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Corporate Leverage Strategy in an Emerging Market

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ABSTRACT

This study empirically investigates whether the introduction of a new corporate governance system in the Korean economy (where controlling shareholders dominate business groups and corporate-bank relationships are prominent) affects corporate leverage strategies. We find evidence suggesting that improved corporate governance, measured by appointments of outside directors and controlling shareholder's ownership, constrains corporate borrowing. Chaebol firms, on average, have higher levels of borrowing than stand-alone firms. However, the largest chaebols, who are heavily involved in multinational ventures, showed the opposite trend, ostensibly due to more diversified business opportunities and sources of financing available in international markets. This suggests that government policies designed to improved corporate governance among "average" chaebols may be ineffective (or only partially effective), because such policies do not account the heterogeneity that exists across chaebols. Lastly, we find that intragroup transactions among affiliates increase corporate borrowing, but they are not consistently related to chaebol borrowing as a whole.

Keywords: Corporate leverage; Governance; Board reform; Chaebol

1. Introduction

Determinants of leverage have been an important issue at the household, corporate and national levels. Growing family debt, fueled by an overheated housing market, is closely related with the 2008-2009 global financial crisis (GFC) in the United States. Strengthening of the governance systems for financial institutions, according to Adams (2012), should have been made before the GFC. The financial market's concern about sovereign debt triggered

the ongoing Euro-zone crisis. Firms as deficit group in an economy's financial flow rely more on borrowing for the positive NPV projects than household and state sectors. The 'leverage' effect of borrowing, however, can increase default risk when corporate faces financial distress.

The objective of this paper is to investigate corporate strategies for leverage when a firm experiences governance reform and faces leverage regulation as a result of the financial crisis and subsequent reforms in South Korea (Korea hereafter). Considering the importance in the economy, we focus on large business groups (i.e., Chaebols) in the nexus of reforms and leverage regulations following the 1997 financial crisis.

The large business group has increased economic concentration and political power. Market's belief of "too

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big to fail' played as de facto exit barrier, which in turn requires more borrowing when the conglomerate faces financial distress. Intra-group transactions among affiliates and payment guarantee among affiliate increased the size of collateral for borrowing. The affiliation with the payment guarantee effectively pays lower interest rate than its own risk-adjusted rate. Thus leverage and intra-group transactions move together, creating a vicious circle.

This paper will increase value to existing literature on corporate governance and capital structure in the following ways. Numerous studies on capital structure exist but examination in the nexus of rapidly changed corporate governance in a developing economy is rare (perhaps none). In contrast with most existing studies on the case of developed economies where governance systems remain stable, Korean listed company has experienced in substantial change in corporate governance system. Thus, a study on corporate leverage strategies along this change in governance system is an interesting issue. Ang and Jung (1993) examined the pecking order theory of capital structure using Korean data. However, the sample of this paper differs from us and thus it ignored the change in corporate governance system. There are number of studies focusing a country specific case including Ozkan and Ozkan (2004) for the UK, Miguel and Pindado (2001) for Spain and Keister (2004) for China. None of these studies examined leverage in the nexus of governance reform. The case of South Korea (Korea hereafter) provides an excellent material for this study as the country has been experienced dramatic changes in both corporate leverage and governance system.

Further, our unique dataset allows us to examine our research goals among intra-business groups. Hoshi, Kashyap and Scharfstein (1991) report corporate structure using Japanese industrial groups. Existing studies on Korean Chaebol also examine Chaebol as a group to compare stand-alone firms. Our study examines top 5 largest Chaebol in comparison with other Chaebols. Similarly, we examined Chaebol based on the Korea Listed Companies Association database (KLCA), the most comprehensive coverage of listed companies on the Korea Exchange.

II. Data and Model

A. Data and Variable Definitions

Table 1 reports summary statistics and defines the variables for the data used in this study. The variable, *OD/BOD*, is the number of outside director divided by total board members. It has a mean value of 13.76 percent over the sample period of 1990-2011. The outside director system was introduced as part of the reforms following the 1997 financial crisis. Firms listed on the Korean stock market started to appoint outside board members in 1999. For the sample period of 1999-2011, the ratio rises to 21.58 percent.

Equity ownership owned by controlling shareholders and their related parties, such as family members, is designated as *CSH*. The variable *Foreigner* is the equity ownership owned by foreign investors. The dichotomous variable *Chaebol* based on the KLCA database and equals one for a firm that is a member of a business group or Chaebol, otherwise it is equal to zero. The Korea Fair Trade Commission usually regulates the top 30 largest business groups as determined by the group's asset size of a whole. *Chaeboltop30* equals one if a business group belongs to a top 30 largest business group (in terms of assets averaged for the years of 1995, 2000 and 2005), otherwise it is equal to zero 0. In a similar vein, we define *Chaeboltop5*. It is equal to one if a business group belongs to a top 5 largest group, and again zero otherwise. Table 1 indicates that around 5 percent of our sample belongs to a top 5 Chaebol.

