as the dependent variable. Table III, columns (3) and (4) report the results that are largely consistent with the horizon alignment hypothesis. The coefficient on the long-term ownership is positive and statistically significant in all specifications, which suggests that an increase in long-term ownership is followed by greater value of overall corporate investment in the following year. For instance, in column (4), a one-standard-deviation increase in long-term institutional ownership is associated with an increase in the average patent economic value by 4.7%. Again, the negative and statistically

significant coefficient on institutional ownership supports the short-termism implication of the horizon alignment hypothesis that short-term investors put pressures on manager's investment decisions toward short-term even if it is value-destroying.

As I derive in Section I, the horizon alignment hypothesis suggests the incentive plan channel through which long-term investors can influence managers of conglomerates in making investment decisions (or capital reallocation decisions) across segments with different horizons. To discover this channel, I repeat the baseline analyses, but now with the measure of managerial incentive horizon, i.e., the average CEO grant vesting period (*Average CGV period*) as the dependent variable.

The results from the OLS regressions are reported in Table III, columns (5) and (6). The coefficient of interest on long-term ownership is positive and statistically significant in all columns. These results provide support for the incentive plan channel. For example, in column (6), a one-standard-deviation increase in long-term institutional ownership is associated with an increase in the average CEO grant vesting period by four months and two weeks. This effect is also economically significant as it is approximately 53% of the standard deviation of the average CEO grant vesting period.

TABLE III ABOUT HERE

IV. Identification

The positive relationships documented in Section III, between investor horizon and corporate investment horizon, corporate investment value, and managerial incentive horizon, are consistent with the implications of the horizon alignment hypothesis. However, this evidence from the estimations using OLS regressions on large panel data is subject to endogeneity that there may be omitted variables that affect both long-term institutional ownership and corporate investment horizon, which would bias my estimates. Among many others, for example, simultaneity is one of the most severe concerns because long-term institutional investors may

self-select stocks with long and more valuable investment projects, which should result in the same empirical evidence above. Addressing this endogeneity concern is critical for the contribution of this study because one of the most important implications in the horizon alignment hypothesis developed in Section I is that investor horizons have causal effects on corporate managerial decisions on the horizon of real investments.

This section discusses an identification strategy which is a 2SLS approach based on an instrumental variable, the Russell 2000 index membership within a narrow bandwidth around the Russell 1000/2000 threshold, and documents evidence on the causality of the results found earlier in Section III as well as on monitoring and governance channel behind the causal relationship. It also discusses, through a cross-sectional analysis, the higher profitabilities of long-horizon investment projects pursued by long-term institutional investors.

To implement the identification strategy discussed in this section, I construct a subsample of U.S. conglomerates ranked near the Russell 1000/2000 threshold. The annual Russell index constituents data are provided by Russell. Since I concentrate on firms around the threshold, I merge my original sample of U.S. conglomerate firms with the Russell data and confine the sample firms to those ranked within the bandwidth of 100 centered on the index threshold, that is, firms ranked between 991 and 1100. Following the literature, I end the sample period in 2006 because Russell started applying the banding policy on their index assignments since 2007 (Boone and White (2015), Appel, Gormley, and Keim (2016), and Crane, Michenaud, and Weston (2016)).[18] The resulting subsample consists of 319 firm-year observations.

A. Discontinuity in Long-term Ownership around the Russell 1000/2000 Threshold

To address the aforementioned endogeneity concern and establish causal inference of the evidence documented so far, I employ an identification strategy based on sharp discontinuity in long-term institutional ownership around the threshold between the Russell 1000 and 2000 indexes. The Russell indexes are reconstituted each year mechanically based on stock prices

[18]For the sake of reducing the index turnover cost, they now make some non-mechanical adjustments to keep consistency in their indexes when the market capitalizations of firms around the threshold are not significant.

as of the last trading day of May: the largest three thousand stocks are ranked based on their market capitalizations from rank 1 to rank 3000, and the first one thousand stocks are assigned to the Russell 1000 index (Russell 1000) and the following two thousand stocks are assigned to the Russell 2000 index (Russell 2000). Within each index, stocks are assigned their index portfolio weights based on this market capitalization ranking. As a result, the firms whose stocks are on the top of Russell 2000 have drastically larger index weights than those whose stocks are on the bottom of Russell 1000. Since the Russell indexes are among the most popular benchmarks that are tracked by the funds operated by quasi-indexing institutional investors[19] who are also classified as long-term investors based on the definition of the measure of long-term institutional ownership used here, long-term institutional ownerships are sharply higher for the firms on the top of Russell 2000 than those on the bottom of Russell 1000.

Figure I graphically shows the discontinuity in long-term institutional ownership around the Russell 1000/2000 threshold. In this figure, I plot the average long-term institutional ownership over stocks in each bin of ten ranks across all years between 1990 and 2006, against the distance from the Russell 1000/2000 threshold which is defined as the actual Russell rank minus 1000.[20] For example, the distance from the threshold of the 999th ranked stock is -1, and that of the 1001st ranked stock is 1. It shows that long-term institutional ownership is increasing in market capitalization, but at the threshold, firms with slightly less market capitalizations have much higher long-term institutional ownership. This discontinuity indicates that, within a narrow bandwidth of firms around the Russell 1000/2000 threshold, the Russell 2000 membership has a clear and strong impact on long-term institutional ownership. Nevertheless, such discontinuity alone cannot fully qualify the Russell 2000 membership as an instrumental variable for long-term institutional ownership. This naturally leads to the next issue.

FIGURE I ABOUT HERE

[19]The Russell 2000 index is the most widely adopted benchmark for small cap stocks while the Russell 1000 index is less commonly benchmarked because it competes against other popular indexes for large and mid caps stocks such as the S&P 500, S&P 400, the CRSP U.S. midcap index, etc.

[20]For this graph, I use the sample of all U.S. public firms instead of conglomerates only.

B. The Exclusion Restriction

Despite the sharp discontinuity in long-term institutional ownership around the Russell 1000/2000 threshold, another condition must be met for the Russell 2000 membership to be used as an instrumental variable - the exclusion restriction. In other words, the Russell 2000 membership must be exogenous to corporate investment horizon, except through its effect on the long-term institutional ownership.

It is the local continuity in potential outcomes around the threshold that enables this identifying assumption to be plausible: other than for the long-term institutional ownership, firms on the bottom of Russell 1000 are similar to those on the top of Russell 2000, hence on average there would have been no difference in potential outcomes including corporate investment horizon between the two groups in the absence of the discontinuity in index weights and long-term ownership. This is a reasonable assumption because the index assignments by Russell are completely mechanical as explained earlier in the previous section, and there is no reason to expect systematic and sharp differences in potential outcomes around the threshold.

Unfortunately, it is impossible to directly test the exclusion restriction using the existing data. I, however, perform a robustness check through an investigation into pretreatment effects to further support the plausibility of the exclusion restriction (Angrist and Pischke (2009)). Any observed pretreatment effects of the Russell 2000 membership on firm characteristics including corporate investment horizon would potentially imply the existence of omitted variables or sample selection bias. Specifically, by regressing the lagged variables on the Russell 2000 membership dummy for the firms ranked within a narrow bandwidth around the threshold, I estimate the mean differences in the main explanatory variable, i.e., the long-term institutional ownership and the dependent variable, i.e., the average product life-cycle length as well as other firm characteristics in the year prior to the index assignment between firms slightly above the threshold and those slightly below the threshold. Table VIII presents the results. Each cell of the table reports the estimated coefficient on the Russell 2000 membership dummy from each OLS regression and its t-statistic in the parenthesis. Each column corresponds to

the pre-treatment firm characteristic examined in each regression and each row corresponds to the bandwidth of firms used in each regression. The results largely show that no significant differences are observed in various potential outcomes and other firm characteristics between firms slightly above and below the index cutoff, which supports the plausibility of the local continuity assumption around the Russell 1000/2000 threshold and subsequently the exclusion restriction as well.

TABLE IV ABOUT HERE

Therefore, the sharp discontinuity between the firms on the bottom of Russell 1000 and those on the top of Russell 2000 exists only on long-term institutional ownership[21], which motivates the use of the IV-2SLS approach.

C. IV-2SLS Estimations

Based on the mechanical index assignments by Russell and the pretreatment analysis, it can be reasonably assumed that the discontinuity around the Russell 1000/2000 threshold is present only on index weights and eventually on long-term institutional ownership, which subsequently implies that the Russell 2000 membership only affects long-term institutional ownership while it is not correlated with any other factors that may influence corporate investment horizon in a narrow bandwidth around the threshold. Therefore, using a dummy variable for the assignment to the Russell 2000 index as an instrumental variable for the long-term institutional ownership, I estimate the following two-stage least square (2SLS) specification:

$$\begin{aligned} LTO_{i,t} &= \alpha + \delta_1 STO_{i,t} + \delta_2 Russell2000_{i,t} + \delta_3(Rank^*_{i,t} - 1000) \\ &+ \delta_4 Russell2000_{i,t}(Rank^*_{i,t} - 1000) + \delta_5 FloatAdj_{i,t} + \tau_t + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} AveragePLCLength_{i,t} &= \theta + \beta_0 \hat{LTO}_{i,t} + \beta_1 STO_{i,t} + \beta_2(Rank^*_{i,t} - 1000) \\ &+ \beta_3 Russell2000_{i,t}(Rank^*_{i,t} - 1000) + \beta_4 FloatAdj_{i,t} + \varsigma_t + \nu_{i,t}. \end{aligned}$$

[21] Note that the discontinuity in long-term institutional ownership originates from the mechanical discontinuity in index weights.

$Russell2000$ is a dummy variable indicating whether the firm belongs to Russell 2000 in a given year t. $Rank*$ is the rank of the firm based on market capitalization as of the last trading day in May each year, and $Rank * -1000$ represents the rank distance from the index threshold. Both the rank distance, $Rank * -1000$, and its interaction with the Russell 2000 dummy, $Russell2000 \times Rank * -1000$, are included to control for any size-related effects and to focus on the variation near the threshold. $FloatAdj$ is the difference between the market capitalization-based rank and the actual rank assigned by Russell. I follow previous studies exploring the same discontinuity around the Russell index cutoff and include this variable to control for the variation in index weights attributed to non-mechanical float adjustments made by Russell on the last day of June (e.g., Appel, Gormley, and Keim (2016) and Crane, Michenaud, and Weston (2016)).[22] The coefficient of interest is β_0 which estimates the marginal changes in average product life-cycle length in response to a one-unit increase in the instrumented long-term institutional ownership.

The results from the first-stage regression reported in Table V, columns (1) and (2) (columns (3) and (4)), formalize the sharp discontinuity in long-term (block) institutional ownership around the Russell 1000/2000 threshold described in Section IV.A.[23] The positive and statistically significant coefficients on the dummy variable, $Russell2000$, indicate that, on average, firms slightly below the threshold exhibit sharply larger long-term institutional ownership than those slightly above the threshold. For instance, in column (2), the mean long-term institutional ownership is 13.07% higher for the firms on the top of Russell 2000 than for the firms on the bottom of Russell 1000. This mean difference is economically significant as it is approximately 66% of the standard deviation and 24% of the average of long-term institutional ownership over the subsample firms used in the identification specifications. Thus, for firms within a narrow

[22] Russell's float calculation to determine the market capitalizations of firms to be used for assigning the index weights is unobservable to researchers. It is mostly about determining which price to be used in case of multiple share classes. However, it does not invalidate any empirical designs including mine because the Russell index memberships can be observed by researchers and the variation in index weights caused by the Russell's undisclosed float calculations can be controlled by the actual ranks assigned by Russell which is also observable to researchers.

[23] I report the discontinuity in long-term *and* block institutional ownership for an additional test on the effect of long-term investors with potentially more intervenient power.

bandwidth around the threshold, the Russell 2000 membership has a strong positive impact on long-term institutional ownership.

Table V About Here

Table VI presents the results from the second stage regressions of the average product life-cycle length, the average patent economic value, and the average CEO's grant vesting period, respectively in columns (1)-(2), (3)-(4), and (5)-(6), on the instrumented long-term institutional ownership predicted from the first-stage regression. The results in all specifications confirm that the positive relationships documented in Section III are causal, that is, an increase of long-term institutional ownership causes the corporate investment horizon, the value of corporate investment, and managerial incentive horizon to increase. The estimated coefficient 3.2568 in column (2) implies that, in the small bandwidth of ± 100, a one-standard-deviation increase in long-term institutional ownership due to the index assignment to Russell 2000 leads to an increase in average product life-cycle length by 0.565 years which is approximately six months and three weeks. This effect is economically significant as it is approximately 54% of the standard deviation of the average product life-cycle length. In addition, the coefficient estimates in columns (4) and (6), respectively, indicate that a one-standard-deviation increase in long-term ownership due to the index assignment to Russell 2000 results in a 4.1%-increase in the average patent economic value and a longer average CEO's grant vesting period by three months and two weeks.

In sum, the estimation results from IV-2SLS regressions here establish the causality of the evidence of the horizon alignment hypothesis documented through the baseline analysis in Section III, which can be interpreted as an increased long-term institutional ownership causing firms to increase their investment horizons and values as well as managerial incentive horizons.

Table VI About Here

D. Horizon Alignment and Mispricing

To test another implication from the horizon alignment hypothesis that underpricing is the main driving force of the horizon alignment effect and hence the effects documented earlier are more pronounced for highly undervalued firms, I divide the sample into above-median- and below-median-undervaluation groups based on some proxies for undervaluation and conduct the IV-2SLS regressions separately for each subsample.

To measure the degree of undervaluation, I use four different proxies introduced in the literature: residual book-to-market ratio by regressing book-to-market on firm age, dividend payment dummy, leverage, size, return volatility, and return on equity (ROE) for each year (Pástor and Veronesi (2003)), residual book-to-market ratio by regressing book-to-market on size, ROE if positive, ROE if negative, and leverage for each industry and each year (Rhodes-Kropf, Robinson, and Viswanathan (2005)), future excess returns (Baker, Stein, and Wurgler (2003) and Polk and Sapienza (2009)), and raw book-to-market ratio (Derrien, Kecskes, and Thesmar (2013)). The first two proxies based on residual book-to-market capture the deviation of the observed book-to-market ratio from the (expected) fundamental book-to-market ratio. Future excess return captures price correction in the future conditional on current misvaluation. The use of raw book-to-market is motivated by the purpose of capturing not only firm-specific relative mispricing but also industry-wide or market-wide absolute mispricing. For all these proxies for mispricing, the greater the value is, the more the firm is undervalued.[24]

Table VII presents the estimation results for this cross-sectional analysis. Columns (1)-(2), (3)-(4), (5)-(6), and (7)-(8) report the results using the Pástor and Veronesi (2003) residual book-to-market, the Rhodes-Kropf, Robinson, and Viswanathan (2005) residual book-to-market, future excess returns, and raw book-to-market as the proxy for mispricing, respectively. The estimated coefficients from 2SLS regressions of each dependent variable - average product life-cycle length, average patent economic value, and average CEO's grant vesting period, on the long-term institutional ownership instrumented by Russell 2000 index membership are re-

[24]To save space, I refer the reader to each paper for the details of estimating each proxy.

ported. In all specifications for the subsamples with above-median degrees of undervaluation, I find positive and statistically significant coefficients on the instrumented long-term ownership. The effects are economically substantial. For instance, in column (2) with average product life-cycle length as the dependent variable using the Pástor and Veronesi (2003) undervaluation proxy, given that the sample standard deviation of long-term institutional ownership is 17.4%, a one-standard-deviation increase in long-term institutional ownership is followed by an increase in average product life-cycle length of 0.607 years which is seven months and one week. It is approximately 57% of the standard deviation of average product life-cycle length. On the other hand, for the subsamples of firms with below-median degrees of undervaluation, the estimated coefficients are much smaller in magnitude or are not statistically significant. The evidence from this cross-sectional analysis implies that the effects of long-term ownership on corporate investment horizon, the value of corporate investment, and managerial incentive horizon are stronger for highly undervalued firms, which is consistent with the horizon alignment hypothesis developed in Section I.

TABLE VII ABOUT HERE

E. Investment Horizon and Capital Allocations

To investigate the capital allocation channel for the adjustment of corporate investment horizon in response to an increase in long-term institutional ownership, I estimate the following segment-level IV-2SLS specification:

$$\begin{aligned} LTO_{i,t} &= \alpha + \delta_1 STO_{i,t} + \delta_2 Russell2000_{i,t} + \delta_3 (Rank^*_{i,t} - 1000) \\ &+ \delta_4 Russell2000_{i,t}(Rank^*_{i,t} - 1000) + \delta_5 FloatAdj_{i,t} + \tau_t + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} INV_{i,j,t} &= \theta + \beta_0 \hat{LTO}_{i,t} + \beta_1 LongPLC_{i,j} + \beta_2 LTO_{i,t-1} \times LongPLC_{i,j} + \gamma_1 STO_{i,t} \\ &+ \gamma_2 (Rank^*_{i,t} - 1000) + \gamma_3 Russell2000_{i,t}(Rank^*_{i,t} - 1000) + \gamma_4 FloatAdj_{i,t} \\ &+ \psi_{i,k} + \varsigma_t + \nu_{i,j,t}. \end{aligned}$$

where i indexes firms, j indexes segments, k indexes industries, t indexes years, INV is segment investment, which is capital expenditures of a segment over its identifiable total assets, $LongPLC$ is a dummy variable that equals one if the segment operates in an industry with above-median product life-cycle length, ς_t is year fixed effect, and $\psi_{k,t}$ denotes industry-firm fixed effects to control for unobserved heterogeneity at the industry-firm level.[25] The coefficients of interest in this segment-level specification are β_0 and $\beta_0+\beta_2$ which estimate the marginal effects of the firms long-term institutional ownership on the segments investment if the segment's industry has short and long product life-cycles, respectively.

