# Stock return comovement and Korean business groups ☆

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## Abstract

This paper explores whether business group affiliations affect the covariance structure of stock returns in Korea. We find that the stock returns of firms belonging to the same business group show positive and significant comovement. The strong comovement between group returns and firm returns is explained by correlated fundamentals. We find strong comovement among business group affiliate earnings. Moreover, variance decomposition of returns shows that cash flow news plays a relatively more important role in explaining group comovement than discount rate news, suggesting a link between stock return comovement and the "tunneling" and "propping" behaviors of business groups. Finally, return comovement increases when a firm joins a business group.
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## 1. Introduction

Large, diversified business groups are a prominent feature of the economic landscape in many countries, particularly in Asia. A business group is a consortium of firms that are connected, often through common share ownership of member firms. It is common for a single individual or family to control all member firms, and cross holdings among member firms are also typical. The role of business groups has attracted considerable academic attention, with researchers presenting evidence in favor of both value-creating and value-destructive functions of business groups. However, relatively little attention has been paid to correlations among member firm stock returns.

In this study, we explore whether business group affiliations impact the covariance structure of stock returns for business groups in South Korea. Focusing only on Korean business groups (known as *chaebol*) provides two advantages. First, chaebol firms are clearly defined. The Korea Fair Trade Commission (KFTC) publishes business group membership each year, identifying member firms and ranking groups by total assets. Second, focusing on Korean markets helps to control for differences in country-level institutional environments that may introduce endogeneity issues and confound results (Joh, 2003).

Using stock returns and business group composition data for Korean firms during the period 2002–2011, we find that stock returns for firms within the same business group exhibit significant comovement, beyond market-wide movements. Furthermore, when we control for industry-wide movement, the effect of group affiliation on chaebol firm comovement remains positive and significant. Our findings are consistent with related studies which suggest that corporate governance mechanisms permitting concentrated ownership over member firms is associated with increased stock return comovement (Morck et al., 2000; Jin and Myers, 2006; Fernandes and Ferreira, 2009).

We next examine the sources of the business group return comovement. Vijh (1994) shows evidence that return comovement could arise from fundamental (economic) or sentimental (noneconomic) factors. It is likely that stock return comovement within Korean business groups stems from the correlation

of the affiliates' fundamentals. Firms within Korean business groups are connected by mutual cross holding agreements. These cross holding arrangements might be an underlying factor affecting return comovement, because even though a controlling shareholder does not have an incentive to manipulate the performance of affiliates, the fundamentals of affiliates may be affected through equity cross holdings (Bae et al., 2008). Thus, if strong return comovement of business group affiliates is significantly influenced by these activities, then the fundamentals of affiliates would also exhibit strong comovement. To test the link between return comovement and fundamentals, we measure comovement in group members' earnings. We find strong positive comovement in business group firm earnings, consistent with the fundamental explanation of business group return comovement.

We further explore the sources of chaebol stock return comovement by evaluating the relative importance of two fundamental components of stock returns, cash flow news and discount rate news (Campbell, 1991). Stock returns change due to innovations in expected future cash flows-which measures real activity-and innovations in the discount rate applied to those cash flows, which measures financial activity. Therefore, we decompose unexpected stock returns into expected cash flow and discount rate news by utilizing the return decomposition framework in Vuolteenaho (2002). We find that stock return comovement is, on average, more strongly related to cash flow news comovement than discount rate news comovement, suggesting that real activity is more important than financial activity in explaining chaebol stock return comovement.

To validate our evidence that the comovement of stock returns of affiliates is attributable to the chaebol group affiliation effect, we examine a subsample of affiliates that changed their group affiliation during the sample period. Our investigation is motivated by recent studies that have explored the "index inclusion effect" on the comovement of stock returns. For example, Barberis et al. (2005) find that corporations newly added to the S&P 500 index experience a significant increase in stock return comovement with the rest of the index. Empirical analysis of firms that are newly added to (or removed from) a Korean business group would provide a more rigorous setting for verifying robustness of the group affiliation effect on the comovement of stock returns. We find that stock returns of firms that newly join a Korean business group comove positively with the returns of the group they join. Prior to joining the chaebol, these firms exhibit an insignificant degree of comovement with returns of that group.

Our study is related to Kim et al. (2015), who focus on comovement before and after the 1997 Asian financial crisis. The authors find that business group comovement increased following the crisis, which they attribute to being in investors' preferred "habitat" along the lines of Barberis et al. (2005). In addition, Kim et al. find that comovement is not related to simple fundamental measures such as ROA, cash flow, and related party transactions. We extend Kim et al.'s results by decomposing business group comovement into cash flow news and discount rate news. Our results contrast with those of Kim et al. in that we find substantial evidence that business group comovement is

related to fundamental factors, as evidenced by group earnings comovement as well as our evidence from the decomposition of group returns.

Our results contribute to the literature on return comovement in three areas. First, our results provide new insight into the relationship between business group affiliations and the covariance structure of stock returns. Second, we show evidence that stock return comovement among chaebol firms is driven by comovement in fundamental factors of member firms. Finally, our study makes an important distinction between cash flow news and discount rate news, and provides compelling evidence that cash flow news is more relevant than discount rate news in the comovement of stock returns among chaebol members.

The rest of the paper is organized as follows. Section 2 briefly reviews relevant literature. Section 3 describes the data employed in our study. Section 4 documents the group comovement of stock returns for firms that are affiliated with Korean business groups. In Section 5 we explain the decomposition framework of stock returns, and we test whether group returns comovement is more strongly associated with cash flow or discount rate news comovement. Section 6 examines changes in business group affiliation, and Section 7 concludes.

## 2. Literature review

Existing literature has examined the value implications of business groups. One collection of studies suggests that business groups have the potential to perform a value creating function among member firms. For example, in countries where external capital markets are not well developed and have severe information asymmetry, business groups can facilitate more efficient allocation of internal capital or sharing of resources and risks. Khanna (2000) reviews the literature on business groups in emerging markets and reports that they can enhance social welfare in countries that lack certain institutions. Khanna argues that business groups may partially replace contract and property rights enforcement mechanisms that are more established in developed countries. Khanna and Palepu (2000) study business groups in India and find similar results, that business groups can help overcome imperfect markets.