The mean (median) value of debt scaled by assets during 1990-2011 is 53.68 (53.71) percent. *Debts* denote sum of interest-payable short-term borrowing and the current portion of long-term borrowing and excludes (non-interest) trade payables. Firm liabilities consist in large part of debts and trade payables. The mean (median) value for *Liability/Equity* for the sample period is 227.58 (108.93) percent, implying that the distribution is somewhat skewed toward highly levered firms. If a listed firm's principal transaction bank is a large and nation-wide then the discrete variable *Principalbank* is equal to one. These banks' market-to-book (MTB) value, as measured by the market value divided by the book value of their capital stock, puts them in the highest quartile among financial institutions. In our sample, these high MTB banks are

Table 1. Summary statistics

variable	N	mean	median	Standard deviation	Description
<i>Governance reform</i>					
OD/BOD	7702	13.76	0.00	16.38	Number of outside directors scaled by total board members
CSH	7526	29.71	30.76	21.20	Equity owned by controlling shareholder and its related parties including family members.
Foreigner	7183	7.31	1.26	13.65	Foreign investor's equity ownership
Chaebol	8428	0.57	1.00	0.49	1 if a firm belongs to a business group and 0 otherwise. A firm is regarded as a group affiliation if the firm has a name of business group in KLCA database.
Chaeboltop5	8428	0.05	0.00	0.20	1 if Chaebol belongs to top 5 large sized and 0 otherwise. Size is based on average assets of a business group in 1995, 2000 and 2005.
Chaeboltop30	8428	0.17	0.00	0.37	1 if Chaebol belongs to top 30 large sized and 0 otherwise. Size is defined same as for Chaeboltop5
<i>External finance</i>					
Borrowing	8265	53.42	53.15	25.13	(short term borrowing +current portion of long term borrowing) scaled by assets
Principalbank	8428	0.42	0.00	0.49	1 if a firm has principal transaction bank whose market-to-book value belongs to high quartile among financial institutions and 0 otherwise
Liability/Equity	8243	227.58	108.93	1828.9	Book value of liabilities divided by book value of capital stock
Equity	7479	5.88E+10	1.20E+10	3.56E+11	Book value of capital stock
Sharereturn	6242	0.11	-0.02	0.70	(current share price - previous share price)/previous share price, where share price is average monthly prices.
Sharevolatility	6645	21.87	17.46	17.23	Standard deviation of monthly basis share price scaled by its mean value
Sharegrowth	7319	596.28	-1.14	8446.34	(current number of shares issued - previous number of shares issued)/previous number of shares issued
Shareprice	6668	23903.78	11498.75	67266.48	Monthly average share price
Noofshares	7479	1.65E+07	3.64E+06	7.21E+07	Total number of shares issued (stock values)
<i>Internal finance</i>					
Netincomegrowth	8243	64.13	0.00	637.03	(Current net income - previous net income) divided by previous net income
Intragrouptransaction	7479	4.84	0.00	195.03	(intra-group loan liabilities + intra-group trade liabilities) / total liabilities

Hana, Kookmin, Korea Development, Shinhan and Woori banks.

Sharereturn is calculated by the ratio of current share price to previous year share price minus one. Share price is an average monthly value of -basis price. *Sharevolatility* denotes the coefficient of variation of (monthly-basis) the share price, calculated by the ratio of the standard deviation to the mean. The portion of individual investors in Korea

has been steadied around 60 percent between 1999 and 2003 (Min et al., 2012). The high volatility is due largely to individual investor's herd behavior. *Sharegrowth* is calculated by the ratio of the current number of shares issued to the previous year's number of shares minus one.

Sources of internal financing include retained earnings and depreciation. Due to data availability we use

Netincomegrowth, defined as (current net income - previous net income) divided by previous net income, as a proxy of internal financing. *Intragrouptransaction* is proxied by the ratio of intra-group liability to total liabilities where intra-group liability is calculated by sum of intra-group trade liability and loan liability.

B. Model

We consider the following unrestricted baseline model for corporate borrowing scaled by assets where *Borrowing* is denoted as Y_{it} .

$$Y_{it} = \text{constant} + \beta_1 \text{OD/BOD}_{it} + \beta_2 \text{CSH}_{it} + \beta_3 \text{Principalbank}_{it} + \beta_4 \text{Intragrouptransaction}_{it} + \beta_5 \text{Chaebol}_{it} + \text{Control Variables}_{it} + \mathbf{D}_{jt} \lambda_{jt} + v_i + \varepsilon_{it} \quad (1)$$

Where i , j and t refers to firm, industry and year respectively. We chose the *OD/BOD* variable as a proxy for good governance for the following two reasons. First, the introduction of the outside director system was one of the material changes following the 1997 crisis, and is similar to the strengthened requirement for independent directors in the US following the Sarbane-Oxley Act of 2002 (Choi, Park and Yoo, 2007; Min and Verhoeven, 2013). Secondly, the outside director data published by KLCA is less susceptible to measurement error than the alternative survey-based index numbers for overall quality of corporate governance (Black and Kim, 2012; Black, Jang and Kim, 2006). The expected sign of good governance is negative. Existing studies attribute the cause of the 1997 financial crisis to increased vulnerability of the economy due largely to highly indebted firms (Joh, 2004; Krueger and Yoo, 2001; Gauti and Krugman, 2010; Mishkin, 1999). Further, dysfunctional corporate governance prior to the 1997 crisis was the principal reason for firms' low profitability, increasing the vulnerability of indebted firms to external shocks (OECD, 2001; Joh, 2004). Given the high level of leverage, the failure to maintain high profitability necessary to pay interest led to the increased vulnerability.