The results are presented in columns (1) and (2) of Table VIII. In both regressions, the coefficient on long-term institutional ownership (β_0) is negative and statistically significant, suggesting that segments with short product life-cycles reduce their investments in physical assets in response to an increase in long-term ownership of their firms. On the other hand, the coefficient on the interaction term (β_2) is positive and statistically significant. Combining these two coefficients, i.e., by $\beta_0+\beta_2$, I find that an increase in long-term institutional ownership of a firm is followed by an increase in investments for long product life-cycle segments. For example, the coefficient of -0.0072 on long-term ownership in column (2) indicates that a one-standard-deviation increase in long-term institutional ownership is associated with a reduction in capital expenditures of approximately 1.6% of total assets for short product life-cycle segments, which is approximately \$2.14 million cut on average given that the sample mean of segment assets is \$134 million. The sum of the two coefficients on long-term ownership and the interaction term, -0.0072 + 0.0086 = 0.0014, indicates that for long product life-cycle segments a one-standard-deviation increase in long-term institutional ownership is associated with an increase in capital expenditures of approximately 0.32% of segment assets, which is approximately \$428,800 raise on average.[26] The economic magnitudes of this differential effect for short and long product

[25]Segment fixed effects cannot be included because Compustat Segment Data File does not provide a unique segment identifier across time. Firm fixed effects cannot be included either because it is not guaranteed that a firm is included in the sample in consecutive years within a narrow band-width around the index cutoff.

[26]It is worth noting that the overall decline in investments following an increase in long-term institutional ownership at the firm level found here is consistent with the evidence documented in Harford, Kecskes, and Mansi (2016).

life-cycle segments are significant. The coefficient of 0.0086 on the interaction term implies difference in capital expenditures of approximately 1.95% of segment assets in response to a one-standard-deviation increase in long-term ownership, and this is nearly 34% of the standard deviation of segment investment.

To additionally examine whether these capital reallocations are made toward long-term *and* profitable segments, I execute cross-sectional analyses by interacting the aforementioned segment-level specification with another indicator variable for segments with greater values of investment projects, i.e., *High PEV*, which is defined as a dummy variable equal to one if the patent economic value of the segment's industry is above-median among all segments within the firm. The results are reported in columns (3) and (4) of Table VIII. In both specifications, the coefficient on the interaction term, $LTO \times LongPLC \times HighPEV$, is positive and statistically significant, which implies that the documented capital reallocation effect of long-term ownership toward long-term segments in columns (1) and (2) is more pronounced among segments with high value of investment projects. Together with the negative and statistically significant coefficient on long-term ownership (LTO), this result shows that firms reallocate their capital from short-term *and* less profitable segments to longer-term *and* more profitable segments in response to an increase in long-term institutional ownership.

Overall, the results in this segment-level analysis suggest that, when there is an increase in long-term institutional ownership, conglomerate firms reallocate their capital toward segments with long-term profitable investment projects, which is consistent with the horizon alignment hypothesis.

TABLE VIII ABOUT HERE

F. The Horizon Alignment through Long-term Block-holders

As mentioned earlier, the literature has evolved to look at institutional investors as the owners of firms rather than just trading agencies. Investors holding a large block of shares of

a firm likely have more influence on the firm's choice of investment projects either because the firm's manager might observe changes in ownership by those investors thereby modifying the firm's investment policies due to tightened or relaxed pressures for short-run stock performance, or because the block shareholders are active enough to participate in the firm's board meetings and directly influence the firm's investment decisions or try to indirectly affect the corporate investment policies by voting for the changes in executive compensation structures.

To examine whether long-term investors with likely more intervenient power are more influential for the changes in managerial incentive horizon and a firm's choices of investment projects, I calculate the ownership by long-term institutional investors who own 5% or more of total shares of the firm. Then I repeat the same 2SLS regressions in section IV.C replacing long-term ownership with this long-term block ownership. Many studies have shown that block shareholders in general indeed influence management and corporate policies (e.g., Holderness (2003), Chen, Harford, and Li (2007), Cronqvist and Fahlenbrach (2009), and Becker, Cronqvist, and Fahlenbrach (2011)). In addition, Brav et al. (2008) and Brav, Jiang, and Kim (2015) find that 13D filings by activist hedge funds with a large stake lead to higher firm value as well as improved firm-level operating performance and plant-level productivity.[27] Thus, a positive coefficient on long-term block ownership would support the aforementioned arguments on the potential channels through which long-term investors influence firms' investment project choices.

The estimation results from the 2SLS specifications on long-term block ownership are presented in Table IX. The positive coefficients on the instrumented long-term block institutional ownership are both statistically and economically significant in all specifications. In column (2) for example, with the average product life-cycle length as the dependent variable, a one-standard-deviation increase in long-term institutional ownership due to the index assignment to Russell 2000 leads to an increase in average product life-cycle length by 0.376 years which is approximately four months and two weeks. These results strengthen the plausibility of the

[27]Edmans (2014) reviews theoretical papers as well as other empirical papers supporting this view on block shareholders as active monitors rather than passive traders.

documented causal horizon alignment effects.

TABLE IX ABOUT HERE

V. Conclusion

In this paper, I study the effect of investment horizons by institutional investors on the horizons of firms' real investments. A battery of analyses looking into institutional holdings and patent citation data provides strong empirical evidence that, in the presence of mispricing, an increase in long-term institutional ownership leads to a lengthened average product life-cycle length of U.S. conglomerate firms. This evidence can be interpreted that, when a stock price of a firm deviates from its fundamental value, the firm increases its corporate investment horizon in response to an inflow of long-term institutional investors as the firm's equity shareholders because it alleviates the equilibrium short-termism by credit- and maturity-constrained short-term arbitrageurs and firms that compensate their managers partly for short-term stock performance.

As a baseline estimation result using a large panel data set, I find a positive relationship between long-term institutional ownership and the average product life-cycle length. This relationship is stronger for firms with greater mispricing, which confirms that this horizon alignment comes from the alleviation of short-term investors' arbitrage-seeking behaviors. A plant-level analysis reveals the within-conglomerate capital reallocation channel behind this horizon alignment. To establish the causality of this baseline relationship, I exploit the firms in a narrow bandwidth around the Russell 1000/2000 index threshold and instrument long-term institutional ownership by the Russell 2000 membership dummy variable based on the sharp discontinuity in long-term ownership around the threshold which is not related to factors that may affect corporate investment horizons. Then, executing IV-2SLS regressions, I document the causal evidence that long-term institutional investors have positive influences on firms' average product life-cycle lengths through governance mechanisms such as large stake holdings

or shareholder rights protection. Finally, as an indirect evidence of the higher fundamental value of long-term investment projects, I find that the short-run performance following an increase in long-term institutional ownership is higher for firms with long product life-cycle than for those with short product life-cycle.

To the best of my knowledge, this paper is the first to show that investor horizons affect the horizons of firms' real investments and that there exists horizon alignment between investors and firms. Some previous studies in the literature have already shown that the existence of short-term investors pressures managers to cut R&D spending to boost short-term earnings and thereby short-term stock prices in the spirit of, for example, Bolton, Scheinkman, and Xiong (2006) (e.g., Bushee (1998) and Cremers, Pareek, and Sautner (2016)). However, while they compare the really-short-term earnings management versus overall investments in tangible or intangible assets regardless of their horizons, in this paper I compare real investments in short-term projects versus long-term projects.

This study also sheds light on the role of long-term institutional investors as owners of firms. In particular, the findings in this paper strengthen the view that lengthening investor horizons can mitigate short-termism problems prevailing among U.S. firms and help them pursue more productive long-term investment projects. Moreover, a further evidence that this effect is more pronounced among firms with large blockholder ownerships possibly opposes the argument that short-termism problems can be resolved by investors holding large stakes of the firms without having to induce investors to lengthen their investment horizons (e.g., Edmans (2015)). A compromised view, which is actually the key takeaway from this study, could be that it is the blockholders with long-term investment horizon who can help corporate managers pursue more profitable long-term investment projects without being distracted.

In this spirit, the evidence documented here also has a policy implication that regulations which would discourage short-term trading behaviors by investors could be a remedy to the prevalent short-termism among U.S. corporations, especially in the context of biased managerial decisions toward investment projects with shorter horizon. This implication in turn supports

the recent moves by politicians and regulators such as the tax reforms proposed by Hilary Clinton in 2015.

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Appendix: Variable Definitions

Average PLC length	The asset-weighted average of industry-level product life-cycle length across all business segments of a publicly listed U.S. conglomerate firm. The product life-cycle length is calculated as the industry median of the patent-level average forward citation lag where the average forward citation lag is the average of the time lapse between the cited patent's grant date and a subsequent citation across all citing patents. For the details of the calculation of the average forward citation lag, see Bilir (2014).
Average PEV	The asset-weighted average of industry-level economic value of patents across all business segments of a publicly listed U.S. conglomerate firm. The economic value of patents for each industry is calculated as the average of the Kogan, Papanikolaou, Seru, and Stoffman's (2017) announcement-return-based measure across all patents in the industry over the six-year-period prior to each year.
Ln(Average PEV)	Natural logaithm of *Average PEV*.
Average CGV period	The average CEO grant vesting (CGV) period in months, calculated as the value-weighted average of vesting period across all performance-based grants in a CEO's compensation package, using the data collected from the Incentive Lab. The vesting period for each grant is computed as the exponentially-weighted average (with the half-life of 6 months) of vesting months between the start and the end of the award vesting period.
Long-term ownership	The fraction of shares held by long-term institutional investors whose portfolio turnover is less than or equal to 35%, where the portfolio turnover is calculated as the fraction of shares that are no longer held after three years of their purchases. For the details of the calculation of this measure, see Derrien, Kecskes, and Thesmar (2013).
Institutional ownership	The fraction of shares held by institutional investors in the 13F data.

Block ownership	The fraction of shares held by institutional investors who own 5% or more of total shares outstanding of the firm.
Sales growth	[Sales(t) - sales(t-1)]/sales(t-1).
Cash flow	(Earnings before interest and taxes + depreciation)/total assets.
Debt	Total debt/total assets.
Size	Natural logarithm of total assets.
Q	(Total assets - book value of equity + market value of equity)/total assets.
Investment	Capital expenditure over total assets.
R&D	Research and development expenditure over total assets.
PV B/M	Residual book-to-market (Pástor and Veronesi (2003)).
RRV B/M	Residual book-to-market based on Rhodes-Kropf, Robinson, and Viswanathan (2005).
Future excess return	Future realized return in excess of its expected return based on Baker, Stein, and Wurgler (2003) and Polk and Sapienza (2009).
Raw B/M	The reciprocal of *Q*.
Market cap.	CRSP price multiplied by the number of shares outstanding as of the last trading day of May.
*Rank**	The rank of each firm based on observed market capitalization as of the last trading day of May.
Float adjustment	The difference between *Rank** and the actual rank assigned by Russell at the end of June.
G-index	The GIM governance index.
ROA	Net income divided by total assets.

Figure I
Long-term Ownership around Russell 1000/2000 Threshold

This figure plots the long-term institutional ownership for the third quarter against the rank distance from the Russell 1000/2000 threshold during 1990-2005, within a narrow bandwidth around the threshold. The stocks are sorted into each bin of ten ranks, and for each bin the long-term institutional ownerships are averaged across all years (y-axis). The distances from threshold are calculated using the actual ranks assigned by Russell (x-axis).

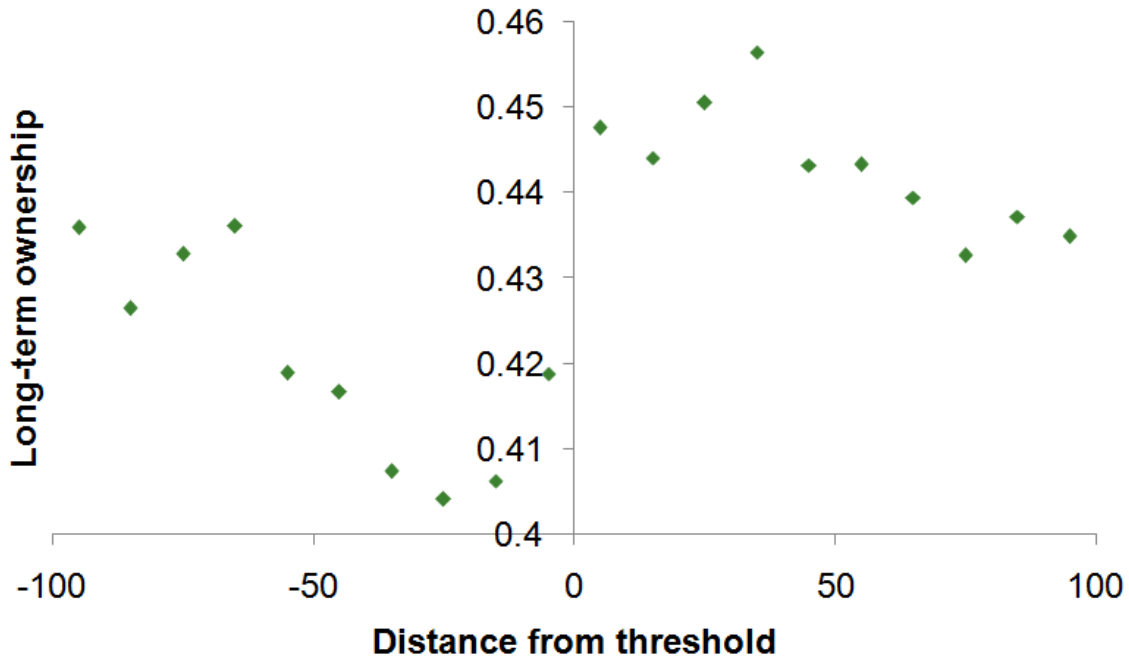

Table I
Product Life-cycle Lengths and Patent Economic Values by Industry

This table lists the product life-cycle length for each SIC 3-digit code.

SIC code	SIC industry name	PLC length
343	Heating Equipment, Except Electric	12.98
341	Metal Cans And Shipping Containers	12.75
345	Screw Machine Products, Bolts, Nuts, Screws	12.53
342	Cutlery, Handtools, And General Hardware	12.36
344	Fabricated Structural Metal Products	12.18
349	Miscellaneous Fabricated Metal Products	12.03
353	Construction, Mining, And Materials Handling	11.90
372	Aircraft and Parts	11.76
358	Refrigeration And Service Industry Machinery	11.62
366	Communications Equipment	11.47
351	Engines And Turbines	11.31
283	Drugs	11.19
369	Miscellaneous Electrical Machinery, Equipment	11.04
335	Rolling, Drawing, Extruding Of Metals	10.91
285	Paints, Varnishes, Lacquers, Enamels	10.75
354	Metalworking Machinery and Equipment	10.62
363	Household Appliances	10.58
352	Farm And Garden Machinery And Equipment	10.43
384	Surgical, Medical, Dental Instruments And Supplies	10.26
289	Miscellaneous Chemical Products	10.15
131	Crude Petroleum and Natural Gas Extraction	10.07
359	Miscellaneous Industrial And Commercial	9.94
371	Motor Vehicles And Motor Vehicle Equipment	9.81
346	Metal Forgings And Stampings	9.70
138	Oil and Gas Field Services	9.62
386	Photographic Equipment And Supplies	9.53
379	Miscellaneous Transportation Equipment	9.46
355	Special Industry Machinery, Except Metalworking	9.37
481	Telephone Communications	9.27
220	Textile mill products	9.15
331	Steel Works, Blast Furnaces, Mills	9.01
737	Programming, Data, and Computer Related Services	8.88
356	General Industrial Machinery and Equipment	8.74
381	Detection and Navigation Instruments, Equipment	8.61
483	Radio and Television Broadcasting Stations	8.46
738	Miscellaneous Business Services	8.30
364	Electric Lighting and Wiring Equipment	8.15

291	Petroleum Refining	8.01
284	Soap, Detergents, Cosmetics	7.83
281	Industrial Inorganic Chemicals	7.62
367	Electronic Components And Accessories	7.39
287	Agricultural Chemicals	7.14
357	Computer and Office Equipment	6.90
365	Household Audio and Video Equipment	6.62
387	Watches, Clocks, Clockwork Operated Devices	6.29
383	Electronics Machinery	5.99

Table II
Summary Statistics

This table reports summary statistics of the variables for the sample that I use to examine how long-term institutional ownership is associated with corporate investment horizon. All variables are defined in Appendix.