Other studies find evidence that business groups may exploit the weaker institutions of the countries in which they operate, taking advantage of minority shareholders. This stream focuses on the agency problems that arise from the separation of cash flow and control rights, a defining feature of many business groups. This discrepancy in cash flow and control rights can create incentives for the controlling shareholder of the group to expropriate wealth from member firms, which researchers have termed "tunneling." Johnson et al. (2000) review the legal treatment of tunneling and find that it is prevalent in both developed and emerging countries. Furthermore, the authors find that it is often conducted legally, despite being in conflict with minority shareholder interests. Examples of such legal tunneling cited by Johnson et al. include the sale of assets from a firm to its controlling owner at below-market prices, loan guarantees collateralized by the firm's assets, and excessive executive compensation. Bertrand et al. (2002) find evidence of tunneling in

Indian business groups. Their methodology is based on how firms respond to performance shocks. In contrast, Siegel and Choudhury (2012) question several aspects of Bertrand et al.'s methodology. Most notably, they argue that differences in firm business strategy must be considered, or else firm responses to industry shocks may be misinterpreted as tunneling. The disparity in the conclusions of these two studies suggests that the role of business groups as vehicles for tunneling has not yet been resolved.

A few studies have looked specifically at chaebol firms in Korea for evidence of tunneling. Bae et al. (2002) study chaebol firms and find that when a chaebol firm acquires another firm, the chaebol firm's stock price tends to fall. However, other firms that belong to the chaebol tend to have positive abnormal returns around the acquisition. Given that the controlling owner of the chaebol has an ownership interest in all member firms, the owner benefits overall from the acquisition, consistent with the tunneling hypothesis. Almeida et al. (2011) find similar results for chaebol firms, and posit that the shares of such firms trade at a discount because they are sometimes used as a vehicle for value-destroying acquisitions. Tunneling is not the only negative side effect of business group affiliation. Kim and Yi (2006) find that greater separation of ownership and control at chaebol firms is associated with more severe earnings management.

Firms that belong to business groups may also benefit from the financial resources of other member firms. It is conceivable that firms facing potential financial distress may receive financial backing from other member firms; this "reverse tunneling" is referred to as propping by existing literature. Studies in this segment contend that a controlling shareholder of a business group may help member firms experiencing financial difficulty by providing private funds or internal capital, so as to reduce the default risk of the firm and ensure group survival. Bae et al. (2008) examine earnings announcements of chaebol firms and find that a negative earnings announcement by a firm has a negative effect on the market value of all firms that belong to the chaebol, consistent with investor pricing of propping within a chaebol. Friedman et al. (2003) find that controlling shareholders prop up member firms as a means to future expropriation of wealth from those firms.

Researchers have identified comovement among stock returns, citing various factors that contribute to return comovement. Kim et al. (2015) study return comovement among Korean business groups. Their analysis is based on average pairwise correlations among member firms vs. industry firms. The authors find that business group stock returns commove more than industry-level stock returns, and that comovement increased after the 1997 Asian financial crisis. Kim et al. argue that group comovement cannot be explained by fundamental factors, which they measure using firm return on assets (ROA), cash flow, and related party transactions. As described in Section 5.2 below, we find that business group comovement is significantly related to firm fundamentals.

Pirinsky and Wang (2006) find comovement among firms whose corporate headquarters are in the same geographic location. Interestingly, they find that when a firm moves the location of its headquarters, the firm's returns comove with returns of firms in the new location after the move. This event study context is an appealing way to demonstrate robustness, and we employ it below. Heston and Rouwenhorst (1994) present evidence that country level factors explain return comovement much more than industry level factors. Bekaert et al. (2009) use a linear factor model to analyze international stock return comovement, and they also find that country of origin explains comovement. Chan et al. (2007) find that firms in the same industry exhibit return comovement, where industry is measured according to several popular classification schemes. Karolyi and Stulz (1996) use high frequency intraday trading data to measure comovement between U.S. and Japanese stocks. They find that comovement is high during large market movements, and they conclude that international diversification does not protect against broad market shocks.

Researchers have also attempted to separate comovement drivers into fundamental and sentimental sources. Barberis et al. (2005) develop a model where firms within the same "style" comove, even though their cash flows may be uncorrelated. They find that firms added to the S&P 500 experience a significant increase in comovement with other S&P 500 firms. This result builds on Vijh's (1994) results and is consistent with the sentiment based view of return comovement. Similarly, Greenwood (2008) looks at firms that are overweighted in the Nikkei 225 index and finds that overweight stocks comove significantly with other Nikkei 225 stocks. In addition, being overweight is negatively associated with comovement with stocks outside the index. Kumar and Lee (2006) also find support for the sentiment based comovement view by analyzing retail investor stock trades.

Another approach to explaining comovement is by decomposing stock returns into different types of news. Viewing the intrinsic value of an asset as the present value of a stream of future cash flows, that asset's value may fluctuate due to (i) changes in expected future cash flows, and (ii) changes in the discount rate applied to those cash flows. Campbell (1991) looks at aggregate New York Stock Exchange returns and develops a vector autoregression for decomposing index returns into cash flow news and discount rate news. Vuolteenaho (2002) elaborates on Campbell's work by decomposing individual stock returns. He finds that cash flow news is more important for explaining firm-level stock returns than discount rate news. In addition, discount rate news is driven mainly by marketwide forces.

## 3. Data

To investigate the relationship between Korean business group membership and stock return comovement, we begin with all publicly traded firms listed on the Korean Stock Exchange (KSE), taken from DataGuide Pro. The sample period is 2002–2011. We delete firm observations that are missing stock returns or financial information. We also exclude financial firms because they are subject to heavy government regulation and are more likely to have different financial policies such as capital and ownership structures than other non-financial firms in Korea. After these screens, our initial sample includes 893 firms listed in the KSE over the sample period.

Table 1
Summary statistics. Panel A provides the total number of firms in a Korean business group in the sample as well as the distribution of the number of firms per business group over the sample period. Panel B reports the distribution of the total number of industries in each business group. The sample includes domestic common stocks listed on the KSE from 2002 to 2011 with coverage in DataGuide.