Too big to fail was implicitly accepted in the Korean market before the onset of the 1997 crisis. A firm's size was positively related to its ability to borrow from banks, particularly given the lack of sophisticated lending

techniques or oversight. Consequently, managers who wanted to borrow more had the incentive to increase the size of the firm. The chairman of a business group also has the incentive to increase the size of the group under his/her control as a symbol of success and economic power. Indeed, the prevalence of tunnelling was facilitated by this increasing size of the firm/group (Bae, Kang and Kim, 2002). Shleifer and Vishny (1997) argue that the ultimate goal of corporate governance is to protect (minority) shareholders. Improved corporate governance in Korea therefore is expected to reduce borrowing. Bebchuk and Weisbach (2010) also suggest that the powerful a CSH the greater their ability to expropriate minority shareholders. A powerful CSH may also increase intra-group transactions, and thereby seek more opportunity for tunnelling. CSH opportunistic behaviours did not face internal constraints due to the BOD's failure to properly monitor and stop these excesses. On average, in the largest thirty Chaebols the CSH could control more than 40 percent of shares as they controlled not only their family ownership but also their in-group ownership (Joh, 2004). Therefore, the CSH was able to select all board members and, hence, have complete control.

Intra-group transaction is complex. Some argue that the advantage in financing created by intra-group markets explains the advent of business groups (Hoshi, Kashyap and Scharfstein, 1991; Almeida and Wolfenzon, 2006). In underdeveloped external capital markets business groups can better mobilize capital required for new ventures. The benefits of internal financing should, however, also be coupled with its potential costs to business groups, in particular tunnelling and the exploitation of minority shareholders (Bae, Kang and Kim, 2002; Claessens, Djankov, Fan and Lang, 2002). Tunnelling and exploitation are often manifested by intra-group capital flows (Johnson et al., 2000; Bertrand, Mehta and Mullainathan, 2002; Jiang et al., 2010; Fisman and Wang, 2010). To the extent that an affiliate provides tunnelling opportunities to the core company of the group, the affiliate will be in greater need of external finance. Leland and Pyle (1977) show that this asymmetric information problem leads to firms relying more on borrowing. Intra-group transaction is a typical example of this asymmetric information problem.

Corporate borrowing is also a function of the structure of an economy's financial system (Mayer, 1990; Levine, 2002). The role of the principal transaction bank in a Korean business group is similar to that in Japan (Nam,

1996). The importance of a Japanese main bank in its corporate finance is documented in numerous papers (Aoki et al., 2000; Aoki et al., 1994; Takeo et al., 1990; Miwa and Ramseyer, 2005). This framework's positive effect on borrowing is that main bank provides implicit insurance against financial or economic distress. Amiti and Weinstein (2011) indicate that high market-to-book value, as a measure of bank health, is highly correlated with a banks' lending to firms in Japan. As a result we expect *Principalbank* to have a positive effect on borrowing.

A Chaebol has an advantage borrowing because they often engaged in cross-debt guarantees which effectively increased the size of collateral available. These mutual payment guarantees allowed even poorly operating affiliates access to borrowing. Consequently, we expect β_5 to be positive. Titman and Wesels (1988) demonstrates that firm size and leverage have a positive correlation, particularly in the case of large firms, because they typically have less direct bankruptcy costs and tends to be more diversified, allowing a higher optimal debt capacity. By contrast, Rajan and Zingales (1995) suggests that less asymmetric information within larger firms results in a smaller incentive to raise borrowing, suggesting a negative relationship between firm size and leverage. Grossman and Hart (1982) demonstrate that, given the information asymmetry between manager and employee, size of tangible/fixed assets could be negatively correlated with borrowing. They point out that this asymmetry problem can be mitigated by the help from financial intermediaries. Firms with high levels of fixed assets would have already high levels of collateralised debt and are thus less motivated to borrow. In our results, we also include the 5 largest Chaebols in comparison with other Chaebols to account for these effects.

The major control variables in our estimation equation include: net income growth, foreign ownership, market liquidity, share return, year-industry effects and firm-specific effects, as described in greater detail in Table 1.

The expected sign for the *Netincomegrowth* coefficient is negative for two main reasons. First, the traditional pecking order theory of finance, coupled with asymmetric information theory, indicates a substitute relationship between internal and external finance (Myers, 1984; Myers and Majluf, 1984; Ross, 1977). Profitable firms may signal quality by leveraging up. Secondly, Rajan and Zingales (1995) suggest that due to the conflict of interests between equity and debt holders firms with future growth prospects

tend to rely more on equity financing. Shareholders of growing firms will consequently invest less to the extent that they want to monopolise the benefits of the growth instead of sharing them with lenders.