	Mean	SD	P25	P50	P75	N
Panel A. Firm-Level Variables						
Average PLC length	9.6409	1.4360	8.3579	9.6530	10.7377	6619
Average PEV	12.8608	4.1883	9.6518	11.6151	13.9902	6619
Ln(Average PEV)	2.5102	0.2838	2.2671	2.4523	2.6384	6619
Average CGV period	12.9456	8.3327	7.8750	11.5000	15.0313	1232
Long-term ownership	0.3228	0.2263	0.0968	0.3494	0.5080	6591
Long-term block ownership	0.1009	0.1107	0.0000	0.0912	0.1788	6591
Institutional ownership	0.4724	0.3213	0.1513	0.5115	0.7475	6591
Sales growth	0.1257	0.4047	-0.0288	0.0758	0.1885	6536
Cash flow	0.0981	0.1708	0.0731	0.1197	0.1672	6557
Debt	0.2199	0.1874	0.0722	0.2026	0.3159	6559
Size	6.4138	2.1904	4.8436	6.3758	7.9578	6569
Q	1.8476	1.4181	1.1250	1.4464	2.0610	6527
Investment	0.0509	0.0472	0.0224	0.0386	0.0647	6472
R&D	0.0539	0.0886	0.0083	0.0265	0.0696	6554
Panel B. Segment-Level Variables						
PLC length	9.5557	1.2362	8.7100	9.7300	10.6100	21170
PEV	16.7895	13.9524	9.7163	11.8385	16.0505	21170
Investment	0.0587	0.0578	0.0225	0.0433	0.0749	21035
Ln(Sales)	5.1674	2.1822	3.7091	5.2376	6.7154	20958
Cash flow	0.1212	0.2349	0.0469	0.1236	0.2119	18991
Size	4.9000	2.2330	3.3405	4.9399	6.5103	21027

Table III
Horizon Alignment between Investors and Firms: Panel Regressions

This table reports the results of panel regressions on the relationship between long-tern institutional ownership and corporate investment horizon, corporate investment value, and managerial incentive horizon, proxied by the average product life-cycle (PLC) lengths, the average patent economic value (PEV), and the average CEO's grant vesting (CGV) period, respectively. All variables are defined in Appendix. I include year fixed effects and/or firm fixed effects in the specifications. In each column, I report estimated coefficients from OLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table documents positive correlations between long-term institutional ownerships and the average PLC length, PEV, and CGV period in the following year.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Avg. PLC length		Ln(Avg. PEV)		Avg. CGV period	
LT ownership	3.1923**	3.1577**	0.2123**	0.2055**	37.1639***	19.5515**
	(2.61)	(1.98)	(2.78)	(2.46)	(3.84)	(2.17)
Inst. ownership	-0.8280	-0.8275	-0.2095***	-0.1637**	-15.4475***	-9.2222**
	(-1.01)	(-1.51)	(-3.88)	(-2.25)	(-3.86)	(-2.04)
Sales growth	0.1795***	-0.0117	-0.0525**	0.0028	0.9387	0.8867
	(3.85)	(-0.39)	(-2.40)	(0.25)	(0.53)	(0.67)
Cash flow	0.0014	0.0052	0.0852***	-0.0733	13.5285***	0.9754
	(0.04)	(0.25)	(3.47)	(-1.62)	(4.54)	(0.18)
Debt	0.3612***	0.0796	0.0547	-0.0669*	1.3466	-3.8583
	(7.23)	(1.42)	(1.50)	(-1.69)	(0.67)	(-1.62)
Size	-0.0814***	-0.0416	0.0210***	0.0105	0.3767	-0.0435
	(-15.28)	(-1.27)	(8.27)	(0.69)	(1.66)	(-0.04)
Q	-0.0470***	0.0130	0.0113**	0.0001	-0.2881	-0.3840
	(-3.88)	(1.02)	(2.55)	(0.02)	(-0.91)	(-1.29)
Investment	-1.4071**	-0.1976	-0.0709	-0.0923	-13.4945	9.8252
	(-2.56)	(-1.31)	(-0.64)	(-0.90)	(-1.31)	(0.80)
R&D	-2.2622***	0.1332	0.4869***	-0.0219	-19.4588***	-6.6132
	(-7.79)	(0.76)	(4.94)	(-0.28)	(-4.70)	(-1.15)
Constant	9.6705***	9.5818***	1.7925***	1.8119***	7.8656***	9.3395
	(705.95)	(182.25)	(64.65)	(20.07)	(3.60)	(1.16)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	No	Yes
N	6,052	6,052	6,052	6,052	1,190	1,190
R^2	0.0826	0.0171	0.0595	0.0066	0.0695	0.1040

Table IV
Pre-treatment sample differences around the Russell 1000/2000 threshold

This table reports the mean differences in various firm characteristics around the Russell 1000/2000 threshold in the year prior to the index assignment. The discontinuity tests are done by regressing each firm characteristic on the dummy variable *Russell 2000* which is equal to one if the firm belongs to the Russell 2000 index, for each subsample with different bandwidths in the neighborhood of the threshold. The bandwidths 20, 25, 30, and 35 indicate the subsamples of firms ranked in [981, 1020], [976, 1025], [971, 1030], and [966, 1035], respectively, based on observed market capitalization from CRSP as of the last trading day of May. All dependent variables are defined in Appendix. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that there is no significant differences in observed market capitalization, long-term institutional ownership, sales growth, cash flow, debt ratio, and average product life-cycle length in very small bandwidths around the Russell 1000/2000 threshold in the year prior to the index assignment, which means that firms are very similar on both sides of the threshold.

Dependent variable	(1) Market cap.	(2) Long-term ownership	(3) Sales growth	(4) Cash flow	(5) Debt	(6) Average PLC length
Russell2000 (bandwith = 20)	10.76	0.00	0.00	-0.00	0.01	0.04
	(0.06)	(0.09)	(0.07)	(-0.02)	(0.21)	(0.31)
Russell2000 (bandwith = 25)	13.92	0.00	-0.00	-0.01	0.02	0.04
	(0.10)	(0.08)	(-0.02)	(-0.41)	(0.39)	(0.34)
Russell2000 (bandwith = 30)	-16.27	0.00	-0.00	-0.01	0.00	0.02
	(-0.19)	(0.25)	(-0.03)	(-0.60)	(0.19)	(0.19)
Russell2000 (bandwith = 35)	-71.22	0.01	0.02	-0.02	0.02	0.05
	(-0.94)	(0.73)	(0.33)	(-0.98)	(0.66)	(0.41)

Table V
Differences in Long-term Ownership around the Russell 1000/2000 Threshold: First-Stage Regressions

This table reports the regression discontinuity test results from first-stage regressions on the differences in long-term (block) institutional ownership around the Russell 1000/2000 threshold. *Russell 2000* is defined in Table IV. *Rank** is the rank of each firm based on observed market capitalization as of the last trading day of May. *Float adjustment* is defined as the difference between *Rank** and the actual rank assigned by Russell at the end of June. All other variables are defined in Appendix. I include year fixed effects in all specifications. In each column, I report estimated coefficients from OLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that there is a sharp discontinuity in long-term (block) institutional ownership around the Russell 1000/2000 threshold, i.e., long-term (block) institutional ownerships of firms that are at the top of the Russell 2000 are much larger than those of slightly larger firms at the bottom of the Russell 1000.

	(1)	(2)	(3)	(4)
Dependent variable	Long-term ownership		Long-term block ownership	
Russell2000	0.0635***	0.0612***	0.0310**	0.0331**
	(4.73)	(4.18)	(2.34)	(2.68)
(Rank* - 1000)	-0.0006	-0.0005	0.0003	0.0002
	(-1.38)	(-1.16)	(0.73)	(0.47)
(Rank* - 1000) x Russell 2000	0.0002	0.0001	-0.0006	-0.0005
	(0.64)	(0.43)	(-1.43)	(-1.17)
Float adjustment	0.0003***	0.0003***	0.0001**	0.0001**
	(12.40)	(10.50)	(2.77)	(2.79)
Constant	0.3103***	0.3065***	0.1161***	0.1269***
	(17.20)	(12.78)	(4.37)	(4.92)
Year FE	No	Yes	No	Yes
N	366	366	366	366
R^2	0.1412	0.2157	0.0480	0.0582

Table VI
Horizon Alignment between Investors and Firms: Instrumental Variable Estimates

This table presents the results of 2SLS regressions on the effects long-term institutional ownership on corporate investment horizon, the value of corporate investment, and managerial incentive horizon, proxied by the average product life-cycle (PLC) length, the average patent economic value (PEV), and the average CEO's grant vesting (CGV) period, respectively. 2SLS regressions instrument long-term ownership using the dummy variable *Russell 2000* defined in Table IV. *Rank** and *Float adjustment* are defined in Table V. All other variables are defined in Appendix. I include year fixed effects in all regressions. In each column, I report estimated coefficients from 2SLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that through sharply increased long-term institutional ownerships, the average product life-cycle length, the average PLC length, PEV, and CGV period of the firms at the top of the Russell 2000 are significantly greater than those of the slightly larger firms at the bottom of the Russell 1000.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Avg. PLC length		Ln(Avg. PEV)		Avg. CGV period	
Long-term ownership	3.2317**	3.2568**	0.2450**	0.2366**	21.2536**	20.6219**
	(2.52)	(2.47)	(2.58)	(2.40)	(2.54)	(2.50)
(Rank* - 1000)	0.0004	0.0004	0.0010	0.0010	0.1501	0.1522
	(0.34)	(0.35)	(1.43)	(1.27)	(0.54)	(0.59)
(Rank* - 1000) x Russell 2000	-0.0001	-0.0001	-0.0020	-0.0019	-0.2399	-0.2408
	(-0.11)	(-0.12)	(-1.59)	(-1.46)	(-0.53)	(-0.54)
Float adjustment	-0.0001	-0.0001	0.0002	0.0002	0.0236	0.0244
	(-0.64)	(-0.57)	(0.88)	(0.79)	(0.57)	(0.61)
Year FE	No	Yes	No	Yes	No	Yes
N	366	366	324	324	77	77

Table VII
Horizon Alignment between Investors and Firms: Cross-sectional Effects

This table reports the results of IV-2SLS regressions on the effects of long-tern ownerships on corporate investment horizons, the value of corporate investment, and managerial incentive horizon, *separately* for the subsamples of more (above-median) and less (below-median) undervalued firms. Undervaluation is proxied by four different measures: residual book-to-market based on Pástor and Veronesi (2003) (*PV residual B/M*); residual book-to-market based on Rhodes-Kropf, Robinson, and Viswanathan (2005) (*RRV residual B/M*); future excess returns based on Baker, Stein, and Wurgler (2003) and Polk and Sapienza (2009) (Future excess return); and raw book-to-market based on Derrien, Kecskes, and Thesmar (2013) (Raw B/M). Long-term ownership is instrumented by the dummy variable *Russell 2000* defined in Table IV. I control for distance from threshold, float adjustment, and year fixed effects in all specifications. In each column, I report estimated coefficients from 2SLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that the horizon alignment effects are stronger for more undervalued firms.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Undervaluation Proxy							
	PV B/M		*RRV* B/M		Fut. exc. ret.		Raw B/M	
	Low	High	Low	High	Low	High	Low	High
Dep. Var.	Average PLC length							
LTO	2.9128*	3.5014**	2.6687*	3.7870***	2.0776	3.5707***	0.6655	3.2216**
	(1.91)	(2.63)	(1.86)	(2.98)	(0.83)	(3.09)	(0.26)	(2.14)
N	190	175	182	163	157	185	171	192
Dep. Var.	Ln(Average PEValue)							
LTO	-0.1226	0.2408**	0.8950	0.2503**	-0.2502	0.2297**	-0.1195	0.2367**
	(-0.44)	(2.60)	(0.94)	(2.35)	(-0.28)	(2.29)	(-0.26)	(2.44)
N	160	154	158	151	143	169	145	164
Dep. Var.	Average CGV period							
LTO	-7.2935	22.7628***	4.0811	20.6900**	-2.4752	21.9286**	1.5061	22.0803***
	(-0.39)	(3.42)	(0.48)	(2.40)	(-0.24)	(3.44)	(0.16)	(3.24)
N	39	38	37	32	35	42	37	40
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table VIII
Long-Term Institutional Ownership and Investments across Segments

This table reports the results of IV-2SLS regressions on the cross-sectional differences across segments in the effect of long-term institutional ownership (*LTO*) on segment investments depending on the segments' product life-cycle lengths. *Long PLC* is a dummy variable equal to one for the segments with above-median product life-cycle lengths within the firm in a given year. *High Value* is a dummy variable equal to one for the segments with above-median patent economic values within the firm in a given year. Long-term ownership is instrumented by the dummy variable *Russell 2000* defined in Table IV. I control for distance from threshold, float adjustment, firm-industry fixed effects, and year fixed effects in all specifications. In each column, I report estimated coefficients from 2SLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors clustered by *industry*. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that an inflow of long-term institutional investors leads to capital reallocations by firms from short-horizon and less-profitable to long-horizon and more-profitable segments.

	(1)	(2)	(3)	(4)
Dependent variable	Investment			
LTO	-0.0075**	-0.0072**	-0.0079**	-0.0069**
	(-2.02)	(-1.99)	(-2.12)	(-2.06)
Long PLC	0.0004	0.0027*	-0.0042*	-0.0053*
	(0.23)	(1.73)	(-1.77)	(-1.95)
High PEV			0.0053*	0.0062*
			(1.80)	(1.85)
LTO × Long PLC	0.0092**	0.0086**	-0.0002	-0.0030
	(2.08)	(2.04)	(-0.03)	(-0.69)
LTO × High PEV			-0.0032	-0.0045
			(-0.43)	(-0.61)
Long PLC × High PEV			-0.0019	0.0004
			(-0.32)	(0.09)
LTO × Long PLC × High PEV			0.0286***	0.0238**
			(2.66)	(2.19)
Constant	0.0708***	0.0683***	0.0701***	0.0680***
	(55.25)	(54.07)	(45.84)	(45.14)
Controls	No	Yes	No	Yes
Industry x Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	988	988	811	811

Table IX
Horizon Alignment between Block-holders and Firms: Instrumental Variable Estimates

This table presents the results of 2SLS regressions on the effects long-term *block* institutional ownership on corporate investment horizon, the value of corporate investment, and managerial incentive horizon, proxied by the average product life-cycle (PLC) length, the average patent economic value (PEV), and the average CEO's grant vesting (CGV) period, respectively. 2SLS regressions instrument long-term ownership using the dummy variable *Russell 2000* defined in Table IV. *Rank** and *Float adjustment* are defined in Table V. All other variables are defined in Appendix. I include year fixed effects in all regressions. In each column, I report estimated coefficients from 2SLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that through sharply increased long-term *block* institutional ownerships, the average product life-cycle length, the average PLC length, PEV, and CGV period of the firms at the top of the Russell 2000 are significantly greater than those of the slightly larger firms at the bottom of the Russell 1000.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Avg. PLC length		Ln(Avg. PEV)		Avg. CGV period	
Long-term block ownership	2.3016**	2.1672***	0.1503**	0.1891**	13.9178**	14.6171**
	(2.33)	(3.10)	(2.11)	(2.46)	(2.31)	(2.39)
(Rank* - 1000)	-0.0044	-0.0018	0.0048	0.0044	0.0815	0.0142
	(-0.77)	(-0.82)	(0.83)	(0.85)	(0.58)	(0.13)
(Rank* - 1000) x Russell 2000	0.0068	0.0029	-0.0068	-0.0063	-0.1513	-0.0384
	(0.89)	(1.05)	(-0.96)	(-0.99)	(-0.68)	(-0.24)
Float adjustment	-0.0003	-0.0002	0.0002	0.0002	-0.0026	-0.0226
	(-0.49)	(-0.75)	(0.34)	(0.31)	(-0.10)	(-0.61)
Year FE	No	Yes	No	Yes	No	Yes
N	366	366	324	324	77	77

Table A.I
Long-Term Ownership and Performance

This table reports the results of 2SLS regressions on the impact of long-term institutional ownership on firm performance measured by return on assets (ROA) separately for the full sample and subsamples based on the average product life-cycle length. *ROA* is defined as net income divided by total assets. In (2)-(3) and (5)-(6), I separate the sample based on whether the average product life-cycle length is above or below the sample median for a given year. *Long-term ownership* is instrumented by the dummy variable *Russell 2000* defined in Table V. *Rank** and *Float adjustment* are defined in Table VI. All other variables are defined in Appendix. I include year fixed effects in all regressions. In each column, I report estimated coefficients from 2SLS regression and their t-statistics, calculated using heteroskedasticity-robust standard errors. ***, ** , and * indicate the statistical significance at the 1%, 5%, and 10% levels, respectively. This table shows that long-term institutional ownership has a positive impact on firm performance in the following year and this effect is more stronger for firms with longer investment horizons in that year.

