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Supply Chain within Business Groups: Do Families Prefer Upstream or Downstream Firms?

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February 2024

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Abstract

This study investigates how the intra-group supply chain may affect controlling families' direct ownership in business group member firms. Previous literature suggests that profitable firms are directly owned by the controlling shareholders and are located at the top of the pyramidal structure. However, profitability may not be exogenous, but rather endogenously generated through related party transactions. Specifically, suppliers within the business group may enjoy guaranteed profits through exclusive sales contracts with other member firms. Based on a sample of large business groups in Korea, we find that suppliers are more likely to be located in the upper part of the pyramid. This pattern is more pronounced in relatively smaller groups, but disappears in the top five business groups. Our findings suggest that the incentive of controlling shareholders to expropriate corporate opportunities may be an important factor in structuring business groups.

Keywords: supply chain, ownership structure, pyramid, business groups

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JEL classification: L22, L23, G32, G34

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1. Introduction

It is well established by now that there is a substantial cross-sectional variation in corporate ownership around the world (La Porta et al., 1999; Faccio and Lang, 2002; Claessens et al., 2000 among many others). In countries other than the U.S. and the U.K., many large public firms are controlled by a dominant family. These families not only control a single firm, but many public and private firms which belong to a business group (Morck et al., 2005; Masulis et al., 2011).

While earlier studies on international block ownership generally focused on how ownership structure may affect corporate decisions or performance (Bertrand et al., 2002; Claessens et al., 2002; Joh, 2003), subsequent studies started considering ownership structure as a dependent variable (Almeida et al., 2011; Masulis et al., 2011). The latter argue that controlling shareholders may choose a certain ownership structure for several reasons. In particular, Almeida et al. (2011) suggest a s*election hypothesis* to explain the formation of business group, where profitable firms are directly owned by controlling shareholders (and thus located at the upper part of the pyramid). Firms with low profitability, but which requires a lot of capital, are owned indirectly through affiliated firms in the business group (and thus located at the lower part of the pyramid).

In this paper, we extend the aforementioned *selection hypothesis* by endogenizing profitability. Instead of taking profitability as given, we allow for a possibility that profitability may be endogenously determined through related party transactions. Related party transactions or RPTs among member firms are highly common in economies where business groups are prevalent. In fact, G20/OECD guidelines on corporate governance specifically acknowledge that these transactions inherently reflect a conflict of interest between the controlling

shareholders and other minority shareholders, so that they should be conducted in fair terms[1]. Nevertheless, unfair transactions that are detrimental to minority shareholders are often upheld in courts in economies where the legal protection of investors is poor. For example, Cheung et al. (2006) document that RPTs may be used to tunnel corporate resources in Hong Kong. A recent report by British hedge fund, Hermes, argues that such practices are the fundamental reason behind the low valuations of the Korean stock market.[2]

The prevalence of these potentially unfair RPTs suggests that a member firm's profitability may well be endogenously determined. One possible channel through which profits are tunneled from a public firm to a family firm is to organize the latter as a supplier of the former. These suppliers within the business group may generate higher profits through exclusive, guaranteed sales contracts with other member firms. Such practice would likely constitute an 'expropriation of corporate opportunities', and may be subject to legal penalties in countries where investor protection is strong. In these jurisdictions, any intra-firm supply would be executed by a division or a wholly-owned subsidiary of a public firm, which is what we observe in U.S.

Based on the above argument, we propose a new hypothesis to explain the structure of a business group where investor protection is poor. Specifically, we test whether the *supply chain* within the business group may explain the inter-corporate ownership structure. Our hypothesis suggests that controlling shareholders would place the *supplier* firms higher on the pyramid than the *customer* firms. This implies that the supply chain jointly determines both the location and profitability of member firms within a business group. As a result, suppliers (customers) tend to be located higher (lower) in the pyramid and exhibit higher (lower)

[1] G20/OECD Principles of Corporate Governance 2023 | OECD iLibrary (oecd-ilibrary.org)
[2] https://www.hermes-investment.com/lu/de/professional/insights/active-esg/asia-ex-japan-equity-letter-to-investors-winter-2023/

profitability.