Badrinath, Kale and Ryan (1996) and Falkenstein (1996) suggest that market liquidity and lower share return affects investor's decision to provide capital to firms. The role of the equity market as opposed to borrowing differs between the pecking order and the static trade off theories. The static trade off theory assumes the existence of optimal capital structure and the firms try to maintain this level. Thus, the firm tends to borrow more when the equity market is bullish. In contrast, the pecking order theory predicts the opposite behaviour for the firm. The firm, ceteris paribus, will issue more number of shares when the price of share is overvalued. We include a control variable *Sharereturn* to account for these dynamics. Its expected sign of this ex ante is indeterminate.

Existing studies imply equity volatility has significant explanatory power for the cost of corporate borrowing (Merton, 1974; Bekaert et al., 2012). Equity volatility captures asset volatility which determines costs of borrowing and corporate default risk in the contingent claims models of corporate debt valuation (Merton, 1974). Bekaert et al. (2012) documented that equity volatility in fact captures other unobservable corporate risk factors as well. *Sharevolatility*, as a risk factor, is expected to decrease borrowing.

Year-industry static effects are to capture macro-economic and/or policy variables affecting homogeneously across firms but heterogeneously across industries. A particular industry's business requiring high level of physical assets may require higher level of borrowing than other industries. Some industries might have enjoyed favorable policies allowing them easier access to financial markets compared to other industries. An example of this is the so-called 'sun-rise' industries favoured by the government's industrial policy of the 1970s. While this picking-the-winner policy no longer applied during our sample period, it is possible that some industries enjoy various financial/taxation favours from this era. We include (SIC-3 digit) industry-year-specific effects, D_{jt} , to control for this year-industry effects. Lastly, overly risk averse decision making may perversely influence the firm's leverage choices. We use a firm specific effect, time invariant, variable, v_i to control for firm-specific factors affecting corporate borrowing. We address

endogeneity issues more rigorously in the robustness check section. We also used the beginning year values of all included covariates except *OD/BOD* and *CSH* to minimise reverse causality.

III. Results

Table 2 reports baseline estimation results investigating the effects of governance reforms on firm borrowing. Column (1) includes only board structure (*OD/BOD*) given internal finance, proxied by *Netincomegrowth*. The reported results strongly suggest that improved corporate governance, i.e., a larger proportion of outside directors, reduces corporate borrowing with a negative coefficient significant at the 1 percent level. This finding illustrates that newly appointed outside directors buy the existing

literature’s pointing that malfunctioned governance led to highly indebted firms whereby increase in vulnerability of the firms as well as economic system (OECD, 2001; Joh, 2004; Krueger and Yoo, 2001).

The estimated equation in Column (2) includes controlling shareholder (*CSH*), as well as board structure (*OD/BOD*) given internal finance. In this specification the *CSH* coefficient is negative and significant at the 1 percent level. We posit three main reasons for result. First, from the lender’s perspective, concentrated ownership may be more attractive than diffused ownership because it simplifies the dialogue window in the circumstance that a corporation declares default (Hart, 1995, Ch.6). Kim and Sorenson (1986) also argue a positive correlation between manager’s ownership and borrowing because an increase in the manager’s ownership reduces agency costs arising from borrowing. However, Korean bankruptcy law was poorly designed and the market for exits of financially distressed firms due to government regulation protecting

Table 2. Baseline estimation of the effect of governance reform

	(1)	(2)	(3)	(4)
OD/BOD	-0.150 [0.000]	-0.133 [0.000]	-0.173 [0.000]	-0.180 [0.000]
CSH		-0.160 [0.000]	-0.214 [0.000]	-0.242 [0.000]
Principalbank			6.224 [0.000]	5.976 [0.000]
Netincomegrowth	-0.119 [0.016]	-0.163 [0.001]	-0.151 [0.005]	-0.164 [0.017]
Sharereturn				-0.670 [0.236]
Sharevolatility				0.217 [0.000]
Year-industry effects	yes	yes	yes	yes
Firm-effects	yes	yes	no	no
_cons	-1782.06 [0.027]	-2207.34 [0.208]	2525.67 [0.000]	2756.67 [0.000]
N	6164	5367	5367	4641
\bar{R}^2	0.574	0.587	0.255	0.276
-ll	2.54E+04	2.21E+04	2.39E+04	2.07E+04

This table reports estimation of regression. Dependent variable is the ratio of total borrowing (short term + current portion of long term) scaled by assets. Figures in parentheses are heteroscedacity-robust p-values. \bar{R}^2 is adjusted R-square. -ll refers to (minus) log-likelihood values.

labor did not work efficiently. Furthermore, the existing literature points out the *CSH*'s expropriation and tunnelling is particularly frequent in an economy where family business groups are dominant (Bebchuk and Weishbach, 2010; Bae, Kang and Kim, 2002). Second, as the *CSH*'s ownership rises it may have increased confidence in managerial control, whereby the marginal value of non-borrowing finance increases at the expense of borrowing. This is because the high level of the *CSH*'s ownership decreases the marginal cost arising from a conflict of interest with minority shareholders, but increases the marginal cost arising from a conflict of interest with lenders, such as bond covenants. Third, ownership tends to be more diffused as a corporation ages, thus as the firm becomes mature borrowing increases (Helwege, Prinsky and Stulz, 2007). Again, the coefficient for (OD/BOD) is negative and significant.