Dependent variable	ROA					
	(1)	(2)	(3)	(4)	(5)	(6)
	Average PLC length			Average PLC length		
	All	Short	Long	All	Short	Long
Long-term ownership	0.1656*	0.0050	0.7165**	0.1578*	-0.0540	0.8073*
	(1.76)	(0.06)	(2.00)	(1.72)	(-0.44)	(1.92)
(Rank* - 1000)	-0.0001	-0.0001	-0.0005	-0.0001	-0.0001	-0.0005
	(-1.04)	(-0.69)	(-1.09)	(-1.00)	(-0.47)	(-1.02)
(Rank* - 1000) x Russell 2000	-0.0000	-0.0001	0.0005	-0.0000	-0.0001	0.0005
	(-0.07)	(-0.16)	(0.94)	(-0.09)	(-0.28)	(0.89)
Float adjustment	-0.0000	0.0000	-0.0002	-0.0000	0.0000	-0.0002
	(-1.02)	(0.01)	(-1.47)	(-0.93)	(0.14)	(-1.40)
Constant	-0.0463	0.0330	-0.3602	-0.0448	0.0387	-0.3844
	(-0.71)	(0.77)	(-1.38)	(-0.64)	(0.74)	(-1.30)
Year FE	No	No	No	Yes	Yes	Yes
N	319	144	175	319	144	175

Political Corruption and Corporate Cash Holdings

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Political Corruption and Corporate Cash Holdings

Abstract

This study empirically analyzes the effects of political corruption on corporate cash holdings policy and the impact of cash holdings on firm performance using 97 multinational data. Specifically, we find that there is a nonlinear cubic function relationship between the political corruption and corporate cash holdings with a negative coefficient of cubic term of political corruption. In advanced countries with low levels of political corruption, there is a U-shape relationship between political corruption and cash holdings; however, in frontier and emerging countries, there is an Inverted-U-shape relationship. These results show that two hypothesis 'Expropriation Shielding hypothesis' and 'Preoccupancy hypothesis' on previous literature are not conflicting, but can be explained differently according to the level of development of countries and the level of political corruption. In addition, we find that the effects of political corruption on firm performance when firms use cash are different in developed and developing countries. From these results, we suggest that political corruption is an important variable in corporate financial policy and firm performance.

1. Introduction

Political corruption is prevalent all over the world and especially cohesion between politicians and firms has received much attention both in the literature and media (Tanzi, 1998). For example, recently it has been hot issue in media that presidential impeachments of former president Park in Korea and former president Rouseff in Brazil have been mainly due to their cohesion with private companies. Therefore, academic literatures document the impact of political connection or environment not only on the performance firms but also the financial policy of firms. For example, Fisman (2001) shows that the value of Indonesian firms are directly affected by the political connection with the former president Suharto who has dominated the political structure of Indonesia for 31 years (1967-1998). In addition, previous studies show that the degree of political corruption in the economy affects the financial policy of the firms such as cash holding policy, earnings management, or capital structures. Among those financial policies, the most important financial policy is cash holdings policy for both corrupt politicians and politically-connected firms, because cash guarantees anonymity and can be used autonomously with low level of surveillance (because of its liquidity and flexibility). Therefore, political environment will affect the cash holdings policy of the firms because cash will be the target of expropriation by the corrupt politicians while companies want to take advantage of corrupt politicians by lobbying through cash. Therefore, this study examines the impact of corruption level of countries on the cash holdings policy of firms belong to the country using the samples from 97 countries.

Corruption level of the country is one of the most important national cultural variables that characterizes and evaluates the political and socioeconomic status of the country, because it influences the overall economic activities of people in the nation and financial policy of firms. Dynamic impact of corruption not only influences the overall economy but also all aspects of society representing the perceived culture of the country. Cultural factors are also influential to the wide range of society, so previous literatures show that significant portion of the firms' financial policy is explained by country level cultural variables while firm-specific characteristics explain only small portion of it (Chen et al., 2015; Doidge et al., 2007; Karolyi, 2016). However, there is no study directly examines the impact of national corruption level on the financial policy focusing on cash holdings policy using multinational data, and there is no study how the corruption and cash holdings affect the

performance of the firm. Furthermore, this study subcategorize the sample into frontier, emerging, and developed countries, and show that the level of economic development has moderating effect to the relation between corruption and cash holdings policy. More specifically, the literatures show that variations in national political corruption affects macroeconomic growth, market structure, corporate decision makings and financial policy except for cash holding policy and its impact on firm performance even though cash is an important asset especially in corrupt economy. Therefore, this study contributes to the literature by testing the impact of national corruption level on firms' cash holdings policy and further its impact on the firms' performance.

In previous studies, there are two controversial hypotheses on the relation between political corruption and cash holdings policy. The first hypothesis is the 'Expropriation Shielding Hypothesis' that the higher level of political corruption, firms will hold the smaller amount of cash to prevent the expropriation by the corrupt politicians. The second hypothesis is the 'Preoccupancy Hypothesis' that the higher level of political corruption, the firm will hold the more amount of cash to take an advantage from corrupt politicians by bribing or lobbying using the cash. However, the previous studies are limited to the national or regional level to test these two hypotheses. By expanding research sample to multinational level, we are able to find how political corruption affects differently on financial policy and performance. Moreover, we are able to compare the impact of political corruption of each countires. Therefore, this study uses multinational data to examine how the effects of corruption on cash holdings differ among frontier, emerging, and developed countries based on these two hypotheses.

In this study, we find that there is a nonlinear cubic function relationship with a negative coefficient of cubic term of political corruption between the political corruption and cash holdings in the firm year observations sample of 600,000 in 97 countries. Among those sample firms, we find that there is a difference in the effect of political corruption on cash holdings among frontier, emerging, and developed countries. In developed countries, we find the U-shape relation between political corruption and cash holdings. Specifically, in developed countries with very low levels of corruption, there is a negative correlation between political corruption and firm cash reserves. However, in some developed countries where corruption is moderate, there is a positive correlation between political corruption and

firm cash reserves. In addition, we find the inverse U-shape relation between political corruption and cash holdings. Specifically, in some emerging countries where corruption is moderate, there is a positive correlation between political corruption and firm cash reserves. In contrast, in some emerging and frontier economies where corruption is extremely high, negative correlations exist between political corruption and firm cash holdings. From our result, expropriation shielding hypothesis and preoccupancy hypothesis are both supported. In developed countries with low level of political corruption, there is less advantage from corruption, so only risk of expropriation exists. In this sample, expropriation shielding hypothesis explains the negative relation between political corruption and cash holdings. In sample with moderate level of corruption in some developed and emerging countries, there is huge advantage from corrupt politicians, so preoccupancy hypothesis well explain the positive relation between political corruption and cash holdings. In the last sample with extremely high level of corruption in some emerging and frontier countries, the risk of expropriation is severe, so firms want to avoid expropriation by reducing cash holdings. In this case, expropriation shielding hypothesis explain the positive relation between political corruption and cash holdings again. These results are robust in the analysis using 2 Stage Least Square (2SLS) using an instrument variable and Propensity Score Matching (PSM), and thus we find the consistent results after controlling for the endogeneity problems.

Moreover, we analyze the effect of political corruption on operating performance when using cash held by the firms. In developed countries with low levels of corruption, reducing cash holdings is beneficial to operating performance. However, in some developed and emerging countries with a medium level of corruption, raising cash reserves is favorable to operating performance. In some frontier and emerging economies, where the levels of corruption are high, it is advantageous to raise cash holdings, but firms have shown to reduce their cash holdings in reality to avoid an expropriation by corrupt politicians.

In this study, we find that both hypotheses can be explained according to the level of economic development and the level of corruption, rather than two hypotheses from the previous studies are opposing. This study extends the research on cash holdings among the studies on political corruption and financial policies of the firm from a country level to international level. We identify a nonlinear cubic function relationship between political corruption and cash holdings that has not been found in previous studies of multinational

countries and find that companies in frontier, emerging, and developed countries respond differently to political corruption in cash holding policy.

The following parts of this study are as follows. In Part 2, we describe the previous research and hypothesis. Part 3 describes the data and key variables. Part 4 describes the research model, and Part 5 describes the results of the empirical analysis derived from these research models. Part 6 deals with the limitations of the study and further research. Part 7 presents conclusions and implications of this study.

2. Literature Review and Hypothesis Development

2.1. Previous studies on culture and the financial policies of firms.

Previous studies have shown that national culture affects the formation of corporate governance and that corporate governance changes can affect corporate financial policies. According to LLSV (1998), shareholder rights protection is estimated to be influenced by cultural factors of the country. After the suggestion of LLSV(1998), other studies empirically find that cultural factors significantly affect the formation of corporate governance, especially shareholder rights protection (Dittmar et al. 2003; Pinkowitz et al. 2006; Kalcheva and Lins 2007; Li and Harrison, 2008).

In particular, Doidge, Karolyi, and Stulz (2007) show that while corporate governance variables are accounted for only 3% of firms' characteristics variables, 70% are accounted for by country dummy variables. In addition, Griffin et al. (2017) find that 90% of the country fixed effect in a firm-level corporate governance regression is explained by cultural factors such as the uncertainty avoidance and individualism. Meanwhile, recent studies have attempted to clarify the ways in which corporate financial policies are changed beyond the effects of cultural variables on corporate governance.

On the line of these previous studies, the most important field of research related to cultural factors in finance is 'change of financial policy' (Chui et al., 2002; Shao et al., 2010; Shao et al. Al., 2013; Boubakri et al., 2016). Specifically, Chen, Dou, Rhee, and Veeraraghavan (2015) identified the cultural influence on a firm's financial policy as 'cultural motive' and find that cultural factors have a significant influence. In addition, Karolyi (2016) stated that culture is a very important variable in financial decision making and should be considered because it increases explanatory power.

From the variables determined by financial policies of firms, we mainly focus on the Cash holding policies. Cash is the most unrestricted asset that can be used autonomously by financial policies (Pinkowitz et al. 2006). Therefore, cash is an asset that is greatly influenced by the agent problem (Jensen, 1986), and in the previous study, there was a significant correlation between cash and corporate governance (Pinkowitz et al., 2006; Dittmar et al., 2007). From this reason, Cash is suitable for studying how cultural factors determine corporate governance and how corporate governance affects financial policies.

Based on this logic, previous studies has been carried out until recently that the cultural factors at the national level affect the cash holdings of firms. Ramirez, A. & Tadesse, S. (2009) find that risk aversion among Hofstede's cultural variables has an effect on firm's cash holdings. In addition, Chen, Dou, and Rhee (2015) find that Hofstede's 'individualism' and 'risk aversion' have an impact on firm cash holdings. According to Chang, & Noorbakhsh (2009), even after controlling the effect of corporate governance and financial market development, 'risk aversion', 'masculinity' and 'long-term orientation' have an impact on firm cash holdings. Fernandes and Gonenc (2016) also find that the higher the cultural diversity, the lower the cash holdings. According to Dudley, and Zhang (2016), the higher the level of social trust, the more cash holdings the firm has.

2.2. Previous studies on corruption and financial policies

Meanwhile, there have been some studies that political corruption, which is a cultural variable that is mainly dealt with in this study, affects corporate financial policies. However, the results of the study on the effect of political corruption on corporate cash retention policies were not intensively investigated. In politics and economics, there have been many empirical studies that political corruption has influenced macroeconomic growth, market structure, and corporate decision making. Bliss and Di Tella (1997) and Ades and Di Tella (1999) find that corruption affects the national market structure. In addition, Shleifer and Vishny (1994) and Hellman et al. (2003) demonstrate that the political environment has a significant influence on the corporate operating activities. Mauro (1995) and Mo (2001) studied corruption and economic growth, and Friedman et al. (2000), Johnson et al. (2000), Choi and Thum (2005) investigated corruption and the size of underground economy in the country. As such, political corruption has a large macroeconomic impact and has a significant impact on the corporate operating activities.

Because political corruption has gained attention in politics and economics, many studies are continuing to find a macro-micro link between political and economic variables in macro view and corporate activities in micro view. Therefore, this study examines the effect of 'political corruption level', which is a national cultural variable, on 'cash holding policy' of corporate financial policy. According to Myers and Rajan (1998), cash, bearer bonds, and commodities are easier to be the target of expropriation than fixed assets because those assets are guaranteed anonymity, do not have specific owners, and are easy to transport. In particular, cash can be the easiest target for a politician to expropriate, and on the contrary, it is the most advantageous asset to use to take advantage of political corruption on the view of the firms. Therefore, cash can be directly affected the impact of political corruption on corporate financial policies rather than other assets.

From the previous literature, two hypotheses are controversial about the effect of political corruption on corporate cash holdings policies. ‘Expropriation Shielding hypothesis’ suggests that firms reduce their cash holdings to prevent expropriation of corrupt politicians, and from this hypothesis, it is expected to have a negative correlation between political corruption and cash holding policies. The contradictory "preoccupancy hypothesis" is that firms are actively using political corruption to facilitate government projects and loans, so firms tend to have more cash because cash is the fastest and least monitored asset for lobbying. From preoccupancy hypothesis, we expect that there is a negative relationship between political corruption and cash holdings.

2.3. Previous studies on Expropriation Shielding Hypothesis

First, in the previous studies, theoretical studies and empirical studies have been conducted in support of the expropriation shielding hypothesis that corporations tend to protect their assets by changing financial policies in order to prevent threats from political corruption. In theoretical research, research has been conducted on how companies behave when politically corrupt politicians exist outside. Shleifer and Vishny (1993) pointed out that corruption acts as a kind of informal tax, causing inefficiencies and lowering firms' performance. Stulz (2005) presented a model with three participants: politicians, corporate insiders such as managers, and external minor shareholders. In this model, a corporate insider may choose a project with a negative NPV to prevent expropriation if the cost of take over by corrupt politicians is large. In addition, Bai, Jayachandran, Malesky, and Olken (2014)

developed a model when a politician want bribes from a firm and how a firm choose which of two options that the firm would pay for bribes or transfer headquarters to another region. Firms have taken into account the cost of bribery and the cost of moving the headquarters, and they select an option with lower cost. Therefore, political corruption acts as a cost to a firm.

In the empirical study, there were not many studies that examine direct relationship between the financial policies of the political corruption. Some similar studies has been conducted in which firms actively change financial policies for rent-seeking when there is a power game between specific entities such as labor unions and firms. According to Klasa, Maxwell, and Ortiz-Molina (2009), firms tend to reduce cash holdings if they are in industry where the power of labor union is strong. In addition, Matsa (2010) find that as unions become more influential, firms strategically raise more debt, increase cash flow volatility and net income volatility, and increase the risk of bankruptcy. This result is based on the theory of Bronars and Deere (1991) and Perotti and Spier (1993), and in this theory, firm strategically take favorable position by showing an unstable state when a company is in a power game. Therefore, we expect that fleeing assets to avoid union demands is likely to be similar in situations where corrupt politicians demand bribery. In this study, we predict that firms will reduce cash and increase leverage by actively utilizing financial policies to maximize firm value and reduce bribery in power games with corrupt politicians.

Some empirical studies that examine more direct relationships between political corruption and cash holding policies have been conducted using data from the United States. Smith, J. D. (2016) find that firms with headquarters in corrupt state reduce cash holdings and boost leverage to avoid expropriation. In addition, according to Liu (2016), CEOs from corrupt cultures are more likely to engage in earnings management, accounting fraud, and opportunistic internal transactions.

Based on these empirical studies and theoretical studies, we conduct empirical analysis to verify the expropriation shielding hypothesis by adding two more assumptions. The first assumption is that politicians will demand more bribes as the firm's ability to pay. This assumption is a common sense, but it is supported by empirical results that "companies that can pay more, should pay more" in the Svensson (2003) Uganda survey. The second assumption is that there is an optimal level of cash ratios for firms to operate and the threats

by corrupt politicians may deviate from optimal levels of cash holdings. The second assumption is theoretically supported by the model of Miller and Orr (1966) that firms have optimal levels of cash holdings, and empirically supported by the studies of Opler et al. (1999), Dittmar et al. (2003), and Kalcheva and Lins (2007).

2.4. Previous studies on Preoccupancy Hypothesis

In the presence of political corruption, firms can take advantage of lobbying and bribery to affect direction of the policy to favorable conditions, and firms can preoccupy government project selections and loans by government. In theoretical research, Leff (1964) find that corrupt CEOs avoid tax better and lead cash transfers (e.g. subsidies) from the government to individual firms. In addition, Huntington (1968) find that corrupt CEOs receive more business projects from the government and improve firm performance by appropriately removing the disturbing factors by giving politicians bribes. They also preoccupy strategically advantageous positions over other firms because they are skilled in using the loopholes of law and bad laws. Therefore, in case of severe political corruption, firms may be more advantageous to exclude competitors in the competitive market if they actively use the cozy relation between politics and business.