Panel A:

| Year | No. KSE-listed firms | No. KSE-listed firms belonging to a business group | No. business groups | Number of firms per business group | | |
|------|------|------|------|------|------|------|
| | | | | Mean | Max | Min |
| 2002 | 685 | 118 | 25 | 4.7 | 17 | 2 |
| 2003 | 694 | 124 | 26 | 4.8 | 17 | 2 |
| 2004 | 693 | 140 | 30 | 4.7 | 16 | 2 |
| 2005 | 684 | 141 | 31 | 4.5 | 14 | 2 |
| 2006 | 684 | 144 | 32 | 4.5 | 14 | 2 |
| 2007 | 696 | 152 | 34 | 4.5 | 15 | 2 |
| 2008 | 710 | 160 | 34 | 4.7 | 15 | 2 |
| 2009 | 729 | 168 | 34 | 4.9 | 16 | 2 |
| 2010 | 742 | 184 | 34 | 5.4 | 18 | 2 |
| 2011 | 743 | 178 | 34 | 5.2 | 17 | 2 |

Panel B:

| Year | Number of Industries | Number of Industries per business group | | |
|------|------|------|------|------|
| | | Mean | Max | Min |
| 2002 | 18 | 3.2 | 15 | 1 |
| 2003 | 18 | 3.3 | 16 | 1 |
| 2004 | 18 | 3.2 | 15 | 1 |
| 2005 | 18 | 3.1 | 11 | 1 |
| 2006 | 18 | 3.2 | 13 | 1 |
| 2007 | 18 | 3.0 | 13 | 1 |
| 2008 | 18 | 3.1 | 11 | 1 |
| 2009 | 18 | 3.2 | 12 | 1 |
| 2010 | 18 | 3.5 | 12 | 1 |
| 2011 | 17 | 3.3 | 9 | 1 |

From our initial sample, we identify firms belonging to Korean business groups using data published by the Korea Fair Trade Commission (KFTC). To identify business group affiliations, we first obtain the information regarding the ranking of Korean business groups and the list of affiliates from the KFTC over the sample period. The list of group affiliates announced by the KFTC includes both listed and unlisted affiliates, but we consider only listed affiliates. We exclude business groups owned by the Korean government. We also require that a business group have at least two affiliates in order to be included in our sample.

KFTC reports group affiliation once a year, usually in April. However, in practice a chaebol may sell an affiliate or add a new member firm during the year. If there is a large discrepancy in the date of group affiliation from KFTC's announcement, we use reports from daily newspapers to verify changes in group affiliation. We follow the KSE's industry classification standard, which is roughly equivalent to the two digit Standard Industrial Classification (SIC) scheme. Results are not materially affected if we use the SIC classification standard. In total, we identify 40 Korean business groups with 209 affiliates in our sample which meet all of the above criteria.

Table 1 presents descriptive statistics for Korean business groups and their member firms in our sample. Panel A shows the total number of firms listed in the KSE and the distribution of

the firms which belong to chaebols in the sample, as well as the total number of chaebols. The total number of firms listed in the KSE varies over time. Starting in 2002 there were 685 listed firms in our sample, and at the end of the sample period in 2011 there were 743. Also, the total number of affiliates listed in the KSE increased from 118 in 2002 to 178 in 2011, and the number of Korean business groups expanded from 25 groups to 34 groups. However, not all firms belonging to Korean business groups are listed on the KSE. The average proportion of listed firms in a chaebol is only 20%. Chaebols have a mean group size of 4.5 firms. Panel B of Table 1 shows the characteristics of 18 industry groups over the sample period. The mean number of industries per chaebol is 3.3, with a maximum of 16 industries, suggesting that business groups in the sample tend to be diversified across industries.

## 4. Business group and stock return comovement

### 4.1. Evidence of stock return comovement

In this section, we examine the impact of Korean business group affiliation on the covariance structure of stock returns. Following existing literature, we employ the capital asset pricing model (CAPM) as our baseline model, and begin our analysis by evaluating the degree of the return comovement

using the slope coefficients from a regression of stock returns on the returns of other stocks in the same chaebol.[1] We build a set of equally weighted portfolio return indices for each chaebol. We use the returns of all affiliates listed in the KSE in the same business group when constructing the return indices. For each stock that belongs to a chaebol, we estimate a stock-level time-series regression at daily, weekly, monthly, and quarterly return frequencies:

$$R_{i,t} = \alpha_i + \beta^{GR} R_t^{GR} + \beta^{MKT} R_t^{MKT} + \varepsilon_{i,t} \qquad (1)$$

where, $R_{i,t}$ denotes the excess return of a particular stock $i$ at time $t$, and $R_t^{GR}$ and $R_t^{MKT}$ denote the excess return of the stock's corresponding business group, and the excess return of the market at time $t$, respectively (Pirinsky and Wang, 2006). We exclude the return of the firm whose returns are the dependent variable when computing its return relative to the rest of the business group ($R_t^{GR}$) to avoid introducing spurious correlations.

As discussed above, existing literature finds that the returns of firms in the same industry exhibit comovement (Chan et al., 2007). Given that chaebols tend to be diversified across industries, it is unlikely that our results are driven by such industry effects. Nevertheless, we control for possible industry effects by adding a return index for each industry by equally weighting the return of the firm's corresponding industry group in our regression model, and we estimate a regression which is an extension of Eq. (1):

$$R_{i,t} = \alpha_i + \beta^{GR} R_t^{GR} + \beta^{MKT} R_t^{MKT} + \beta^{IND} R_t^{IND} + \varepsilon_{i,t} \qquad (2)$$

where $R_t^{IND}$ is the excess return of the firm's corresponding industry. $\beta^{GR}$ is our measure of comovement, which is the sensitivity of the member firm returns to the return of the rest of the chaebol after controlling for other variables in the regression model. We run the above regressions using daily, weekly and monthly return frequencies.