Column (3) includes the principal transaction banking system (*Principalbank*) as well. The positive sign of the estimated coefficient is significant at 1 percent level.

Column (4) shows unrestricted model specification. All other variables are as expected: *Netincomegrowth* is negative suggesting a substitution effects for external borrowing; the positive *Principalbank* is similar to the role of main bank in Japan; increased *Sharevolatility* raises the firm risks whereby decreased lending from lenders. Negative sign of share price (*Sharereturn*) supports the pecking order theory of finance. However, statistical significance of this *Sharereturn* depends on model specification.

The following builds on the "baseline" model by including industry group interactions. Two variables capture this, *Intragrouptransactions* and an interaction term between *CSH* and *Intragrouptransactions*, *CSHXIntragroupttransaction*.

Table 3 reports these results. The interaction variable, *CSHXIntragroupttransaction*, is statistically significant and negative. This suggests either *CSH* mitigates the positive effect of borrowing by intra-group transactions, or increased intra-group transaction intensifies the negative effects of *CSH* on borrowing. To examine this, we ran two regressions: (1) regress *Intragroupttransaction* on lagged *CSH*, and then, (2) regress *CSH* on lagged *Intragroupttransaction*. In the second regression (2) *Intragroupttransaction* was 0.33 (p-value=0.00), but *CSH* in the first regression (1) was 0.001 (p-value=0.243). This result implies the 'channel' of the attenuation effects of the interaction variable is mainly driven by intra-group transaction rather than *CSH*.

Intra-group transaction tends to increase *CSH* ownership possibly due to increased wealth generated from this intra-group transaction, which in turn decreases borrowing to minimise agency problems with the lenders (i.e., bond covenants). As *CSH* ownership increases, *CSH* becomes more concerned with bond covenants because the marginal costs of agency problems arising from minority shareholders will diminish as a result of a narrowed disparity between *CSH*'s cash flows and control rights. Estimation results of the unrestricted model on column (3) are similar to column (2).

Table 3. *CSH* and its interaction with intra-business group trade

	(1)	(2)	(3)
OD/BOD	-0.171 [0.000]	-0.167 [0.000]	-0.162 [0.000]
CSH	-0.289 [0.000]	-0.302 [0.000]	-0.265 [0.000]
Principalbank	6.205 [0.000]		5.958 [0.000]
Intragroupttransaction	0.068 [0.001]	0.058 [0.005]	0.081 [0.000]
CSHXIntragroupttransaction	-0.050 [0.006]	-0.063 [0.000]	-0.053 [0.004]
Netincomegrowth	-0.126 [0.035]	-0.126 [0.042]	-0.130 [0.041]
Sharereturn			-0.211 [0.721]
Sharevolatility			0.225 [0.000]
Year-industry effects	Yes	Yes	Yes
_cons	2399.981 [0.000]	2365.977 [0.000]	2255.886 [0.000]
N	3967	3967	3778
\bar{R}^2	0.211	0.198	0.244
-ll	1.78E+04	1.78E+04	1.69E+04

We extend the model in Table 4 by including the dummy variable *Chaebol* signifying whether a firm belongs to a business group (i.e., *Chaebol*) and the interaction term *ChaebolXIntragroupttransaction* between *Chaebol* and intra-group transaction. As previously noted, a firm belonging to a business group is thought to have a higher level of borrowing. This is due to the increased value

of its collateral and the mutual debt payment guarantees among the group's affiliate firms. Concerns regarding the relationship between business groups and the banking sector have led to the Korea Fair Trade Commission to regulate bank borrowing by the top 30 largest Chaebols' affiliates. For example, Chaebols' affiliates were not allowed to borrow more than 100 percent of their capital stock. Table 4 suggests that firms belonging to a Chaebol borrow more (scaled by assets) than independent firms. In contrast to the bank borrowing restrictions, Chaebols' affiliates have not been restricted from borrowing from non-bank financial institutions (NBFIs). Despite restrictions on bank borrowing, the increase in borrowing from NBFIs leads to increases in Chaebol's total. The dummy variable Chaebol in Table 4 is positive, even when controlling for principal trade bank (*Principalbank*) in Columns (1) and (3). These finding indicates that Chaebol's

borrowing from NBFIs is proportionately more than from banks.

The interaction variable *ChaebolXIntragroupttransaction* is consistently negative although its statistical significance depends on controlling for the existence of a principal bank. The negative sign may be explained by the possibility that a high level of intra-group-transactions within a Chaebol leads to less borrowing as compared to other Chaebolss. In particular, the results on Columns (3) and (4) suggest that this interaction effect is significant only when we impose zero effects of *Principalbank*. When we control for *Principalbank*, the positive effects of *Chaebol* in conjunction with *Intra-group trade* is no longer statistically significant. Assuming that a Chaebol's borrowing, other than from a principal transaction bank, is from NBFIs, higher borrowing is mainly due to its affiliation to a business group (who often has large portion of NBFIs ownership)