Meanwhile, in empirical studies, political corruption can lead to better firm performance when firms actively use the political corruption through bribes and lobbying in the emerging countries. According to Debacker, Heim, and Tran (2015), US companies with owners from corrupt countries are more skillful in avoiding taxes, and it increase firm performance. Mironov (2015) also find that the corrupt CEOs in Russia can increase the company's sales growth even more. Even if the politically corrupt environment raises additional costs and threats to expropriation by politicians, paying bribes in the face of corruption can be optimal for operating performance from an individual company's perspective. For example, in competition for government-sponsored projects, firms can quickly give bribe and benefit from it, and they can get a good loan from the government. (Fisman, 2001; Faccio et al., 2006; Claessens et al., 2008; Goldman et al., 2009; Duchin and Sosyura, 2012; Tahoun, 2014)

2.5. Hypothesis Development

The previous studies show that there is a confrontation between expropriation shielding hypothesis and preoccupancy hypothesis about the relations between political corruption and corporate cash holdings policy. In the empirical studies, the results of

supporting the expropriation shielding hypothesis are mostly found in developed countries, and the results supporting the preoccupancy hypothesis are found in emerging countries. If the level of economic and political development of the country is low, then there will be a large number of firms seeking to take an advantage in political corruption. However, after the economic and political development of the country has been fully achieved, the negative impact of political corruption such as expropriation by corrupt politicians may become even greater. Therefore, in this study, we assume that political corruption will affect the corporate cash holdings policy according to the level of economic and political development of the country, and we establish hypothesis for empirical analysis as follows.

Hypothesis-1a. In countries with high levels of corruption, firms are likely to have less cash because of the risk of expropriation by corrupt politicians. (Expropriation Shielding hypothesis)

Hypothesis 1b. In countries with high levels of corruption, firms are likely to have more cash because it is important to take advantage of opportunities quickly by corrupt politicians through lobbying. (Preoccupancy hypothesis)

Hypothesis 1c. According to the level of economic development, the Expropriation Shielding hypothesis and the Preoccupancy hypothesis will be compatible.

Hypothesis 2a. In countries with high level of corruption, corporate operating performance will be worsened by high cost of the threats by corrupt politicians.

Hypothesis 2b. In countries with high level of corruption, corporate operating performance will be improved by preoccupancy of opportunities by bribe and lobbying.

3. Data and Variable descriptions

3.1. Financial variable data

The corporate financial data used in this study is collected from Compustat Capital IQ provided by Whaton Research Data Services and the data of Compustat North America and Compustat Global are merged to collect worldwide data. Firms in the financial industry and banking industry are excluded because those samples are not suitable for this study. Unlike firms in other industries, financial institutions and banks have restrictions on cash holdings, so the motive of holding cash is different. Therefore, in this study, data on individual firms in 97 countries are collected from 1995 to 2015, and the number of firm year observations is 688,789.

From the collected sample, we excluded missing values in financial variables. We

also confirmed that some outliers exist in our sample because our data is international, and we excluded the upper 1% and lower 1% of the financial variables to prevent these values from causing bias in the results. In addition, for some firms with missing value in research and development expenses, we assumed that those firms have a value of 0 in research and development expenses[1]. From this process, we obtained 600,961 firm year observations. Meanwhile, in some countries, stock price data is inaccurate and can not be collected for market capitalization variables. The number of firm year observations in our sample that can obtain stock price and market cap is 253,072, and this sample is mainly used in our empirical analysis by adding the market capitalization variable to the normal cash regression to examine the effect of political corruption on the cash holdings of firms[2]. Table 1 shows the number of firm year observations by country, industry, and year.

[Insert Table 1: Sample Distribution]

3.2. Proxy of Political corruption.

The Corruption Index of the International Transparency Organization is used as proxy for the level of political corruption at the national level. The index is provided from 1995 to 2015. In the case of the cultural variables used in the previous studies, the reliability of the data has been pointed out because the survey is not continuous and has only one survey (Karolyi, 2016). However, since the corruption index of the International Transparency Organization is annually published, and it is continuous data. Moreover, it is an index derived by integrating the results of five rational surveys, so it can overcome the vulnerability of existing cultural variables. As the corruption index is higher, it means that there is less political corruption. Therefore, in this study, we made an adjustment by subtracting the maximum value of 10 for the convenience of explanation, so that the higher the index, the higher the level of political corruption.

[1] In the study of Dittmar et al. (2007), it was treated as 0 if the R & D cost could not be obtained. The sample size decreased when we treat R & D cost was not zero and discard those data, but the main analysis of this study show no significant difference.

[2] The results of the empirical analysis with 253,072 samples after inserting the market capitalization variables and the results of using 600,961 samples excluding the market capitalization variables are not significantly different.

3.3. National level variables

Meanwhile, the macroeconomic factors such as the legal system, the level of economic development, and the opportunity cost of the bond market, which affect the corporate governance of the country, may change the corporate cash holding policy. Therefore, in this study, macro variables were collected and used controlling variables. First, the legal origin of the country is used as a proxy of corporate governance, and the three dummy variables of the English, the Continental, and Nordic laws are added as control variables. According to a previous study of LLSV (1999) on the legal system and corporate governance, the protection of shareholder rights is more important in the case of the Anglo-American law than other legal systems. Therefore, we expected that there would be a difference between the countries that follow Anglo-American law and those that do not.

In addition, since the level of economic development of the country is closely related to political corruption, we added the per capita GDP variable to control it. As the stock market is active, it is easier for companies to raise funds through the stock market, so we have added stock trading volume to GDP to control these effects. In addition, the real interest rate variable of the Treasury bond by country is used as the control variable because the opportunity cost of holding more cash increases as the real interest rate of the bond market increases. Macroeconomic variables were collected through the World bank database and the OECD factbook.

Table 2 shows the statistics of the variables used in the regression model of this study. Table 3 shows the correlation coefficient between each variable.

[Insert Table 2: Descriptive Statistics]

[Insert Table 3: Pearson’s Correlation Coefficient]

4. Research Model

4.1. Normal cash regression

In order to investigate the effect of political corruption on firm's cash holdings policy, this study uses normal cash regression model by Opler et al. (1999) that explains the motives of corporate cash holdings. In this study, we use a model that adds additional country-specific explanatory variables in addition to firm-level variables on the amount of cash held by the

firm for normal operating activities. Specifically, the variables such as the legal system variable, GDP per capita, stock trading volume to GDP, and the real interest rate of treasury bonds are added to the regression model. We can see that after adding the macroeconomic variables in the normal cash regression model, the level of explanatory power is higher than the model with only contains firm level explanatory variables These results are similar to those of Doidge, Karolyi, and Stulz (2007). Specific models and variables are described as follows.

$$\ln\frac{Cash_{i,t}}{TA_{i,t}} = \beta_0 + \beta_1 Ln(TA_{i,t}) + \beta_2\frac{CF_{i,t}}{TA_{i,t}} + \beta_3\frac{NWC_{i,t}}{TA_{i,t}} + \beta_4\frac{CPX_{i,t}}{TA_{i,t}} + \beta_5 Lev_{i,t} + \beta_6 Industry\ risk_{i,t} + \beta_7 Div\ dummy_{i,t} + \beta_8\frac{R\&D_{i,t}}{TA_{i,t}} + \beta_9\frac{MarketValue_{i,t}}{Total_{i,t}} + \beta_9\frac{StockTradedVolume}{GDP}_{i,t} + \beta_{10}\ln(GDPpercapita_{i,t}) + \beta_{11} RealInterestRate_{i,t} + \beta_{12} LegalOrigin_{i,t} + \beta_{13} Corruption_{i,t} + YFE + IFE + CFE + \varepsilon \quad (1)$$

Cash is the cash and cash equivalents, TA is the total assets, NWC is the net working capital, and the difference between the current assets and the current liabilities, CPX is the capital expenditure and the difference between tangible and intangible assets at t and tangible and intangible assets at t-1, Lev is long-term debt leverage, which is the long-term debt divided by total equity. Industry risk is the standard deviation of the cash flows in Fama and French 48 industry classifications. Div dummy is a dummy variable that has a value of 1 if there was a dividend at time t and a value of 0 otherwise. R & D means research and development expenses. Market value is the market capitalization, StockTradedVolume/GDP is the value of each country's stock trading volume divided by GDP, and GDP per capita means GDP over population in country. Real Interest Rate means the real interest rate of treasury bonds. Legal Origin are three dummy variables, and we add English, the Continental, and Nordic laws variables. Corruption refers to the level of political corruption in the country, and we use the proxy of corruption described in the preceding part.

$$\ln\frac{Cash_{i,t}}{TA_{i,t}} = \beta_0 + \beta_1 Ln(TA_{i,t}) + \beta_2\frac{CF_{i,t}}{TA_{i,t}} + \beta_3\frac{NWC_{i,t}}{TA_{i,t}} + \beta_4\frac{CPX_{i,t}}{TA_{i,t}} + \beta_5 Lev_{i,t} + \beta_6 Industry\ risk_{i,t} + \beta_7 Di\square\ dummy_{i,t} + \beta_8\frac{R\&D_{i,t}}{TA_{i,t}} + \beta_9\frac{MarketValue_{i,t}}{Total_{i,t}} + \beta_9\frac{StockTradedVolume}{GDP}_{i,t} + \beta_{10}\ln(GDPpercapita_{i,t}) + \beta_{11} RealInterestRate_{i,t} + \beta_{12} LegalOrigin_{i,t} + \beta_{13} Corruption_{i,t} + \beta_{14} Corruption_{i,t}^2 + \beta_{14} Corruption_{i,t}^3 + YFE + IFE + CFE + \varepsilon \quad (2)$$

On the other hand, the effects of political corruption on corporate cash holding

policies may be different as national politics and economy development. In the case of emerging or developing countries, the preoccupancy of government projects and loans may be more effective in the early stages of economic development using political corruption. However, in developed countries where the economy has developed somewhat, the negative effects of the threat of expropriation of political corruption may be greater. Based on these assumptions, we assume that there is a nonlinear relationship between political corruption and cash holdings, and we use the above regression model with the addition of the square and cube terms of political corruption in model (2). The definitions of frontier, emerging, and developed countries are based on the World Bank's national classification system, and we add dummy variables by these definitions.

4.2. The effect of political corruption on the operating performance in case of using cash

4.2.1. ROA model

Political corruption affects cash holdings, but it also affects operating performance when cash is used. If the preoccupancy hypothesis is surppoted, the greater the degree of political corruption, the bigger the ROA will be because the firm uses cash to better utilize political corruption and take an advantage from politicians by using cash. However, if the expropriation sheilding hypothesis is supported, the ROA of the next period will be significantly lower because firms are more likely to choose a project with a negative NPV to avoid the more severe political corruption. In particular, Morivov (2015) find that corrupt CEOs perform better and they achieve higher sales growth. Thus, rather than the market's assessment of cash holdings, it can be important how political corruption affects the use of cash and operating performance.

$$ROA_{i,t} = \beta_0 + \beta_1 \frac{Cash_{i,t-1}}{NA_{i,t-1}} + \beta_2 Corruption_{i,t-1} + \beta_3 \frac{Cash_{i,t-1}}{NA_{i,t-1}} \times Corruption_{i,t-1} + \beta_4 Ln(NA_{i,t}) + \beta_5 \frac{PPE_{i,t}}{NA_{i,t}} + \beta_6 ROA_{i,t-1} + \text{YFE} + \text{IFE} + \varepsilon \quad (3)$$

NA is net assets that total assets minus cash and cash equivalent, PPE is Property, plant, and equipment, ROA is return on assets that is operating income over total assets.

4.3. Identification Strategies for alleviate endogeneity problems in empirical tests

4.3.1. Two stages least squares (2SLS)

To examine the effect of political corruption on corporate cash holding policy, the

reverse causality problem is not severe because it is reasonable that macro variables affect the micro corporate financial policies when we interpret the correlation between corruption and cash as causality. However, there may be an omitted variable bias due to unmeasurable variables in our regression model. Therefore, in this study, we try to alleviate endogeneity problem corruption index by borrowing the ideas of previous studies.

According to the research of Campante and Do (2014), more isolated areas of the capital city in a state are more vulnerable to voter surveillance, and it results higher political corruption. Campante and Do (2014) attempted to reduce the endogeneity problem of political corruption by using the Gravity-based Centered Index for Spatial Concentration. Meanwhile, population density is a good instrument variable because it is hard to imagine that population density affects firm's cash holding policy. Therefore, in this study, we borrow this idea to use two stages least squares (2SLS) method using the largest urban population ratio of each country as an instrument variable.

Therefore, in the first stage, the corruption index is estimated by using the largest urban population density as the instrumental variable, and the estimated corruption index is used in the model (1) and model (2). The Durbin chi2 test and the Wu-Hausman F test show that the p-value is significant at 1% level, so that the null hypothesis that all variables in the model are exogenous can be rejected. In other words, in the case of the model used in this study, it is more appropriate to use the instrument variable because there is an endogeneity problem of the corruption index.

4.3.2. Propensity Score Matching (PSM)

In order to examine the different treatment effect of political corruption on corporate cash holdings in emerging and developed countries, we calculate propensity score based on the firm size (total assets). We separate our sample by propensity score that has value from 0 to 1, and we matched the most similar observation in same year and same industry. We use 4 dependent variables to examine the non-linear treatment effect of political corruption on corporate cash holdings. (1) Dummy variable that has value 1 if corruption index is higher than the median of total sample, otherwise 0. (2) Dummy variable that has value 1 if corruption index is higher than 25%, but has 0 when corruption index is lower than 75%. (3) Dummy variable that has value 1 if corruption index is higher than 25% in developed countries sample, but has 0 when corruption index is lower than 75% in developed countries

sample. (4) Dummy variable that has value 1 if corruption index is higher than 25% in frontier/emerging countries sample, but has 0 when corruption index is lower than 75% in frontier/emerging countries sample.

After matching by propensity score, we analyze the difference between treatment group and control group on the effect of political corruption on corporate cash holdings, and check the significance level by using t-statistics. By using matching, we can see more robust result in case of alleviating the endogeneity problems.

5. Empirical Results

5.1. Empirical Results in Normal Cash Regression

5.1.1. Cubic function relationship between political corruption and cash holdings

As a result of previous studies, it can be a plausible explanation in the case of some developed countries for expropriation shielding hypothesis that the political corruption increases only the threat of expropriation by corrupt politician. However, in an empirical study of emerging countries, it can be seen that the preoccupancy hypothesis can be a plausible explanation because there is more advantages of political corruption, and firm may hold more cash to preoccupy those advantages. Therefore, in this study, we assume that the effects of political corruption on corporate cash holdings would be different between developed and frontier/emerging countries. Specifically, we expect that the relation between political corruption and cash holdings in our sample would take the form of a non-linear function rather than a simple linear relationship.

The results of Model 1 in Table 3 are the univariate results between the corruption index and the cash holdings. As a result of adding the square term and the cubic term of the corruption index, we find that the coefficient of the cubic term is negative, and there is a cubic function (decrease in first, then increase, and decrease again) relationship existed in our sample. In Model 2 and 3, we add firm level control variables that explain the motives of holdings cash by the research of Oppler et al. (1999). Some firm in our sample in this study did not disclose research and development(R&D) expenses, so we treated as a value of 0 in this case by following the same method of Dittmar et al. (2007). In Model 2, we exclude samples that have missing value in R&D expenses, and in Model 3, we treat R&D expenses as a value of 0 in case of missing value. In both models, we find that the cubic relation between political corruption and cash holdings are consistent.

Meanwhile, we add the ratio of market value to total assets (MTB) in model 4, and the number of firm year observations has been reduced from 535,392 to 296,557 due to lack of stock price disclosure in many countries. MTB is added in other models in our analysis because it is an important explanatory variable as proxy variable of growth opportunity in normal cash regression. Even if the number of samples is decreased, the cubic relation function between the corruption index and the cash holdings are also consistent.

In Model 5, we added country-level variables that were not considered in previous studies as control variables. By adding country-level variables in our models, and the sample was reduced to 253,072, and we mainly use this sample in other analysis. Stock traded / GDP is stock trading volume / GDP. This variable is used as proxy for the degree of development of the stock market. The coefficient is negative at 1% significance level, and it means that the more the stock market develops, firm can easily raise fund through the stock market, so firms holds less cash. Ln (GDP per capita) is the natural logarithm of GDP per capita, and indicates the level of economic development of the country. We find that the coefficient of Ln(GDP per capita) is positive and significant at 1% level. It means that the level of economic development in the country becomes higher, firm can generate more cash from its operating activities, so firms hold more cash. The Real Interest rate is the inflation adjusted interest rate of treasury bonds and can be viewed as the opportunity cost when a firm hold cash in it. From our results, the coefficient is negative and significant at 1% level, so firms have less cash because of high opportunity costs.

From Model 6 to 8, we fixed the year effects, industry effects, and country effects to see the cubic relation is consistent in case of fixed effect models. In Model 6, we use random effect model by assuming that there is no correlation between control variables and error term, and we find that the cubic relation between corruption index and cash holdings is consistent. Moreover, in Model 7, we fixed year effects and Fama and French 48 industry effects, and we fixed also country effects in Model 8. In both Models, we find that the cubic relation between corruption and cash holdings is consistent. Even though the differences between countries were partially controlled by the national dummy variables, the effects of political corruption continue to appear in Model 8. These results show that there are effects of change in corruption within the country as well as effects between countries.