Table 2 reports the time series regression estimates of Eqs. (1) and (2) and the averages of the estimated coefficients, with t-statistics in parentheses. Results show that the stock returns of chaebol firms exhibit robustly positive comovement even after controlling for both market and industry effects. Group betas ($\beta^{GR}$) are highly significant across both models and all data frequencies. Average group betas vary from 0.309 to 0.515 over the various specifications. Industry betas ($\beta^{IND}$) are between 0.382 and 0.546 across specifications. Group betas remain highly significant after controlling for industry effects, suggesting that the strong positive return comovement among firms in the same chaebol is not due to industry comovement.

## 5. Sources of group return comovement

Having demonstrated evidence of positive stock return comovement among firms in the same chaebol, we continue our analysis by looking at comovement from the perspective of the

Table 2

Business group comovement. For each stock in the sample, we estimate a time-series regression of stock returns on the returns of a business group index, the market portfolio, and industry indices. Cross-sectional averages of the estimated coefficients are reported, with t-statistics in parentheses. The group index (GR) is the equally weighted return of all stocks from the firm's corresponding business group, excluding the firm itself. The market index (MKT) is the return index of all stocks listed in the Korean stock market. The industry index (IND) is the equally weighted return of the stock's corresponding industry, according to the KSE 18-industry classification. The sample period is 2002 to 2011.

| Frequency | $\beta^{GROUP}$ | $\beta^{MKT}$ | $\beta^{IND}$ |
|---|---|---|---|
| Daily | 0.344 | 0.7056 | |
| | (18.27) | (29.40) | |
| | 0.309 | 0.3579 | 0.382 |
| | (17.22) | (11.13) | (13.31) |
| Weekly | 0.370 | 0.6937 | |
| | (15.11) | (21.42) | |
| | 0.335 | 0.2931 | 0.433 |
| | (14.30) | (6.91) | (12.24) |
| Monthly | 0.486 | 0.5795 | |
| | (11.78) | (10.44) | |
| | 0.432 | 0.1030 | 0.546 |
| | (10.49) | (1.58) | (7.26) |
| Quarterly | 0.515 | 0.4838 | |
| | (9.58) | (7.72) | |
| | 0.473 | 0.0863 | 0.456 |
| | (7.30) | (0.82) | (4.34) |

intrinsic value of an asset, where innovations in both expected future cash flows (fundamentals) and expected discount rates of a firm determine changes in stock returns.

### 5.1. Comovement of earnings

In this section, we examine the sources of group return comovement by investigating the association between firm fundamentals and business group comovement. If comovement of chaebol firm stock returns is driven by fundamentals, then the cash flows of firms in the same chaebol could also be systematically correlated. Chaebol member firms are legally independent firms whose shares are separately traded in the Korean stock market. However, in practice it is believed that member firms serve as subdivisions of a controlling shareholder, resulting in close economic relationships among affiliates (Chang and Hong, 2000). If strong group comovement of stock returns is driven by group-wide activities which decrease or increase innovations in the fundamentals of affiliates, then it is possible that firm fundamentals would also exhibit strong comovement within the same business group.

Following Pirinsky and Wang (2006), we use quarterly earnings of group members as a proxy for firm fundamentals and investigate whether the group effect on return comovement of affiliates is driven by the comovement of firms' fundamental cash flows. We construct three earnings measures. For each firm in our sample, we first calculate the change in the level of earnings over the past one, two and four quarters. We then scale each earnings change variable by the firm's book value of equity, and denote these three earnings growth rates *Earning1*,

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[1] Kim et al. (2015) calculate pairwise correlations for business groups and average the correlations within each business group. We find it advantageous to use a modified market model that controls for industry and market comovement.

Table 3
Business group earnings comovement. For each stock in the sample, we estimate time-series regressions of its earnings growth rate on group, industry and market earnings growth indices. Earning1, Earning2, and Earning4 are the earnings change from the previous 1, 2, and 4 quarters, respectively, scaled by the lagged book value of equity. The group and industry earnings-growth indices include all stocks from the firm's corresponding business group and industry, excluding the firm itself, and the market earnings growth index includes all stocks in the Korean stock market. Average values of the estimated coefficients are reported with *t*-statistics in parentheses. The sample includes domestic common stocks traded on KSE from 2002 to 2011 with coverage in DataGuide.

|  | Group Earnings Growth | Market Earnings Growth | Industry Earnings Growth |
|---|---|---|---|
| Earning1 | 0.2876 | 0.0989 | 0.1668 |
|  | (3.56) | (1.65) | (2.10) |
| Earning2 | 0.4852 | 0.0182 | 0.0658 |
|  | (5.77) | (0.80) | (1.00) |
| Earning4 | 0.5016 | 0.072 | 0.0747 |
|  | (3.10) | (1.31) | (0.81) |

*Earning2*, and *Earning4*, respectively. Using these three firm-level earnings change variables, we create market, industry, and group earnings change indices by equally weighting the earnings changes of all firms within a chaebol, industry, and market, denoted as $Earning_k^{MKT}$, $Earning_k^{IND}$, and $Earning_k^{GR}$, where $k = (1, 2, 4)$. We exclude each firm's earnings growth ratio from the group and industry index to which it belongs. We also delete all firms with fewer than 16 quarterly earnings during the sample period. We then estimate a time-series regression for each stock:

$$R_{i,t} = \alpha_i + \beta^{GR} Earning_{k,t}^{GR} + \beta^{MKT} Earning_{k,t}^{MKT}$$
$$+ \beta^{IND} Earning_{k,t}^{IND} + \varepsilon_{i,t} \qquad (3)$$

Table 3 reports the cross-sectional means of market, industry, and group earnings betas. Results show a significant positive association between a firm's earnings growth rate the earnings growth rate of the business group to which it belongs. Average group betas ($\beta^{GR}$) are between 0.2876 and 0.5016 across earnings growth rates, with *t*-statistics all greater than 3. Interestingly, the magnitudes of the market and industry factors are lower, and significance of those betas is not as robust. Overall, results are consistent with the argument that strong comovement of returns is driven by correlation of chaebol firm fundamentals. These results contrast with those of Kim et al. (2015), who do not find evidence of a relation between group comovement and firm fundamentals, as measured by ROA, cash flow, and related party transactions.