Table 4. Estimation results of corporate borrowing taking Chaebols into account

	(1)	(2)	(3)	(4)
OD/BOD	-0.175 [0.000]	-0.165 [0.000]	-0.175 [0.000]	-0.165 [0.000]
CSH	-0.292 [0.000]	-0.285 [0.000]	-0.291 [0.000]	-0.284 [0.000]
Principalbank	5.775 [0.000]		5.796 [0.000]	
Intragroupttransaction			0.055 [0.004]	0.057 [0.004]
Chaebol	3.101 [0.000]	4.259 [0.000]	3.082 [0.000]	4.248 [0.000]
ChaebolXIntragroupttransaction			-0.036 [0.187]	-0.054 [0.010]
Netincomegrowth	-0.130 [0.036]	-0.130 [0.049]	-0.123 [0.042]	-0.125 [0.057]
Sharereturn		-0.251 [0.674]		-0.244 [0.682]
Sharevolatility		0.230 [0.000]		0.229 [0.000]
Year-industry effects	Yes	Yes	Yes	Yes
_cons	2357.484 [0.000]	2159.124 [0.000]	2358.044 [0.000]	2160.671 [0.000]
N	3968	3779	3967	3778
\bar{R}^2	0.215	0.239	0.214	0.238
-ll	1.78E+04	1.69E+04	1.78E+04	1.69E+04

and is no longer facilitated by increased intra-group transaction.

As previously shown, a firm's borrowing is influenced by whether it belongs to a Chaebol or is a stand-alone firm. But the relationship between firm borrowing and Chaebol affiliation is more complex. As Tables 5 and 6 demonstrate, Chaebol size matters. Using the KLCA business group data, we use dummy variables to denote whether a firm is a Chaebol member of varying sizes. Korea Fair Trade Commission regulations target the top

30 largest Chaebols. We further subset these Chaebols into the five largest (Top 1-5), the ten largest (Top 1-10), the twenty largest (Top 1-20) and the thirty largest (Top 1-30) Chaebols. Repeated estimation of the model using a dummy variable for Chaebol size and compare results across different Chaebol sizes provides a means to determine the effect of Chaebol size on corporate borrowing.

Tables 5 and 6 show intra-group analyses. Table 5 divided KLCA based business groups into top 30 largest

Table 5. Estimation results for top 30 largest Chaebols and intra-group transaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Top 1-5	Chaebol	Top 1-10	Chaebol	Top1-20	Chaebol	Top 1-30	Chaebol
OD/BOD	-0.163	-0.155	-0.169	-0.160	-0.168	-0.158	-0.168	-0.156
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CSH	-0.304	-0.292	-0.294	-0.282	-0.293	-0.279	-0.292	-0.281
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Principalbank	6.691		6.521		5.985		5.577	
	[0.000]		[0.000]		[0.000]		[0.000]	
Intragroupttransaction	0.073	0.076	0.071	0.073	0.071	0.075	0.069	0.074
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Top5Chaebol	-8.260	-5.529						
	[0.000]	[0.010]						
Top5XIntragroupttransaction	-22.866	-18.636						
	[0.062]	[0.109]						
Top10Chaebol			-2.417	-0.042				
			[0.108]	[0.978]				
Top10XIntragroupttransaction			-14.538	-8.122				
			[0.182]	[0.443]				
Top20Chaebol					3.720	5.638		
					[0.005]	[0.000]		
Top20XIntragroupttransaction					-27.19	-20.946		
					[0.011]	[0.046]		
Top30Chaebol							4.323	5.752
							[0.000]	[0.000]
Top30XIntragroupttransaction							-3.295	-0.467
							[0.475]	[0.913]
Netincomegrowth	-0.13	-0.133	-0.129	-0.131	-0.125	-0.127	-0.121	-0.123
	[0.027]	[0.041]	[0.031]	[0.046]	[0.038]	[0.056]	[0.047]	[0.065]
Sharereturn		-0.202		-0.201		-0.225		-0.265
		[0.734]		[0.735]		[0.706]		[0.657]
Shareprice		0.223		0.226		0.228		0.229
		[0.000]		[0.000]		[0.000]		[0.000]
Year-industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	2407.041	2218.713	2384.967	2209.707	2376.179	2203.579	2395.66	2221.987
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	3967	3778	3967	3778	3967	3778	3967	3778
\bar{R}^2	0.216	0.234	0.212	0.232	0.213	0.235	0.214	0.238
-ll	1.7E+04	1.6E+04	1.7E+04	1.6E+04	1.7E+04	1.6E+04	1.7E+04	1.6E+04

Top 5 Chaebol is 1 if a firm belongs to top 5 largest Chaebols and 0 otherwise (Columns 1 and 2). Top 10 Chaebol is 1 if a firm belongs to top 10 largest Chaebols and 0 otherwise (Columns 3 and 4). We continued this exercise for top 20 (Columns 5 and 6) and top 30 Chaebols (Columns 7 and 8). Consequently, Top 30 Chaebol includes largest number of ones.

with a further clustering within these 30 largest Chaebols. Interestingly, the roles of Chaebol differ between the only top 10 largest and the top 30 Chaebols. Columns (1)-(4) show that an affiliate of top 10 largest Chaebols decrease borrowing whereas the top 30 Chaebols increases.

We redefined binary variable for Chaebols to examine the possibility that firms belong to different size of Chaebols might borrow differently.