5.1.2. Difference between frontier/emerging countries and developed countries, and

identification of inflection points

To examine the different effect of political corruption on cash holdings between developed and frontier/emerging countries, we divided the sample into developed and frontier/emerging countries according to the World Bank classification. Table 4 shows that the coefficients of the cubic term are not significant, only the coefficient of the square term is significant and positive, so there is a U-shape relation between political corruption and cash holdings. A sample of developed countries with very low levels of corruption such as Finland and Canada shows that companies reduce cash holdings to avoid expropriation in the face of political corruption. However, in countries such as Italy and Spain where are developed countries but somewhat corrupt, we find that firms have more cash to take an advantage from political corruption for preoccupancy. Specifically, the inflection point of the corruption index estimated by the coefficient of model 1 is about 2.94, and the expropriation shielding hypothesis is supported in the countries with the corruption index of less than 2.94 among developed countries, and the preoccupancy hypothesis is supported in the countries above 2.94.

On the other hand, in Model 3 and Model 4, we analyze only for frontier and emerging countries. Again, unlike the whole sample, the coefficient of the cubic term is not significant and only the coefficient of the square term is significant. However, we find there is an Inverted-U-shape relation between political corruption and cash holdings unlike the developed countries. In the sample of frontier/emerging countries such as Korea with relatively low corruption level (but, with more corruption than developed countries), firms hold more cash to preoccupy opportunities from corrupt politicians. However, in the sample of frontier/emerging countries such as Pakistan and Mexico with extremely severe corruption, we find that firms reduce cash holdings to avoid the risk of expropriation by politicians. The inflection point estimated by the coefficient of model 3 is about 5.17, and we find that preoccupancy hypothesis is supported in countries with frontier/emerging countries' corruption index less than 5.17, and the expropriation shielding hypothesis is supported in countries above 5.17.

We find two inflection points in the cubic function between corruption index and cash holdings, but these points are not perfectly correct because of the econometric limitations of our model. However, these points give us some implications that there are three intervals in the relation between corruption and cash holdings, and two hypothesizes can be

explained by the level of corruption and economic development. To the convenience of analysis, we use 2.94 and 5.17 in other analysis.

Specifically, in the interval of corruption index below 2.94, developed countries with considerably low levels of corruption are included. In these countries, there is no motive to preoccupy loans and projects from corrupt politicians, and only the motive to avoid the risk of expropriation exists. Therefore, the expropriation shielding hypothesis is supported in developed countries with corruption index below 2.94.

In the interval with corruption index greater than 2.94 and below 5.17, some developed countries and emerging countries are included. These countries are more corrupt than countries in the first interval, and firms in these countries have motives to preoccupy opportunities actively from corrupt politicians. Therefore, firms hold more cash, and this result supports the preoccupancy hypothesis.

In the interval with a corruption index of 5.17 or higher, frontier/emerging countries with extremely high levels of corruption are included. In these countries, the cost of corruption is so high because of extreme level of expropriation by corrupt politicians. Therefore, firms hold less cash to avoid the risk of expropriation, and this result supports the expropriation shielding hypothesis again.

In order to confirm that there are three intervals and what hypothesis is supported in each interval, we empirically analyze the relation between political corruption and cash holdings in each intervals from the models 5 to 7.

In Model 5, we only analyze the first interval that contains developed countries sample with corruption index lower than 2.94. The coefficient of corruption index is -0.108 at 1% significance level, so there is a negative association between corruption and cash holdings that supports the expropriation shielding hypothesis. Model 6 only contains some emerging countries and developed countries with corruption index greater than 2.94 and below 5.17. The coefficient of corruption index is 0.0437 at 1% significance level, so it means that there is a positive association between corruption and cash holdings that supports the preoccupancy hypothesis. Model 7 contains the last interval, and we analyze only frontier/emerging countries with corruption index 5.17 or higher. The coefficient is -0.0214 at 1% significance level, so there is a negative association between corruption and cash holdings. The expropriation shielding hypothesis is supported in the sample of the last interval again.

5.1.3. Mitigation of endogeneity problem and robustness test

In our analysis, we borrow the idea and method of Campante and Do (2014). We use the urban population density in the largest city from the Worldbank Database as the instrument variable of corruption index in 2 stages least square (2SLS) model. The more crowded the population in the city, the more political interest and surveillance of the voters, so the level of the political corruption is deceased. However, we think that the urban population density in the largest city may not have an association with corporate cash holding policies, so we expect this instrument variable is effective to control the endogeneity problem in our model.

Model 1 in Table 5 is the first stage of 2SLS, and the dependent variable is corruption index. As expected, there is a significant negative association between the urban population density in the largest city and corruption index. This result is consistent with the idea of Campante and Do (2014). In next, we predict the corruption index in the first stage of Model (1), and we replace the corruption index to estimated corruption index 'TI_Corruption(Estimated)' in Model 2. In Model 2 where mitigates the endogeneity problem from the omitted variable bias by using instrument variable, we find that the cubic relation between political corruption and cash holdings is consistent.

However, in the results not reported in the table, unlike our expectation, there is a significant association between the urban population density in the largest city and corporate cash holdings (coefficient: 0.0032, and significant at 1% level). We find that the Spearman's Rho between the error term in the first stage in Model (1) and the error term in the second stage in Model (2) is 0.0589 at 5% significance level. It means that the correlation between the instrument variable and the dependent variable in second stage exists, so the omitted variable bias is not perfectly controlled unlike our expectation.

In spite of this result, it is not conceptually clear that there exists association between the urban population density in the largest city and corporate cash holdings. Moreover, the effect of omitted variables on the cash holdings is remarkably low because the coefficient of Spearman's Rho is low. Therefore, we partially control the endogeneity problem caused by omitted variable bias, and the effect of omitted variable bias is not that much.

In Model 3, we add estimated corruption index from the first stage, and we fix the year effects and industry effects. In Model 4, we also add year effects, industry effects, and

country effects. In both models, we find the consistent results that there exist the cubic function relation between political corruption and cash holdings. Meanwhile, we find that the coefficient of Spearman's Rho is not significant in Model 4, so we presume that the omitted variable bias is controlled by fixing the country effects.

In Table 6, we conduct propensity score matching(PSM) to mitigate the endogeneity problem. We generate the propensity score by using dummy variables generated by corruption index as dependent variable through logit regression. We matched samples in treatment groups and samples in control groups by the size of firm (Ln(total assets)). Panel A show the results of logit regression by each dummy variables, and the coefficient of Ln(total assets). We predict propensity score from the logit regression result, and matched samples in 0.01 level.

In the first result of Panel B, we make a dummy variable that has value 1 if the corruption index is higher than median, and 0 if the corruption index is lower than median. The difference is 0.0929 and significant at 1% level. It means that treatment group holds more cash than control group in the whole sample. In the previous empirical analysis, there exists the cubic relation between corruption index and cash holdings, so this results supports that samples (mostly, developed countries) with relatively high level of corruption hold more cash holdings than the samples (frontier/emerging countries) with low level of corruption.

In the second result, we make a dummy variable that has value 1 if the corruption index is higher than 25%, and 0 if the corruption index is lower than 75%. We find that there is no significant difference between the treatment group and control group after matching. This result shows that expropriation shielding hypothesis is supported in both top 25% sample and bottom 25% sample of corruption index, so there is no difference between the two samples.

Meanwhile, in the third result, we made a dummy variable only in frontier/emerging countries. The dummy variable has value 1 if the corruption index is higher than 25%, and 0 if the corruption index is lower than 75% in frontier/emerging countries sample. We find that the difference between treatment group and control group is significant at 1% level, it means treatment group hold less than control group after matching. In frontier/emerging countries, firms hold less cash in case of extremely severe corruption even if we control the endogeneity problem by matching. Therefore, this result support that there

exists inverted-U-shape relation between political corruption and cash holdings in frontier/emerging countries.

In the last and forth result, we made a dummy variable only in developed countries. The dummy variable has value 1 if the corruption index is higher than 25%, and 0 if the corruption index is lower than 75% in developed countries sample. There is a empirically significant difference at 1% level between treatment group and control group, and we find that treatment group holds more cash than control group. This result means that firms with relative higher level of corruption in developed countries hold more cash, so there exists U-shape relation between political corruption and cash holdings in developed countries.

After mitigating the endogeneity problems by using 2SLS and PSM, we consistently find that there exists the cubic function relation between political corruption and cash holdings (Decrease in first, increase, and then decrease again) in the whole sample.

5.1.4. The effect of political corruption on operating performance in using cash

In Table 7, we examine the effect of political corruption on operating performance at t period in using cash holdings at t-1 period. From the expropriation shielding hypothesis, political corruption has a negative effect on the operating performance, so it is beneficial for firms to reduce cash holdings to reduce the effect of political corruption. In contrast, from the preoccupancy hypothesis, political corruption has a positive effect on the operating performance, so firm hold more cash to take an advantage from politicians.

Specifically, we divide our sample to three intervals by using the two inflection points from the previous result in Table 4. First interval contains samples with corruption index lower than 2.94, second interval contains samples with corruption index from 2.94 to 5.17, and third interval contains samples with corruption index more than 5.17. We examine the operating performance at t period in using cash holdings at t-1 period in each intervals, and we measure the operating performance by operating income over total assets (ROA).

In Model 1 and Model 2, we use the developed countries samples with corruption index lower than 2.94. We find that the coefficient of corruption index is not statistically significant, so there is no association between political corruption and operating performance in developed countries with low level of corruption. In addition, we find that the coefficient of interaction term between corruption index and cash holdings at time t-1 is 0.0116 at 1% significance level. This means that firms can increase the operating performance by reducing

cash holdings to avoid expropriation when there exists the political corruption in this sample. This result supports the expropriation shielding hypothesis.

Model 3 and Model 4 contains developed countries samples with corruption index from 2.94 to 5.17. The coefficient of corruption index is -0.00226 at 10% significance level, and it means that corruption has a negative effect on the operating performance in the sample of developed countries with moderate level of corruption. Additionally, we find that the coefficient of interaction term between corruption index and cash holdings at time t-1 is 0.0174 at 1% significance level. Therefore, it is beneficial in operating performance for firms to increase cash holdings in this developed countries with moderate level of corruption. This result means that corruption itself is not positive for the operating performance, but there exists advantages of preoccupancy of opportunities from politicians. This result supports the preoccupancy hypothesis.

Model 5 and Model 6 contains frontier/emerging countries samples with corruption index from 2.94 to 5.17. The coefficient of corruption index is 0.00246 at 1% significance level, so there is a positive association between political corruption and operating performance unlike the result of developed countries in Model 3 and 4. The coefficient of interaction term between political corruption and cash holdings at time t-1 is 0.00301 at 1% significance level. This result means that holding more cash is beneficial to operating performance in frontier/emerging countries with moderate level of corruption. Therefore, in this sample, we find that political corruption itself has positive association with operating performance, and holding more cash is also beneficial to firm by enhancing the preoccupancy of opportunities. This result supports the preoccupancy hypothesis strongly.

In Model 7 and Model 8, we examine the frontier/emerging countries with corruption index more than 5.17, that is severe level of political corruption. The coefficient of political corruption is not statistically significant, so there is no significant effect of political corruption on operating performance unlike our expectation. The coefficient of interaction term between political corruption and cash holdings at time t-1 is 0.0103 at 1% significance level. Therefore, holding more cash is beneficial for firms to increase operating performance in frontier/emerging countries with extreme level of corruption, but from the previous analysis, firms in this interval reduce cash holdings to avoid risk of expropriation by corrupt politicians. In the view of firms, we think that firms want to avoid the expropriation even

though it suffered a decline in operating performance.

6. Conclusion

Cultural factors have a significant impact on the firm's financial policies and operations, and are necessary to account for explaining firm behavior and performance that are not explained by firm-level variables. This study investigated political corruption, which has a more direct impact among cultural factors, especially corporate financial policies and operating activities. Specifically, we empirically examines the two confront hypothesis. First hypothesis is expropriation shielding hypothesis, which is proposed by Stulz (2005) and several empirical studies. This hypothesis suggests that firms reduce their cash holdings to prevent the risk of expropriation from political corruption. Second hypothesis is preoccupancy hypothesis, which is proposed by Huntington(1968). This hypothesis suggest that firm hold more cash to have an advantages by preoccupancy of government projects and loans easily by corrupt politician.

This paper expand the empirically studies that examine the effect political corruption on corporate cash holdings from a country level analysis to international study, and we find cubic function relation between political corruption and corporate cash holdings that is not found in previous studies. Specifically, we find that there exists U-shape in developed countries, and inverted-U-shape in frontier/emerging countries even if partially control the endogeneity problems.

This suggests that the two hypotheses that were confronted in previous researches are not actually confronted but can be explained by both the level of economic development and the level of corruption in the country. This study use multinational data from 97 countries and find that the two hypotheses of the previous studies are supported differently by the level of economic development and level of corruption. In this way, our study contributes to the literature on cultural factors and corporate financial policies.

There are some limitations of this paper from these reasons. The corruption index used as proxy of political corruption is based on the survey data even if the index is continuously collected and integrated 5 surveys to reduce perception bias. Although we partially control the endogeneity problem through 2SLS by using instrument variable, we are

not able to control the endogeneity problem perfectly because of the limitation of our model. Moreover, our sample data is an unbalanced panel because firm level data such as stock price is not perfectly announced, so the sample of our analysis is decreased from 600,961 to 253,072 when we exclude observations with missing values.

Table1. Descriptive Statistics

This table provides summary statistics for the variables in Normal Cash Regression and ROA Regression from 1995 to 2015. The definitions of each variable are shown in Appendix A. All variables are winsorized at the 1% level.

Panel A. Normal Cash Regression

Variables	N	Mean	p25	p50	p75	SD
Ln(Cash/TA)	253,072	-2.49216	-3.27133	-2.28344	-1.51429	1.353617
TI_Corruption	253,072	3.467104	2.2	2.7	5.2	1.965688
Ln(TA)	253,072	6.76499	4.620414	6.718479	8.764644	2.946398
NWC/TA	253,072	0.16321	0.0158	0.157	0.329	0.298089
FCF/TA	253,072	0.007504	0.004695	0.055958	0.10128	0.255171
CPX/TA	253,072	0.054228	0.0139	0.0338	0.0699	0.06216
Leverage	253,072	0.524176	0.324	0.504	0.669	0.322471
STDEV_FCF/TA	253,072	11.77594	0.936892	3.077747	11.15181	22.02033
RD/TA	253,072	0.021488	0	0	0.00886	0.061175
MTB/TA	253,072	6.81E+13	1.84E+11	8.19E+11	3.06E+12	4.53E+14
Dividend Dummy	253,072	0.706503	0	1	1	0.455365
Stock Traded Value/GDP	253,072	111.7041	45.01248	87.08185	155.6272	86.73153
Ln(GDP per capita)	253,072	9.859364	9.129443	10.46372	10.69892	1.231852
Real Interest Rate	253,072	3.792266	1.874019	3.205684	4.822991	4.81351

Panel B. ROA Regression

Variables	N	Mean	p25	p50	p75	SD
ROA(t)	384,842	-0.05159	-0.0286	0.023913	0.063016	0.343499
Cash/NA(t-1)	384,842	0.345394	0.034406	0.109571	0.289714	0.841523
TI_Corruption(t-1)	384,842	3.47151	2.224916	2.7	5	1.968953
Ln(NA)	384,842	6.38984	4.265057	6.378436	8.383526	3.014848
PPE/NA	384,842	0.540289	0.209894	0.475597	0.806493	0.397013
ROA(t-1)	384,842	-0.04478	-0.025	0.025198	0.065269	0.321767

Table 2. Sample Distribution

This table provides sample distribution in our multinational samples from 1995 to 2015. Panel A shows the distribution by countries, Panel B shows the distribution by industries, and Panel C shows the distribution by years.