### 5.2. Decomposition of returns

We have presented evidence that the stock returns of chaebol firms exhibit positive comovement, and that this comovement is consistent with comovement in the fundamentals of group members. We further explore sources of return comovement through variance decomposition, separating firm stock returns into cash

flow news and discount rate news components. We then evaluate the relative importance of the two return components in explaining group comovement.

#### 5.2.1. Return decomposition[2]

Based on Campbell's (1991) linear approximation that decomposes firm stock returns into cash flow news and discount rate news, Vuolteenaho (2002) implements a log-linear valuation model based on accounting data by replacing dividends with the clean surplus identity:

$$bm_{t-1} = (r_t) - (roe_t) + bm_t \qquad (4)$$

$$bm_{t-1} = \sum_{j=0}^{\infty} r^j (r_{t+j}) - \sum_{j=0}^{\infty} r^j (roe_{t+j}) \qquad (5)$$

where $bm_t$, $r_t$, and $roe_t$ denote the log book to market ratio, log stock returns, and log return on equity at time $t$, and $\rho^j$ denotes the discount coefficient term.[3] Eq. (4) separates price into expected future cash flow and discount rate news. In order to analyze return, Vuolteenhao further derives the model by taking the change in expectation of Eq. (4) from $t-1$ to $t$ and rearranging:

$$r_t - E_{t-1}(r_t) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (roe_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j} \qquad (6)$$

$$r_t - E_{t-1}(r_t) = Ncf_{t+1} - Ndr_{t+1} \qquad (7)$$

where $\Delta E_t$ denotes the change in expectation from period $t-1$ to $t$.

The return decomposition in Eq. (7) can be conveniently operationalized via vector autoregression. Following Vuolteenaho (2002), we implement the return decomposition by employing stock returns, earnings divided by beginning book value of equity (ROE), and book-to-market ratio as state variables in the VAR model assuming following form:

$$r_t = \alpha_1 r_{t-1} + \alpha_2 roe_{t-1} + \alpha_3 bm_{t-1} + \eta_{1t} \qquad (8)$$

$$roe_t = \beta_1 r_{t-1} + \beta_2 roe_{t-1} + \beta_3 bm_{t-1} + \eta_{2t} \qquad (9)$$

$$bm_t = \gamma_1 r_{t-1} + \gamma_2 roe_{t-1} + \gamma_3 bm_{t-1} + \eta_{3t} \qquad (10)$$

Notation for the equations above is more convenient in matrix form, and an individual firm's state vector is assumed as follows:

$$Z_t = \Gamma Z_{t-1} + \eta_t \qquad (11)$$

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[2] See Vuolteenaho (2002) and Callen and Segal (2010) for more details of this method. Callen and Segal (2010) provide a well-documented summary of variance decomposition method. They also provide SAS programs for estimating variance decompositions from cross-sectional time-series data in their appendix.
[3] Following existing literature, our study assumes that $\rho = 1$ for simplicity.

where

$$Z_t = \begin{pmatrix} r_t \\ roe_t \\ bm_t \end{pmatrix}, \quad \Gamma = \begin{pmatrix} \alpha_1 & \alpha_2 & \alpha_3 \\ \beta_1 & \beta_2 & \beta_3 \\ \gamma_1 & \gamma_2 & \gamma_3 \end{pmatrix}, \quad \eta_t = \begin{pmatrix} \eta_{1t} \\ \eta_{2t} \\ \eta_{3t} \end{pmatrix}$$

Following Vuolteenaho (2002), we compute cash flow news and discount rate news:

$$Ncf_t = (e_1 + \lambda_1)'\eta_t$$

$$Nr_t = \lambda_t'\eta_t$$

where $e_k' = (1,0,\ldots,0)$ is a vector whose first element is one and whose other elements are zero, and $\lambda_k' = e_k' \rho \Gamma (I - \rho\Gamma)^{-1}$ with $(I - \rho\Gamma)^{-1}$ being the matrix equivalent of the present value of the sum. We can estimate the variance-covariance matrix of the cash flow news and the discount rate news as follows:

$$var(Ncf_t) = (e_1 + \lambda)' \sum (e_1 + \lambda)$$

$$(Nr_t) = \lambda' \sum \lambda$$

$$cov(Ncf_t, Nr_t) = \lambda' \sum (e_1 + \lambda)$$

We decompose quarterly stock returns into cash flow and discount rate news by estimating the first order VAR model in Eq. (7). Following Vuolteenaho (2002), we estimate the VAR from panel data using a weighted least squares (WLS) approach and one pooled prediction regression per state variable. We weigh each cross-section equally by deflating the data for each firm-quarter by the number of firms in the corresponding cross-section. We calculate a set of equally weighted indices for group-, market-, and industry-level cash flow and discount rate news comovement for each quarter. Similar to Eq. (2), we then measure the degree of comovement of cash flow and discount rate news for each firm by estimating the following firm level time-series regressions:

$$CF_{i,t} = \alpha_i + \beta^{GR} CF_t^{GR} + \beta^{MKT} CF_t^{MKT} + \beta^{IND} CF_t^{IND} + \varepsilon_{i,t} \tag{12}$$

$$DR_{i,t} = \alpha_i + \beta^{GR} DR_t^{GR} + \beta^{MKT} DR_t^{MKT} + \beta^{IND} DR_t^{IND} + \varepsilon_{i,t} \tag{13}$$

### 5.2.2. The relative importance of cash flow and discount rate news

We evaluate the relative importance of cash flow news and discount rate news on group comovement by comparing the magnitude of the coefficients in the cross-sectional regression models that include either cash flow news or discount rate news comovement variables. Given that cash flow news is computed by the sum of innovations in current and future earnings, we further break down cash flow news into current period and future period cash flow news. We examine the relative contribution of

Table 4

Correlation. This table presents correlations. Group comovement is the sensitivity of a firm's stock returns to the stock returns of the other firms belonging to the same business group. Cash flow news and discount rate news are based on Vuolteenaho's (2002) stock return decomposition. Size is the log of firm market capitalization. Leverage is the ratio of total debt to total assets. Book to market is the ratio of book to market equity. ROA is return on assets. Earning comovement is the sensitivity of a firm's earnings to the earnings of the other firms belonging to the same business group. Group assets is the total assets of the firm's business group. No. Firms is the log of the number of firms in the business group. Institutional ownership is the equity ownership held by mutual fund managers in Korea. The sample includes domestic common stocks listed on the KSE from 2002 to 2011 with coverage in DataGuide.