Table 5 report that the analysis in Table 4 using Chaebol defined as a business group who has a name of business group in KLCA database is almost identical to Columns

(7) and (8) using Top30Chaebol dummy. Interestingly, however, the sign of Top5Chaebol (and Top10Chaebols) is opposite to those for Top20Chaebol and Top30Chaebol. Further, Top5Chaebol dummy is statistically significant; implying that pattern of the largest-size Chaebols is different from smaller sized ones. Interaction between Chaebol and intra-group trade, however, does not show a consistent pattern: 5 percent significant for Top20Chaebol and 10 percent significant for Top5Chaebol, but no significance for the rest. In an unreported table, we repeated estimation using different definition of Chaebols. Instead

Table 6. Estimation results for top 30 largest Chaebols and principal banking system

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Top1-5 Chaebol	Top6-30Chaebol	Top6-30Chaebol	Top6-30Chaebol	Top11-30 Chaebol	Top11-30 Chaebol	Top1-30Chaebol	Top1-30Chaebol
OD/BOD	-0.166 [0.000]	-0.157 [0.000]	-0.149 [0.000]	-0.147 [0.000]	-0.155 [0.000]	-0.152 [0.000]	-0.162 [0.000]	-0.156 [0.000]
CSH	-0.305 [0.000]	-0.291 [0.000]	-0.301 [0.000]	-0.297 [0.000]	-0.299 [0.000]	-0.295 [0.000]	-0.288 [0.000]	-0.281 [0.000]
Principalbank	7.006 [0.000]		3.960 [0.000]		4.461 [0.000]		4.748 [0.000]	
Intragroupttransaction	0.073 [0.001]	0.075 [0.001]	0.063 [0.001]	0.077 [0.000]	0.064 [0.001]	0.077 [0.000]	0.063 [0.001]	0.074 [0.000]
Top1-5Chaebol	-1.630 [0.564]	-6.918 [0.000]						
Top5XPrincipalbank	-10.766 [0.001]							
Top6-30Chaebol			1.591 [0.341]	9.501 [0.000]				
top6-30XPrincipalbank			10.594 [0.000]					
Top11-30Chaebol					2.133 [0.270]	9.927 [0.000]		
Top11-30XPrincipalbank					11.136 [0.000]			
Top1-30Chaebol							0.869 [0.567]	5.728 [0.000]
Top1-30chaebXPrincipalbank							5.033 [0.008]	
Netincomegrowth	-0.130 [0.027]	-0.133 [0.041]	-0.113 [0.065]	-0.122 [0.067]	-0.116 [0.058]	-0.125 [0.061]	-0.118 [0.054]	-0.124 [0.065]
Sharereturn		-0.192 [0.746]		-0.296 [0.620]		-0.263 [0.660]		-0.266 [0.656]
Shareprice		0.223 [0.000]		0.226 [0.000]		0.225 [0.000]		0.229 [0.000]
Year-industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	2413.5 [0.000]	2225.2 [0.000]	2461.8 [0.000]	2242.1 [0.000]	2408.3 [0.000]	2193.7 [0.000]	2421.6 [0.000]	2222.4 [0.000]
N	3967	3778	3967	3778	3967	3778	3967	3778
\bar{R}^2	0.217	0.234	0.225	0.245	0.224	0.243	0.215	0.238
rmse	21.391	21.437	21.28	21.29	21.296	21.322	21.415	21.387
-ll	1.7E+04	1.6E+04	1.7E+04	1.6E+04	1.7E+04	1.6E+04	1.8E+04	1.7E+04

of the cumulative type of definition of binary variable, we divided the top 30 largest Chaebol to make 5 groups (i.e., quintile distribution). Estimation using these quintiles confirms this different pattern of the top 5 largest Chaebols' borrowing.

Having observed Table 5 suggesting the possible difference between larger and smaller sized Chaebols, we reran the model after dividing the Top 30 Chaebols into smaller cluster and after taking into account the effect of principal transaction banking system. Globally reputed firms including Samsung, Hyundai, LG and POSCO are included in this top 5 Chaebol. Similar to Table 5, Table 6 reports that affiliates to top 5 Chaebols borrow less. This less borrowing (scaled by assets) is possibly due to their accessibility to various alternative source of financing other than borrowing. Globally reputed firms, for example, can access to bond market in the world. We further hypothesise that the role of principal transaction bank for the reputed firms should be less important than others. Columns (1) and (2) in Table 6 shows borrowing of firms belong to top 5 largest Chaebols. Binary variables for this top 5 chaebol (*Top1-5Chaebol*) are negative, which are opposite to those for other smaller sized Chaebols. The interaction between this Top 5 Chaebol and *Principalbank* in Column (1) is negative and this is opposite to the rest (Columns 3-6 in particular). These findings, combined with positive role of *Principalbank*, indicate that the role of principal transaction bank for top 5 largest Chaebols (i.e., reputed Chaebols) is smaller (in fact opposite) than that for the smaller sized Chaebols. In contrast, smaller sized Chaebol's borrowing is facilitated by the principal transaction banking system.

IV. Further analyses and Robustness check

Our estimations thus far consider firm-effects and year-industry effects for the sample period of 1990-2011. One of the remaining questions is reliability of estimated standard errors due to cluster-correlation. The other question is whether there is any significant change in our estimated coefficients before and after the 1997 financial crisis.