Panel A. Country Distribution

Country	Frequency	Percent	Cum.	# of unique firm	Country	Frequency	Percent	Cum.	# of unique firm
Argentina	764	0.3	0.3	16	Mexico	1,073	0.41	59.44	25
Australia	13,205	5.11	5.4	392	Namibia	29	0.01	63.08	1
Austria	78	0.03	5.43	8	Netherlands	1,712	0.66	63.96	53
Bahrain	94	0.04	6	10	New Zealand	990	0.38	64.74	19
Bangladesh	389	0.15	5.89	23	Nigeria	575	0.22	63.3	14
Belgium	796	0.31	5.74	34	Norway	1,031	0.4	64.36	56
Botswana	1	0	7.06	1	Oman	421	0.16	64.9	6
Brazil	2,756	1.07	7.06	63	Panama	48	0.02	64.92	4
Bulgaria	184	0.07	5.96	5	Papua New Guinea	48	0.02	65.85	6
Canada	18,470	7.14	14.2	683	Peru	671	0.26	65.18	18
Chile	1,526	0.59	15.74	39	Philippines	1,673	0.65	65.83	42
China	18,831	7.28	23.02	229	Poland	610	0.24	66.08	53
Colombia	187	0.07	23.12	4	Portugal	63	0.02	66.11	11
Cotedivoire	59	0.02	23.05	8	Qatar	114	0.04	66.15	#N/A
Croatia	360	0.14	32.47	12	Republic of Korea	8,032	3.11	58.5	626
Cyprus	132	0.05	23.17	28	Republic of South Africa	2,667	1.03	99.98	104
Czech	150	0.06	23.23	15	Republic of Venezuela	60	0.02	98.59	6
Denmark	381	0.15	24.11	23	Russia	1,331	0.51	66.67	28
Ecuador	2	0	24.11	#N/A	Singapore	5,583	2.16	68.82	136
Egypt	459	0.18	24.29	6	Slovakia	54	0.02	68.85	9
Estonia	28	0.01	24.47	4	Slovenia	143	0.06	68.9	8
Finland	559	0.22	24.68	27	Spain	424	0.16	24.45	26
France	2,721	1.05	25.73	188	Sri Lanka	1,022	0.4	58.99	110
Germany	1,908	0.74	23.97	126	Sweden	1,009	0.39	69.29	59
Greece	577	0.22	31.71	60	Switzerland	2,451	0.95	15.15	48
Hong Kong	1,608	0.62	32.33	32	Thailand	4,594	1.78	71.07	122
Hungary	173	0.07	32.54	6	Uganda	2	0	71.07	#N/A
Iceland	14	0.01	39.74	#N/A	Ukraine	38	0.01	71.08	#N/A
India	15,644	6.05	39.55	246	United Kingdom	14,880	5.75	31.49	628
Indonesia	2,489	0.96	33.5	78	United States of America	71,093	27.49	98.57	306
Ireland	471	0.18	39.73	15	Vietnam	915	0.35	98.95	34
Israel	2,877	1.11	40.85	48	Zambia	36	0.01	99.99	2
Italy	2,433	0.94	41.79	63	Zimbabwe	18	0.01	100	9
Jamaica	45	0.02	41.81	5					
Japan	34,134	13.2	55.32	1034					
Jordan	819	0.32	42.12	23					
Kenya	177	0.07	55.39	12					
Kuwait	254	0.1	58.59	24					
Lebanon	10	0	58.6	2					
Lithuania	22	0.01	59	1					
Luxembourg	19	0.01	59.01	8					
Malaysia	9,150	3.54	63.06	286	**Total**	**258,631**	**100**		
Malta	41	0.02	59.45	4					

Panel B. Industry Distribution

Industry	Freq.	Percent	Cum.	# of unique firm
Agriculture	1,609	0.62	0.62	36
Aircraft	852	0.33	0.95	13
Alcoholic Beverages	2,015	0.78	1.73	62
Apparel	4,496	1.74	3.47	129
Automobiles and Trucks	5,550	2.15	5.61	146
Banking	450	0.17	5.79	4
Business Services	26,682	10.32	16.11	641
Business Supplies	2,742	1.06	17.17	84
Candy and Soda	721	0.28	17.44	16
Chemicals	9,730	3.76	21.21	256
Coal	1,113	0.43	21.64	25
Computers	7,752	3	24.63	173
Construction	7,391	2.86	27.49	236
Construction Materials	9,921	3.84	31.33	292
Consumer Goods	5,453	2.11	33.44	153
Defense	246	0.1	33.53	#N/A
Electronical Equipment	17,911	6.93	40.46	447
Entertainment	4,502	1.74	42.2	110
Fabricated Products	806	0.31	42.51	17
Food Products	9,304	3.6	46.11	242
Healthcare	2,916	1.13	47.23	53
Insurance	772	0.3	47.53	14
Machinery	10,636	4.11	51.65	231
Measuring and Control Equip	3,098	1.2	52.84	46
Medical Equipment	4,801	1.86	54.7	79
Personal Services	1,948	0.75	58.46	32
Petroleum and Natural Gas	10,108	3.91	62.37	248
Pharmaceutical Products	10,405	4.02	66.39	217
Precious Metals	4,010	1.55	67.94	173
Printing and Publishing	2,272	0.88	68.82	62
Real Estate	898	0.35	69.17	11
Recreational Products	2,462	0.95	70.12	66
Restaurant, Hotel, Motel	5,327	2.06	72.18	143
Retail	12,115	4.68	76.87	248
Rubber and Plastic Products	3,415	1.32	78.19	112
Shipbuilding, Railroad Eq	659	0.25	78.44	21
Shipping Containers	693	0.27	78.71	26
Steel Works, Etc.	7,685	2.97	81.68	221
Telecommunications	5,985	2.31	83.99	118
Textiles	4,042	1.56	85.56	98
Tobacco Products	363	0.14	85.7	13
Trading	2,303	0.89	86.59	30
Transportation	9,728	3.76	90.35	255
Utilities	9,372	3.62	93.97	201
Wholesale	12,567	4.86	98.83	289
miscellaneous	3,020	1.17	100	100
Total	**258,631**	**100**		

Panel C. Year Distribution

Year	Frequency	Percent	Cum.
1996	2,496	0.97	0.97
1997	3,597	1.39	2.36
1998	9,904	3.83	6.19
1999	11,859	4.59	10.77
2000	12,647	4.89	15.66
2001	13,859	5.36	21.02
2002	14,211	5.49	26.51
2003	13,837	5.35	31.86
2004	14,611	5.65	37.51
2005	14,789	5.72	43.23
2006	15,262	5.9	49.13
2007	15,364	5.94	55.07
2008	14,878	5.75	60.83
2009	14,956	5.78	66.61
2010	14,917	5.77	72.38
2011	14,796	5.72	78.1
2012	15,531	6.01	84.1
2013	15,423	5.96	90.07
2014	14,894	5.76	95.82
2015	10,800	4.18	100
Total	**258,631**	**100**	

Table 4. Pearson's Correlation Table

This table shows the correlation coefficients of variables in our analysis. All variables are winsorized at the 1% level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Ln(Cash/TA)	TI_Corruption	Ln(TA)	NWC/TA	FCF/TA	CPX/TA	Leverage	STDEV_FCF/TA	RD/TA	MTB	Dividend Dummy	Stock Traded Value/GDP	Ln(GDP per capita)	Real Interest Rate	Legal Origin (UK)	Legal Origin (FR)	Legal Origin(GE)
Ln(Cash/TA)	1																
TI_Corruption	0.00656***	1															
Ln(TA)	-0.0525***	0.189***	1														
NWC/TA	0.452***	-0.0284***	-0.0546***	1													
FCF/TA	-0.0839***	0.0820***	0.350***	0.193***	1												
CPX/TA	-0.0763***	-0.0157***	-0.0240***	-0.103***	0.0407***	1											
Leverage	-0.252***	-0.00650**	0.0289***	-0.655***	-0.240***	-0.0552***	1										
STDEV_FCF/TA	0.0271***	-0.0320***	-0.0558***	-0.0322***	-0.0607***	0.0512***	-0.00945***	1									
RD/TA	0.265***	-0.109***	-0.224***	0.184***	-0.303***	-0.0895***	-0.0239***	0.0271***	1								
MTB	0.00718***	0.108***	-0.130***	0.00583**	-0.0321***	-0.00626**	-0.0146***	0.00189	-0.00580**	1							
Dividend Dummy	-0.0598***	0.277***	0.413***	-0.0295***	0.249***	-0.0261***	-0.0349***	-0.0667***	-0.266***	0.0641***	1						
Stock Traded Value/GDP	0.00539**	-0.352***	-0.189***	0.0484***	-0.0854***	-0.0204***	0.0532***	0.0338***	0.179***	-0.0698***	-0.345***	1					
Ln(GDP per capita)	0.0122***	-0.862***	-0.148***	0.0311***	-0.0808***	-0.0195***	0.0235***	0.0400***	0.131***	-0.0799***	-0.277***	0.457***	1				
Real Interest Rate	-0.0201***	0.128***	0.00803***	-0.00227	0.0138***	0.00830***	0.00949***	-0.0279***	-0.00357	0.0214***	0.0128***	-0.0842***	-0.148***	1			
Legal Origin(UK)	-0.0347***	-0.323***	-0.303***	0.0439***	-0.104***	0.0419***	0.00495*	0.0513***	0.143***	-0.154***	-0.340***	0.332***	0.155***	-0.0679***	1		
Legal Origin(FR)	-0.00042	0.310***	0.0868***	-0.0110***	0.0484***	-0.00970***	-0.00285	-0.0105***	-0.0541***	0.102***	0.122***	-0.293***	-0.210***	0.256***	-0.425***	1	1
Legal Origin(GE)	0.0378***	0.182***	0.273***	-0.0406***	0.0790***	-0.0397***	-0.00427*	-0.0473***	-0.117***	0.103***	0.285***	-0.156***	-0.0445***	-0.0945***	-0.778***	0.196***	1

Table 3. OLS Regression results for the effect of political corruption on corporate cash holdings (1): The whole samples

This table examines the effect of political corruption on corporate cash holdings in the whole samples. The dependent variable is the natural logarithm of cash and cash equivalent by total assets. Details on variables are provided in Appendix A. All variables are winsorized at the 1% level. VIFs of all variables are below 10. The ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Ln(Cash/TA)	**(1) Pooled**	**(2) Pooled**	**(3) Pooled**	**(4) Pooled**	**(5) Pooled**	**(6) RE**	**(7) FE**	**(8) FE**
TI Corruption	-0.194***	-0.330***	-0.399***	-0.309***	-0.502***	-0.397***	-0.353***	-0.130***
	(-16.23)	(-17.67)	(-33.06)	(-22.79)	(-29.23)	(-22.74)	(-20.66)	(-3.631)
TI Corruption^2	0.0720***	0.109***	0.126***	0.0918***	0.136***	0.107***	0.0950***	0.0586***
	(22.20)	(21.00)	(38.16)	(24.58)	(28.93)	(22.24)	(20.27)	(6.016)
TI Corruption^3	-0.00717***	-0.00957***	-0.0109***	-0.00735***	-0.00986***	-0.00808***	-0.00726***	-0.00506***
	(-27.04)	(-22.05)	(-40.44)	(-23.85)	(-26.06)	(-21.11)	(-19.46)	(-6.744)
Ln(TA)		0.0362***	0.0283***	0.0248***	0.0147***	0.0128***	0.0271***	0.0239***
		(33.63)	(38.13)	(29.57)	(15.66)	(13.58)	(28.95)	(25.04)
NWC/TA		2.053***	2.111***	2.201***	2.193***	2.199***	2.212***	2.234***
		(158.2)	(234.1)	(219.3)	(203.2)	(204.3)	(203.6)	(206.5)
FCF/TA		-0.571***	-0.781***	-0.737***	-0.717***	-0.700***	-0.707***	-0.694***
		(-50.00)	(-85.30)	(-73.47)	(-68.19)	(-66.60)	(-68.10)	(-67.19)
CPX/TA		-0.976***	-0.0769**	-0.143***	-0.121***	-0.0505	0.189***	0.272***
		(-18.08)	(-2.486)	(-4.040)	(-3.176)	(-1.327)	(4.838)	(6.993)
Leverage		-0.00438	0.0449***	0.138***	0.163***	0.182***	0.235***	0.253***
		(-0.388)	(5.572)	(15.11)	(16.59)	(18.54)	(23.94)	(25.87)
Industry sigma		0.00341***	0.00278***	0.00220***	0.00216***	0.00186***	-0.000555***	-0.000579***
		(23.93)	(30.65)	(22.73)	(20.55)	(17.48)	(-4.105)	(-4.312)
R&D/TA		1.988***	3.558***	3.351***	3.475***	3.504***	2.828***	2.950***
		(75.39)	(100.9)	(83.88)	(82.52)	(83.46)	(63.52)	(66.50)
MTB				1.55e-17***	-1.82e-17 ***	-2.22e-17***	-3.12e-17***	-3.51e-17***
				(3.188)	(-3.452)	(-4.224)	(-6.116)	(-6.633)
Dividend dummy		-0.0889***	-0.00778	-0.00689	-0.0966***	-0.129***	-0.0709***	-0.177***
		(-12.89)	(-1.562)	(-1.240)	(-15.71)	(-20.73)	(-11.52)	(-26.96)
Stock traded/GDP					-0.000412***	-0.000608***	-0.000640***	-0.000164***
					(-12.18)	(-16.73)	(-17.80)	(-2.691)
Ln(GDP per capita)					0.0628***	0.0151***	0.000593	-0.0894***
					(12.36)	(2.770)	(0.111)	(-7.160)

Real Interest Rate					-0.00622***	-0.00185***	-0.000940*	-0.00139
					(-12.30)	(-3.541)	(-1.845)	(-1.607)
Legal Origin (UK)					0.0433*	-0.0499**	-0.0734***	
					(1.870)	(-2.143)	(-3.244)	
Legal Origin (FR)					0.157***	0.0852***	0.0643***	
					(6.305)	(3.414)	(2.652)	
Legal Origin (GE)					0.299***	0.223***	0.213***	
					(12.56)	(9.368)	(9.167)	
Constant	-2.389***	-2.742***	-2.877***	-2.909***	-3.289***	-2.771***	-3.112***	-2.832***
	(-181.0)	(-113.4)	(-186.5)	(-170.0)	(-57.09)	(-44.61)	(-46.44)	(-21.26
Year effect						Random	Fixed	Fixed
FF48 Industry effect						Random	Fixed	Fixed
Country effect								Fixed
Number of observations	535,392	150,834	392,809	296,557	253,072	253,072	253,072	253,072
Adjusted R^2	0.0032	0.323	0.245	0.259	0.268	0.268	0.317	0.326

Table 4. OLS Regression results for the effect of political corruption on corporate cash holdings (2): Developed / Emerging countries sample

This table examines the effect of political corruption on corporate cash holdings in developed countries and emerging countries. We also separate our samples into three intervals by using inflections from Model (1) and (3). The dependent variable is the natural logarithm of cash and cash equivalent by total assets. Details on variables are provided in Appendix A. All variables are winsorized at the 1% level. VIFs of all variables are below 10. The ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Ln(Cash/TA)	**(1)Developed**	**(2)Developed**	**(3)Emerging**	**(4)Emerging**	**(5)Low**	**(6)Moderate**	**(7)High**
TI Corruption	-0.166***	-0.00803	0.150***	0.219***	-0.108***	0.0437***	-0.0214*
	(-11.75)	(-0.300)	(4.191)	(2.845)	(-17.14)	(2.978)	(-1.900)
TI Corruption^2	0.0282***	0.0109**	-0.0145***	-0.0150**			
	(10.63)	(2.260)	(-4.415)	(-2.281)			
Ln(TA)	0.0187***	0.0138***	0.0439***	0.0474***	0.0132***	0.0457***	0.0481***
	(15.74)	(11.61)	(25.95)	(27.39)	(10.31)	(20.56)	(26.91)
NWC/TA	2.209***	2.224***	2.229***	2.240***	2.216***	2.316***	2.203***
	(170.6)	(172.5)	(102.6)	(103.3)	(163.3)	(74.73)	(98.53)
FCF/TA	-0.706***	-0.687***	-0.527***	-0.517***	-0.690***	-0.665***	-0.507***
	(-61.50)	(-60.18)	(-18.21)	(-17.91)	(-58.22)	(-17.06)	(-16.86)
CPX/TA	0.177***	0.243***	0.291***	0.294***	0.247***	-0.0626	0.267***
	(3.652)	(5.038)	(3.995)	(4.047)	(4.852)	(-0.591)	(3.683)
Leverage	0.258***	0.269***	0.266***	0.274***	0.269***	0.309***	0.148***
	(22.68)	(23.74)	(12.48)	(12.86)	(22.69)	(10.39)	(6.751)
Industry sigma	-0.000695***	-0.000702***	-0.000218	-0.000201	-0.000786***	0.000232	-0.000628**
	(-4.246)	(-4.313)	(-0.850)	(-0.785)	(-4.602)	(0.610)	(-2.359)
R&D/TA	2.742***	2.853***	2.219***	2.209***	2.719***	2.528***	2.696***
	(55.96)	(58.47)	(15.93)	(15.89)	(53.74)	(14.90)	(19.12)
MTB	-4.63e-17***	-6.38e-17***	-9.64e-18	5.69e-18	-5.21e-17***	2.24e-18	8.33e-18
	(-4.928)	(-6.808)	(-1.571)	(0.876)	(-4.593)	(0.253)	(1.163)
Dividend dummy	-0.0718***	-0.191***	0.0907***	0.0853***	-0.0762***	0.0191	0.0255
	(-10.26)	(-25.66)	(5.771)	(5.431)	(-10.27)	(1.096)	(1.486)
Stock traded/GDP	-0.000741***	-0.000233***	0.000247**	0.000139	-0.000420***	-0.000238	-9.23e-05
	(-16.13)	(-2.621)	(2.573)	(1.187)	(-8.091)	(-1.246)	(-0.921)
Ln(GDP per capita)	-0.210***	-0.0310	-0.0664***	-0.142***	-0.189***	0.0628***	0.00450
	(-12.22)	(-1.210)	(-8.495)	(-5.728)	(-11.73)	(4.417)	(0.596)
Real Interest Rate	0.000450	-0.0128***	4.31e-05	-0.000915	0.00662***	0.000792	-0.000353
	(0.274)	(-5.908)	(0.0793)	(-0.923)	(3.827)	(0.413)	(-0.616)