| | Group Comovement | Cash Flow News | Current Cash Flow News | Future Cash Flow News | Discount Rate News | Size | Leverage | Book to Market | ROA | Earnings Comovement | Group Assets | No. Firms | Herfindahl Index | Institutional Ownership |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group Comovement | 1.000 | | | | | | | | | | | | | |
| Cash Flow News | 0.533 | 1.000 | | | | | | | | | | | | |
| Current Cash Flow News | 0.061 | −0.177 | 1.000 | | | | | | | | | | | |
| Future Cash Flow News | 0.513 | 0.836 | −0.128 | 1.000 | | | | | | | | | | |
| Discount Rate News | 0.268 | −0.106 | 0.178 | −0.009 | 1.000 | | | | | | | | | |
| Size | −0.027 | 0.105 | 0.014 | 0.104 | 0.102 | 1.000 | | | | | | | | |
| Leverage | −0.008 | −0.042 | 0.145 | −0.148 | −0.254 | −0.023 | 1.000 | | | | | | | |
| Book to Market | 0.016 | 0.098 | −0.144 | 0.072 | −0.034 | −0.454 | −0.190 | 1.000 | | | | | | |
| ROA | −0.051 | −0.066 | −0.077 | 0.007 | 0.232 | 0.367 | −0.482 | −0.254 | 1.000 | | | | | |
| Earning Comovement | 0.040 | −0.055 | 0.379 | 0.151 | 0.044 | −0.112 | 0.110 | 0.012 | −0.097 | 1.000 | | | | |
| Group Assets | 0.011 | −0.037 | 0.088 | −0.011 | 0.143 | 0.471 | −0.011 | −0.401 | 0.176 | 0.050 | 1.000 | | | |
| No. Firms | −0.031 | −0.029 | 0.100 | −0.044 | 0.086 | 0.245 | −0.088 | −0.231 | 0.106 | 0.032 | 0.688 | 1.000 | | |
| Herfindahl Index | −0.136 | −0.026 | 0.023 | −0.036 | 0.023 | 0.088 | −0.195 | −0.180 | 0.133 | 0.010 | 0.208 | 0.525 | 1.000 | |
| Institutional Ownership | 0.103 | 0.052 | 0.022 | 0.082 | 0.074 | 0.043 | −0.040 | −0.085 | 0.038 | 0.020 | 0.204 | 0.121 | 0.047 | 1.000 |

these proxies for real activity and financial activity to provide more detailed evidence on the source of cash flow news for group comovement (Callen and Segal, 2010). We consider the following cross-sectional regression model with various firm and group characteristics as control variables and compare the magnitude of the coefficients:

$$GCI_i = \alpha_i + \beta^{CF} CF_i + \beta^{DR} DR_i + \beta^{Firm} Firm_i$$
$$+ \beta^{Group} Group_i + \varepsilon_i \qquad (14)$$

where $GCI_i$ is the business group stock return comovement beta from Eq. (2), $CF_i$ is the is the cash flow news comovement beta from Eq. (12), $DR_i$ is the discount rate news comovement beta from Eq. (13), $Firm_i$ are firm-level control variables, $Group_i$ are group-level control variables, and $\varepsilon_i$ is an error term. We consider a set of firm and group characteristics that have been documented to be associated with return comovement. *Earnings correlation* is the index of earnings comovement as measured using Eq. (3). *Size* is the natural log of the firm's market capitalization measured at the end of the previous quarter. *Book-to-market ratio* is the ratio of book value of equity over market value of equity calculated at the end of the previous quarter. *Leverage* is the ratio of total debt to total assets. *ROA* is return on assets. *Group Assets* is the total business group assets reported by KFTC. *No. Firms* is the natural log of the total number of affiliates in the business group. *HHI* is the degree of industry diversification of the business group, measured by the Herfindahl index. *Institutional Ownership* is the equity ownership held by mutual fund managers in Korea.

We average all independent variables over the sample period, then standardize them by subtracting the sample mean and dividing by the standard deviation to give the variables a zero mean and unit variance (Hirshleifer et al., 2009; Chava and Purnanandam, 2010). This approach allows direct comparison of the regression coefficients since they represent a one standard deviation change in each variable. We estimate eight different cross-sectional model specifications to capture the combined explanatory power of these fundamentals for group comovement. This methodology allows us to compare a set of factors that best explain variations in group comovement.

Table 4 presents correlations between the dependent variables (cash flow news, current cash flow news, future cash flow news, and discount rate news) and other firm and group control variables. We observe several key relations. First, although group stock return comovement is positively associated with both cash flow and discount rate news comovement variables in univariate analysis, cash flow news comovement is more strongly associated with group comovement than with discount rate news comovement. Second, future cash flow news comovement is more strongly related to group comovement than current cash flow news comovement. Lastly, the correlation among firm and group specific variables is relatively low, with the highest correlation of −0.482 between ROA and Leverage, giving us a level of confidence in using independent firm and group variables in our models.

Table 5 reports results of the cross-sectional regressions of business group stock return comovement on cash flow news

comovement and discount rate news comovement. The first two columns estimate the relative contribution of cash flow news and discount rate news on group comovement, while the other columns (columns (3)–(8)) further decompose cash flow news into current period and future period cash flow news. We find substantial evidence that chaebol stock return comovement is more strongly associated with cash flow news than discount rate news, after controlling for both firm and group characteristics. The coefficients on cash flow news in columns (1) and (2) are positive and statistically significant, and they are about five times greater in absolute value than the coefficient on discount rate news. Because all independent variables are standardized, the coefficients represent the effect of a one standard deviation change, and the difference in magnitudes suggests that cash flow news is more important in driving stock return comovement than discount rate news.

We also find that the coefficient of current cash flow news in columns (3) and (4) shows little explanatory power for the dependent variable. Neither of the coefficients on current cash flow news in column (3) and (4) are statistically significant. Interestingly, when future cash flow news is added to the model as shown in column (7) and (8), the coefficient of future cash flow news shows considerable explanatory power, suggesting that the explanatory power of real activity for group comovement is mainly driven by future real activity. Finally, all models except those in columns (1) and (2) show that the coefficient on discount rate news is not significant, further evidence that real activity explains stock returns comovement more so than financial activity.