In untabulated tables, we ran panel data models using two groups of sample periods. First two columns are fixed

effect model estimated by within estimator and the last two columns are random effect model estimated by GLS estimator. Random effect model is more restrictive than fixed effects as it assumes the unobserved firm-specific effects are not correlated with included regressors. The limitation of the fixed effect model is that it cannot estimate indicator variables such as *Principalbank* and *Chaebol*. Thus, we present both estimation results. Main advantage of this panel model is to obtain cluster (i.e. firm)-level correlation standard errors (p-values). Estimation results are qualitatively same as before (results are available upon request).

Endogeneity bias caused by reverse causality is a remaining issue. We consider the simultaneity bias is potentially from the possibility that level of borrowing affects the firm's appointment of outside directors (and/or foreign investor's investment). To address this reverse causality we employed the instrumental estimation method. We used two instrument variables. One is year-industry effect dummies. This year-industry effect dummies are used as either included covariate or excluded instrument variable depending on model specification (Angrist and Pischke, 2009). The other is residuals obtained from regression of *OD/BOD* on *Borrowing*, *Board size* at the beginning of period, squared of its own variables and interaction between these two. Motivation of using this instrument is that board size in Korea has traditionally been determined by seniority-based promotion (Kim and Briscoe 1997). Furthermore, the amended Listing Act requires 25 percent of outsiders is based on the size of board. The inclusion of *Borrowing* as covariate means the residuals of the regression is correlated with *OD/BOD* but uncorrelated with *Borrowing* by construction (Amiti and Weinstein, 2011).

Column (1) in Table 7 report GMM estimation for the restrictive model including only *OD/BOD* variable. The rest of the estimations are based on 2SLS. The results are consistent with our main findings except the absolute value of the estimated coefficient of the instrumented variable (i.e., *OD/BOD*) increases.

Table 7. Instrument variable estimation of borrowing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
OD/BOD	-0.441 [0.000]	-0.437 [0.000]	-0.424 [0.000]	-0.214 [0.000]	-0.205 [0.000]	-0.226 [0.000]	-0.223 [0.000]
CSH					-0.267 [0.000]	-0.299 [0.000]	-0.286 [0.000]
Principalbank					6.434 [0.000]		4.784 [0.000]
Chaebol							7.132 [0.000]
Foreigner				-1.717 [0.000]	-0.611 [0.000]	-0.669 [0.000]	-0.682 [0.000]
Netincomegrowth			-0.126 [0.002]	-0.149 [0.007]	-0.149 [0.018]	-0.169 [0.007]	-0.162 [0.010]
Sharereturn						0.217 [0.634]	0.075 [0.867]
Sharevolatility						0.165 [0.000]	0.170 [0.000]
year-industry effects	yes	no	no	no	no	no	no
firm-effects	no	yes	yes	yes	no	no	no
N	7310	7310	7159	6613	5890	5226	5226
\bar{R}^2	0.177	0.527	0.624	0.35	0.125	0.103	0.128
First-stage output							
F-values	7310.09	434.84	429.66	2737.95	2440.44	2005.13	1949.90
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
\bar{R}^2	0.961	0.965	0.965	0.960	0.962	0.959	0.960
Instrumented variables	Outsider n.a.	Outsider n.a.	Outsider n.a.	Outsider foreigner	Outsider foreigner	Outsider foreigner	Outsider foreigner
excluded Instrument variables	residual n.a.	residual year-industry	residual year-industry	residual year-industry	residual year-industry	residual year-industry	residual year-industry

Constant variables are not reported for brevity

V. Summary and Conclusion

This paper investigates changing corporate strategies for leverage when firms experienced dramatic change in governance system in Korea where business groups have been prevalent.

Our estimation confirms that improved corporate governance, measured by appointments of outside directors, and controlling shareholder's ownership constrained corporate borrowing. Our finding also implies the Principal Banking System in Korea has a significant role to increase corporate leverage both before and after the crisis.

Chaebol *on average* has higher level of borrowing than stand-alone firms owing to its increased collateral values, the long-lasting mutual debt-payment guarantee among

affiliates, and access to non-bank financial institutions. However, affiliates belong to the top 5 largest Chaebols have lower level of borrowing than others because of its established global reputation and accessibility to diversified source of financing. This finding illustrates that affiliates to the top 5 largest Chaebols has different pattern of borrowing than other smaller sized Chaebols. An implication of this result is that government policies targeting 'average' Chaebols is not effective as a differentiated approach.

Intragroup transactions among Chaebol affiliates increased corporate borrowing. This finding is consistent with average Chaebols' higher level of borrowing than stand-alone firms. Intra-group transaction also has a positive association with CSH ownership due possibly to tunnelling, which in turn constrains corporate borrowing to minimise agency problem with the lenders (i.e., bond

covenants). This finding supports our prediction that CSH's relative concerns about bond covenants vis-à-vis the agency problem associated with minority shareholders will proportionately increase as CSH's ownership increases. In contrast with the positive association with CSH ownership, intragroup transaction does not have a consistent relationship with borrowing from Chaebol as a whole.

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