Legal Origin (UK)	-0.168*** (-7.241)		-0.170*** (-14.74)		-0.179*** (-7.815)	0.0566** (2.391)	-0.333*** (-27.03)
Legal Origin (FR)	-0.0654** (-2.359)		-0.128*** (-8.728)		-0.0722** (-2.327)	-0.0411** (-2.106)	-0.195*** (-12.49)
Legal Origin (GE)	0.108*** (4.334)				0.119*** (4.779)		
Constant	-0.870*** (-4.610)	-3.303*** (-12.34)	-3.510*** (-27.49)	-3.653*** (-14.27)	-1.127*** (-6.304)	-4.545*** (-22.40)	-3.261*** (-24.54)
Year effect	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
FF48 Industry effect	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Country effect		Fixed		Fixed			
Number of observations	174,017	174,017	62,990	62,990	157,139	32,428	63,505
Adjusted R^2	0.332	0.346	0.279	0.289	0.338	0.287	0.284

Figure 2 Fitted Plots Graph (Total sample)

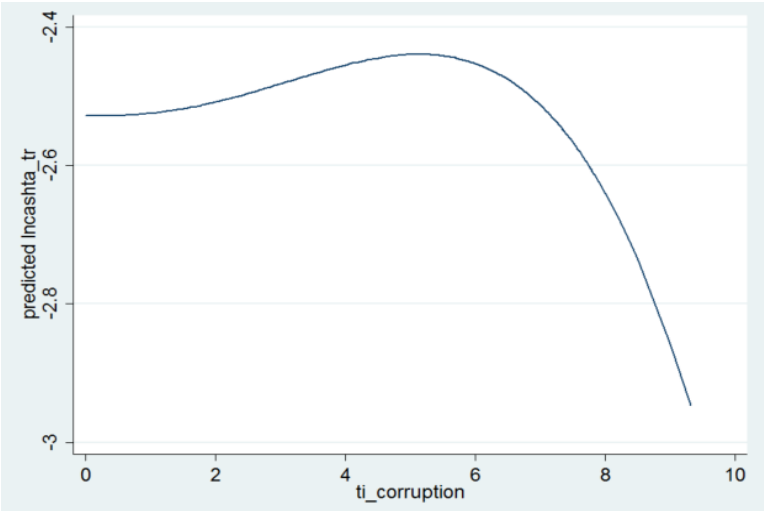

Figure 1 Fitted Plots Graph with 95% CI (Total sample)

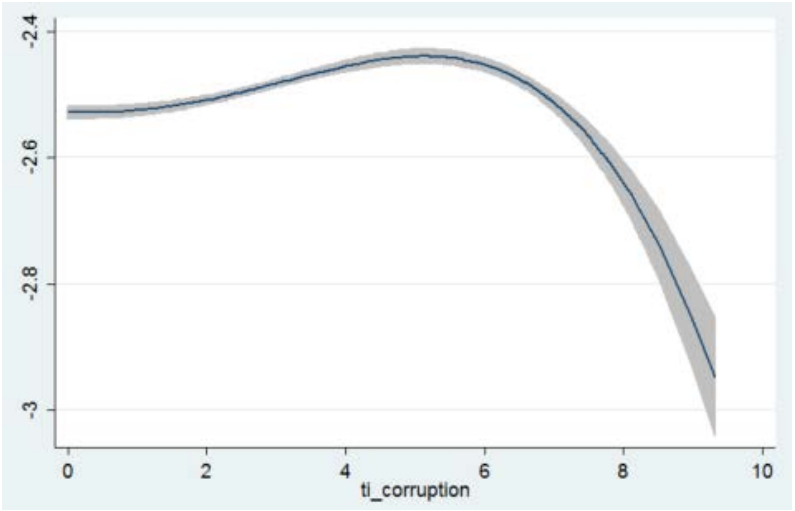

Figure 3 Fitted Plots Graph (Corruption < 5)

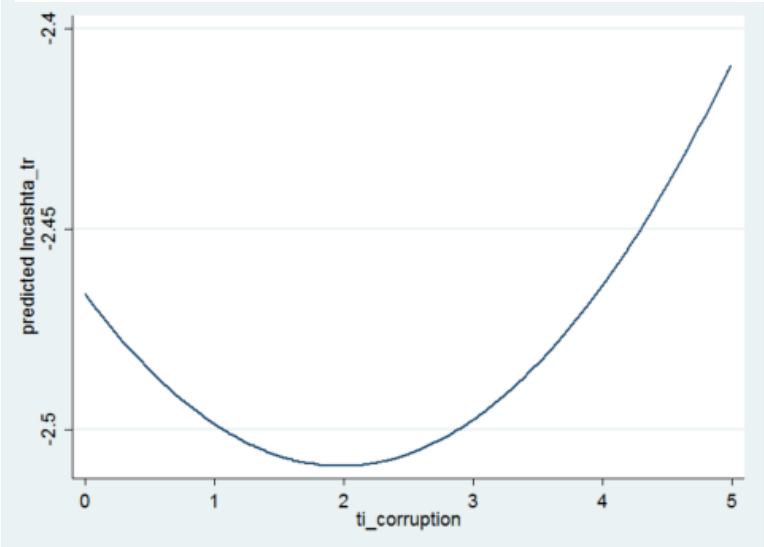

Figure 4 Fitted Plots Graph (Corruption > 5)

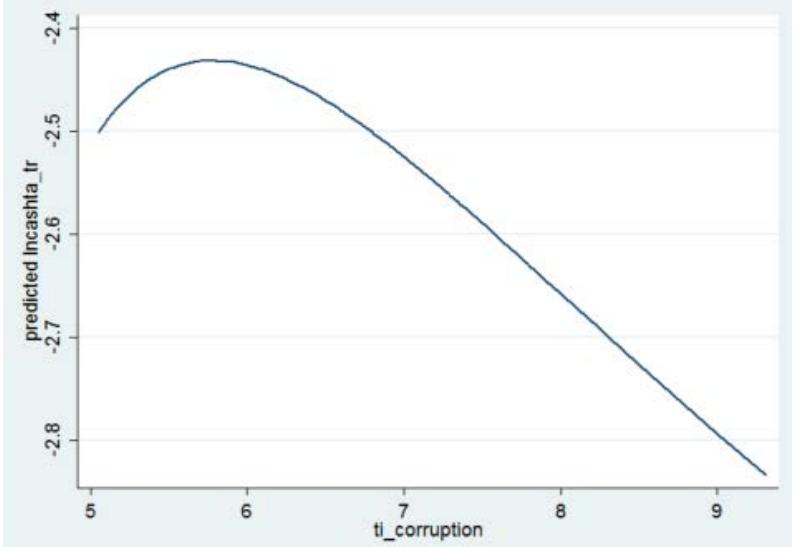

Table 5. 2 Stages Least Squares Regression results for the effect of political corruption on corporate cash holdings

The dependent variable is the natural logarithm of cash and cash equivalent by total assets. We used a two-stage model to solve the endogeneity issue, and the instrument variable is the urban population density in the largest city. All variables are winsorized at the 1% level. VIFs of all variables are below 10. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Ln(Cash/TA)	**(1) 1st stage TI Corruption**	**(2) 2nd stage Ln(Cash/TA)**	**(3) 2nd stage Ln(Cash/TA)**	**(4) 2nd stage Ln(Cash/TA)**
TI Corruption (Estimated)		-0.939***	-0.553***	-1.106***
		(-35.35)	(-19.16)	(-4.337)
TI Corruption^2		0.191***	0.0801***	0.102***
		(30.06)	(11.31)	(11.52)
TI Corruption^3		-0.0138***	-0.00592***	-0.00600***
		(-31.17)	(-12.16)	(-9.899)
Largest City Population Ratio	-0.0134***			
	(-114.2)			
Ln(TA)	0.0575***	0.0346***	0.0399***	0.0623***
	(76.75)	(32.44)	(37.33)	(4.213)
NWC/TA	-0.00725	2.184***	2.216***	2.231***
	(-0.837)	(201.6)	(204.0)	(203.3)
FCF/TA	-0.107***	-0.748***	-0.726***	-0.760***
	(-12.63)	(-70.65)	(-69.79)	(-25.97)
CPX/TA	-0.989***	-0.385***	-0.0374	-0.403
	(-32.38)	(-9.779)	(-0.932)	(-1.572)
Leverage	0.00600	0.160***	0.244***	0.259***
	(0.759)	(16.30)	(24.82)	(26.15)
Industry sigma	0.000591***	0.00214***	-0.000422***	-0.000200
	(6.905)	(20.18)	(-3.121)	(-0.994)
R&D/TA	0.271***	3.517***	2.918***	3.143***
	(7.984)	(82.85)	(65.27)	(37.96)
MTB	2.40e-16***	6.80e-17***	2.50e-17***	1.16e-16*
	(56.94)	(11.83)	(4.442)	(1.869)
Dividend dummy	0.235***	-0.00700	-0.0210***	-0.0136
	(47.75)	(-1.117)	(-3.323)	(-0.224)

Stock traded/GDP	0.00105*** (40.23)	-0.000427*** (-11.58)	-0.000332*** (-8.352)	0.000665** (2.400)
Ln(GDP per capita)	-1.332*** (-720.5)	-0.212*** (-12.99)	-0.343*** (-20.91)	-0.823** (-2.383)
Real Interest Rate	0.00271*** (6.844)	-0.00553*** (-11.31)	0.000193 (0.381)	-0.00124 (-1.055)
Legal Origin (UK)			-0.240*** (-11.24)	
Legal Origin (FR)			-0.119*** (-5.281)	
Legal Origin (GE)			0.0392* (1.827)	
Constant	16.19*** (835.8)	0.388** (2.119)	1.131*** (6.079)	6.820* (1.657)
Spearman's Rho		0.0589***	0.0484***	0.001
Year effect			Fixed	Fixed
FF48 Industry effect			Fixed	Fixed
Country effect				Fixed
Number of observations	258,089	252,534	252,534	252,534
Adjusted R^2	0.766	0.264	0.313	0.326

Table 6. 2 Stages Least Squares Regression results for the effect of political corruption on corporate cash holdings

This table shows the result of Propensity Score Matching(PSM). In logit regression in Panel A, we use 4 dummy variables as dependent variables. Pooled 50% Dummy variable has value 1 if corruption index is higher than the median of total sample, otherwise 0. Pooled 25% Dummy variable has value 1 if corruption index is higher than 25%, but has 0 when corruption index is lower than 75%. Emerging 25% Dummy variable has value 1 if corruption index is higher than 25% in developed countries sample, but has 0 when corruption index is lower than 75% in developed countries sample. Developed 25% Dummy variable has value 1 if corruption index is higher than 25% in frontier/emerging countries sample, but has 0 when corruption index is lower than 75% in frontier/emerging countries sample. In Panel B, the dependent variable is the natural logarithm of cash and cash equivalent by total assets. We used propensity score matching to solve the endogeneity issue. Treatment group and control group are matched by firm size (Ln(TA)) in same year and same industry. All variables are winsorized at the 1% level. VIFs of all variables are below 10. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Logit Regression

Ln(Cash/TA)	**(1) Pooled 50% Dummy**	**(2) Pooled 25% Dummy**	**(3) Emerging 25% Dummy**	**(4) Developed 25% Dummy**
Ln(TA)	0.0987*** (106.57)	0.0873*** (68.03)	-0.0409*** (-15.36)	0.0659*** (44.16)
Constant	-0.5863*** (-90.09)	-0.5424*** (-59.71)	0.2895*** (14.21)	-0.4199*** (-39.52)
Number of observations	543,943	285,639	63,903	190,253
Adjusted R^2	0.0155	0.012	0.0027	0.0075

Panel B. Propensity Score matching estimator

	Firm Year Observation	**Treated**	**Controls**	**Difference**	**t-stat**
Pooled 50% Dummy	526,497	-2.5411	-2.6340	0.0929***	17.34
Pooled 25% Dummy	275,851	-2.6088	-2.5995	0.0072	-1.29
Emerging 25% Dummy	62,613	-2.6053	-2.4665	-0.1388***	-9.71
Developed 25% Dummy	182,281	-2.4845	-2.5197	0.0087***	4.07

Table 7. OLS Regression results for the effect of political corruption on corporate cash holdings operating performance when using cash

This table shows the result of ROA model. We examine the effect of political corruption on the operating performance when using cash. The dependent variable is ROA that is operating income by total assets. We separate our sample into three intervals. First interval contains samples with corruption index lower than 2.94, second interval contains samples with corruption index from 2.94 to 5.17, and third interval contains samples with corruption index more than 5.17. We also separate second interval into Developed and Emerging from Model (3) to (6). All variables are winsorized at the 1% level. VIFs of all variables are below 10. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

ROA (Operating income/TA)	**(1) Developed Low**	**(2) Developed Low**	**(3) Developed High**	**(4) Developed High**	**(5) Emerging Low**	**(6) Emerging Low**	**(7) Emerging High**	**(8) Emerging High**
Cash/NA_{t-1}	-0.00971**	-0.00996**	-0.0754***	-0.0746***	-0.0321***	-0.0315***	-0.0845***	-0.0855***
	(-2.365)	(-2.423)	(-15.17)	(-14.94)	(-5.583)	(-5.463)	(-8.376)	(-8.433)
$\text{TI Corruption}_{t-1}$	-0.00132	-0.00355	-0.00226*	-0.00801***	0.00246***	0.00200	-0.00151	0.000996
	(-0.496)	(-0.738)	(-1.682)	(-2.628)	(3.640)	(0.660)	(-1.418)	(0.333)
Cash/NA_{t-1} x $\text{TI Corruption}_{t-1}$	-0.0116***	-0.0114***	0.0174***	0.0171***	0.00301***	0.00292***	0.0103***	0.0105***
	(-3.626)	(-3.551)	(10.46)	(10.28)	(2.875)	(2.787)	(6.916)	(7.003)
Ln(NA)	0.0154***	0.0152***	0.0120***	0.0124***	0.00962***	0.00989***	0.0103***	0.0105***
	(54.00)	(51.47)	(44.24)	(44.26)	(33.15)	(33.64)	(30.96)	(31.30)
PPE/NA	-0.0263***	-0.0254***	-0.0275***	-0.0268***	-0.0144***	-0.0142***	-0.0134***	-0.0124***
	(-11.80)	(-11.35)	(-13.05)	(-12.68)	(-6.004)	(-5.924)	(-5.170)	(-4.758)
ROA_{t-1}	0.508***	0.508***	0.651***	0.650***	0.465***	0.462***	0.466***	0.462***
	(154.9)	(154.6)	(222.8)	(221.8)	(104.1)	(103.2)	(93.10)	(91.90)
Constant	-0.0885***	-0.0695***	-0.0710***	-0.0577***	-0.0834***	-0.0648***	-0.0401***	-0.0431*
	(-7.996)	(-5.462)	(-7.419)	(-4.256)	(-7.646)	(-3.184)	(-3.092)	(-1.721)
Year effect	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
FF48 Industry effect	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Country effet		Fixed		Fixed		Fixed		Fixed
Number of observations	74,405	74,405	74,069	74,069	39,588	39,588	31,956	31,956
Adjusted R^2	0.405	0.411	0.526	0.532	0.316	0.321	0.319	0.324

Appendix A. Definitions of Variables

Variable	Definition
Ln(Cash/TA)	The natural logarithm of cash and cash equivalent over total assets
TI_Corruption	Corruption index by Transparency International. We adjust the score by subtracting from 10 for interpretation
Ln(TA)	The natural logarithm of total assets
NWC/TA	(Current assets – Current liabilities)/Total assets
FCF/TA	Free cash flows/Total assets
CPX/TA	Capital expenditure/Total assets
Leverage	Long term liabilities/Total equity
STDEV_FCF/TA	Standard deviation of FCF/TA in same year and same industry
RD/TA	Research and Development expenditure/Total assets
MTB	(Market capitalization + Total liabilities)/Total assets
Dividend Dummy	Dummy variable has value 1 if there was cash dividend of common shares, and otherwise 0
Stock Traded Value/GDP	Value of Stocks traded in a country over gross domestic product
Ln(GDP per capita)	The natural logarithm of per capita GDP
Real Interest Rate	Real interest rate of Treasury bills
Legal Origin(UK)	Dummy variable has value 1 if a country follows UK legal origin, otherwise 0
Legal Origin(FR)	Dummy variable has value 1 if a country follows French legal origin, otherwise 0
Legal Origin(GE)	Dummy variable has value 1 if a country follows German legal origin, otherwise 0
ROA	Operating income/Total assets
Ln(NA)	The natural logarithm of (Total assets – cash and cash equivalent)
PPE/NA	Property, Plant, and Equipment over (Total assets – cash and cash equivalent)

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