Overall, VAR analysis suggests that cash flow news comovement plays a more important role in explaining Korean business group stock return comovement than discount rate news. In other words, real activity that drives cash flows to equityholders appears more strongly associated with return comovement than financial activity, represented by the firm's cost of equity. Nevertheless, the evidence does not rule out the possibility that such a phenomenon can also be jointly driven by both unobserved "tunneling" and "propping" behavior of a business group. Our finding that return comovement is positively related to earnings comovement is consistent with the findings of Kim and Yi (2006) that earnings management is more prevalent among chaebols. It is plausible that the comovement of affiliated stock returns in Korean business groups could be driven by tunneling behavior of the controlling shareholders of chaebols. Djankov et al. (2008) show that business groups provide direct opportunities to expropriate wealth through tunneling using related party transactions. If such tunneling behavior decreases innovations in the cash flows of chaebol members and increases comovement in cash flow news, then the observed comovement of chaebol firm stock returns may also reflect propping behavior.

Byun et al. (2013) demonstrate that chaebol firms have a considerably lower cost of debt in the Korean capital market and argue that this is because investors perceive enhanced protection from firms belonging to chaebols, as membership is a credible signal that a troubled firm will receive financial assistance from other member firms. If this group-wide propping activity reduces the default risk of member firms in the business group, it is likely

Table 5

Business group comovement and stock return decomposition. The dependent variable is the degree of stock return comovement with a firm's business group. Cash Flow News and Discount Rate News are based on the return decomposition of Vuolteenaho (2002). We standardize all independent variables over the sample period. Coefficient estimates are reported with *t*-statistics in parentheses. The sample includes domestic common stocks traded on KSE from 2002 to 2011 with coverage in DataGuide.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Cash Flow News | 0.7368 | 0.6978 | | | | | | |
| | (9.39) | (9.06) | | | | | | |
| Current Cash Flow News | | | 0.0614 | 0.0739 | | | 0.0554 | 0.067 |
| | | | (0.78) | (0.98) | | | (0.82) | (1.02) |
| Future Cash Flow News | | | | | 0.647 | 0.5955 | 0.6461 | 0.594 |
| | | | | | (6.98) | (6.42) | (6.96) | (6.41) |
| Discount Rate News | 0.1443 | 0.121 | 0.2124 | 0.1798 | 0.1038 | 0.0882 | 0.0972 | 0.0799 |
| | (2.91) | (2.55) | (3.40) | (2.97) | (1.87) | (1.62) | (1.73) | (1.45) |
| Size | 0.0241 | 0.0098 | 0.0971 | 0.0783 | 0.0481 | 0.0309 | 0.0479 | 0.0299 |
| | (0.87) | (0.34) | (2.85) | (2.17) | (1.60) | (0.95) | (1.59) | (0.92) |
| Leverage | 0.1263 | 0.09 | −0.0168 | −0.1204 | 0.1056 | 0.0359 | 0.0862 | 0.0071 |
| | (0.54) | (0.38) | (−0.06) | (−0.40) | (0.41) | (0.14) | (0.33) | (0.03) |
| Book to Market | 0.0678 | 0.0957 | 0.1105 | 0.1315 | 0.0646 | 0.0903 | 0.0692 | 0.0956 |
| | (1.47) | (1.99) | (1.85) | (2.14) | (1.26) | (1.68) | (1.34) | (1.77) |
| ROA | 5.8642 | 5.6724 | 0.4559 | −0.1881 | 1.6919 | 1.6023 | 1.987 | 1.9285 |
| | (1.50) | (1.46) | (0.09) | (−0.04) | (0.40) | (0.38) | (0.46) | (0.45) |
| Earning Comovement | 0.0794 | 0.0712 | 0.0556 | 0.0453 | 0.0189 | 0.0158 | 0.0068 | 0.0012 |
| | (2.29) | (2.11) | (1.16) | (0.98) | (0.49) | (0.41) | (0.16) | (0.03) |
| Group Asset | | 0.099 | | 0.1297 | | 0.1192 | | 0.1247 |
| | | (1.88) | | (1.93) | | (2.03) | | (2.12) |
| No. Firms | | −0.0028 | | −0.0062 | | −0.0045 | | −0.0049 |
| | | (−0.80) | | (−1.39) | | (−1.16) | | (−1.27) |
| Herfindahl Index | | −0.0852 | | −0.1057 | | −0.0842 | | −0.0811 |
| | | (−1.10) | | (−1.07) | | (−0.97) | | (−0.94) |
| Institutional Ownership | | 3.7059 | | 5.2461 | | 2.972 | | 2.904 |
| | | (2.16) | | (2.41) | | (1.53) | | (1.50) |
| Intercept | −0.7565 | −1.2485 | −2.4402 | −2.9837 | −1.2623 | −1.7673 | −1.2692 | −1.7923 |
| | (−0.96) | (−1.56) | (−2.48) | (−3.00) | (−1.47) | (−1.99) | (−1.47) | (−2.02) |
| Adjusted $R^2$ | 47.63% | 51.12% | 13.28% | 20.60% | 36.21% | 39.39% | 36.06% | 39.40% |
| Number of Obs. | 149 | 149 | 149 | 149 | 149 | 149 | 149 | 149 |

that the discount rates of member firms would eventually comove within the same business group resulting in the comovement of discount rate news. However, distinguishing these explanations for the group comovement phenomenon is beyond the current scope of the study.

## 6. Change in group membership

We further examine return comovement using a subset of firms that either joined or left a chaebol during the sample period. If affiliation with a chaebol drives the covariance structure of a firm's stock returns, then analysis of the subsample of firms that change group membership could provide a more rigorous setting for testing of the group comovement effect.

We identify firms that join or leave chaebols by comparing the KFTC list of Korean business groups in two consecutive years. We then manually verify the date the firm joins or leaves the group using major newspapers and the database compiled by the Korean Listed Companies' Association (KLCA). Our final subsample of firms that change group membership consists of 40 addition and 17 removal events over the sample period. To assess the effect of changes in chaebol membership on return comovement, for each addition and removal we estimate the

following regression separately for the 3 years before and 3 years after the event:

$$R_{i,t} = \alpha_i + \beta^{GR} R_t^{GR} + \beta^{DUM} D^{GR} + \beta^{DGR} D^{GR} R_t^{GR}$$
$$+ \beta^{MKT} R_t^{MKT} + \beta^{IND} R_t^{IND} + \varepsilon_{i,t} \qquad (15)$$

$R_{i,t}$ is the excess return of a stock $i$, $R_t^{GR}$ is the excess return of the stock's business group, $R_t^{MKT}$ is the return on the market portfolio, and $R_t^{IND}$ is the equally weighted index of the stock's industry. $D^{GR}$ is a dummy variable identifying the firm's addition to or removal from the business group. To clarify the interpretation of the dummy variable, we define it in two different ways, according to whether a firm was added to or removed from a chaebol. The dummy variable for addition to a chaebol takes a value of 0 if the firm stays out of the business group, and 1 when it is added to the group. If a firm is removed from a chaebol, we assign the value of 0 when the firm stays in the group, and 1 when the firm leaves the group. We are most interested in the interaction between addition/deletion and comovement, and the effect of this change in business group affiliation on return comovement is measured by $\beta^{DGR}$. We run the above regression for daily, weekly and monthly return frequencies. We exclude the 6 month period ending the month before and after the addition

Table 6

Changes in stock return comovement for firms that join or leave business groups. We identify a sample of 57 firms that either join or leave business groups between 2002 and 2011. For each stock in the sample we estimate a time-series regression for the 3 years prior to and the 3 years subsequent to the event (inclusion or deletion from business group). Panel A reports results for firms that join a business group; in this panel, DUM takes a value of 1 if a firm joins a business group. Panel B reports results for firms that leave a business group; in this panel, DUM takes a value of 1 if a firm leaves a group. DGR is the interaction between group comovement and the indicator for joining/leaving a group. The group index (GR) is constructed as the equally weighted return of all stocks from the firm's corresponding business group, excluding the firm itself. The market index (MKT) is the return index of all stocks listed on the KSE. The industry index (IND) is the equally weighted return of the stock's corresponding industry, according to the KSE 18-industry classification. Cross-sectional averages of coefficient estimates are presented, with *t*-statistics in parentheses.

| Sample | $\beta^{GROUP}$ | $\beta^{DUM}$ | $\beta^{DGR}$ | $\beta^{MKT}$ | $\beta^{IND}$ |
|---|---|---|---|---|---|
| *Panel A: Additions* | | | | | |
| Daily | 0.036 | 0.400 | 0.111 | 0.359 | 0.618 |
| *t-stat* | (1.43) | (3.04) | (4.19) | (4.14) | (8.19) |
| Weekly | 0.037 | 0.091 | 0.132 | 0.726 | 0.298 |
| *t-stat* | (0.70) | (0.30) | (2.34) | (6.66) | (3.47) |
| Monthly | 0.078 | −1.638 | 0.181 | 0.186 | 0.749 |
| *t-stat* | (0.78) | (2.11) | (2.01) | (4.92) | (1.32) |
| *Panel B: Deletions* | | | | | |
| Daily | 0.177 | −0.110 | −0.051 | 0.267 | 0.588 |
| *t-stat* | (3.50) | (0.37) | (0.82) | (2.97) | (6.20) |
| Weekly | 0.126 | 0.467 | 0.017 | 0.899 | 0.017 |
| *t-stat* | (1.60) | (1.46) | (0.20) | (0.16) | (7.20) |
| Monthly | 0.214 | 3.792 | 0.084 | 0.018 | 0.770 |
| *t-stat* | (1.06) | (2.52) | (0.43) | (0.06) | (3.08) |

or removal announcement to reflect the time for incorporation and diffusion of information to investors.

Table 6 presents the results of regressions with the chaebol addition and removal dummy. Panel A shows the average of the estimated betas with respect to the various indices when affiliates are *added* to a business group, and panel B shows the average of the estimated betas when they are *removed* from a business group. Although removal from a business group is not significantly associated with changes in comovement, results show that firms newly added to a chaebol experience a significant increase in sensitivity to that chaebol's stock returns ($\beta^{DGR}$). This result holds for daily, weekly and monthly return frequencies. The increase in $\beta^{DGR}$ is between 0.111 and 0.181 across return frequencies. This result supports the evidence presented earlier using the full sample, implying that a firm's addition to a business group has a significant and positive effect on that firm's comovement with other firms in the same business group, consistent with Kim et al. (2015).

## 7. Conclusion

Despite the increased academic interest in the role of business groups in a country's economy, the impact of business group affiliations on the stock prices of member firms is relatively unexplored. This study investigates whether the Korean business group affiliations affect the covariance structure of underlying stock returns. We find positive and significant comovement in

the stock returns of firms belonging to the same Korean business group. We also demonstrate that our findings are robust to a subsample of affiliate firms that changed their group affiliation.

We also examine the comovement of chaebol member firm fundamentals. Consistent with the fundamental-based explanations, our results indicate that the comovement of stock returns can be explained by comovement in corporate earnings. These findings suggest that investors other consider firms belonging to the same business group as relevant since the unique governance and structural system of Korean business groups allows coordination of firm activities within the group.

Finally, given that strong comovement in the stock returns of group affiliates is attributed to correlation of fundamentals, we further explore more detailed sources of the group returns comovement by examining the relative importance of cash flow and discount rate news. We find that cash flow news plays a greater role in explaining stock return comovement than discount rate news. Our evidence that Korean business group return comovement is driven by the relative importance of two fundamental return factors contrasts sharply with the results of Kim et al. (2015) and may have important implications about the widely documented tunneling and propping behaviors of business groups. That is, our results might imply that the comovement of cash flow and discount rate news are closely related to unobserved tunneling and propping behaviors of business groups, respectively. However, although our study suggests a possible linkage between two return decomposing components and tunneling and propping behaviors, whether tunneling or propping effects contribute significantly to the phenomenon of group comovement is an interesting issue that warrants future research.

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