We take advantage of Korean business group data to formally test our hypothesis. A number of prior studies have used Korean data to explore various implications of business groups (Bae et al. 2002, Baek et al. 2006). Korea is well known for the high level of private benefits enjoyed by controlling shareholders of family business groups, or chaebols, which are often unchallenged or unsuccessfully challenged. One advantage of the Korean setting is the detailed data availability provided by the Korea Fair Trade Commission (KFTC). KFTC officially designates large business groups for regulatory purposes every year, and provides various metrics for both public and private member firms. Among the information provided, we specifically resort to the pair-wise ownership and transaction data between each member firm in a given business group.

Based on this dataset from 2009 to 2016, we identify each member firm in a business group as either a supplier or a customer based on the direction of related party transactions. Following Almeida et al. (2011), we also calculate a *position* measure within the pyramid, a particular type of ownership structure in a business group, that measures the distance between the controlling shareholder and its affiliates. This measure quantifies where the firm is located within the pyramid.

Once we create our key variables, we implement a univariate analysis to compare the characteristics of *suppliers* and *customers*. We find that suppliers exhibit higher ultimate ownership by the controlling shareholder and lower value of the position (upper location in the pyramid) than customers. This implies that the controlling shareholders own the supplier more directly than the customer in a business group. We find similar results when we run regressions controlling for other variables. That is, suppliers still tend to be located closer to the controlling family than customers in a multivariate analysis. When we add profitability as an additional explanatory variable, both supplier dummy and profitability remain statistically significant.

To further distinguish between the *selection hypothesis* and *supply chain hypothesis*, we next classify each business group into (1) large (2) medium, and (3) small based on aggregated total assets at the group level. One prediction of the selection hypothesis is that the selection effect would be more pronounced in financially constrained business groups. This is because the incentive to utilize capital of an existing member firm located upper in a pyramid would be stronger for business groups under financial constraints. If so, we expect profitability to be more important than supply chain in relatively smaller business groups. On the contrary, we find that profitability no longer explains position in smaller business groups, but supplier dummy still does explain. We also find exactly the opposite pattern in larger business groups. That is, being a supplier no longer explains position, but profitability does. One possible interpretation is that when business groups are still relatively small, the controlling families actively expropriate the business opportunities of public firms. But once the business group becomes very large, e.g. Samsung or Hyundai, they no longer resort to this practice.

As a robustness check, we examine the effect of changes in the supply chain on changes in position. To make sure that suppliers are not inherently different from non-suppliers, we compare their characteristics one year before becoming a supplier, and find that there is no difference across most of the characteristics. But once you become a supplier, we find that your position is more likely to decrease.

We next document a strong correlation between being a supplier and profitability, both in terms of magnitude and ratio. To identify the potential channel that generates high profits of suppliers, we next examine their cost of goods sold (COGS) and selling, general, and administrative expenses (SG&A). We find that suppliers' COGS are higher while their SG&A's are lower. This implies that suppliers' high profits are not driven by operational efficiency, but rather by cost cuts in SG&A. To further explore this channel, we examine advertising costs and find that suppliers pay lower advertising costs. This is intuitive since suppliers within the

business group do not have to face market competition since their sales to member firms are guaranteed so that advertisements are not necessary.

As an additional robustness test, we create a matched sample of suppliers and customers from firms that are not members of business groups based on size, year, and industry, and repeat our main analysis. We find very similar results in this subsample analysis. Our final test takes advantage of a regulatory change that penalizes the expropriation of corporate opportunities. We find that the tendency to locate suppliers upper in the pyramid (closer to the family) is mitigated after this regulatory change, further supporting a causal relationship between being a supplier and its position within the business group.

Overall, our findings suggest that the supply chain may be an important factor that determines both the location and profitability of business group member firms. The controlling family has an incentive to create a family firm that can easily sell to its member firms without incurring marketing costs. This incentive leads supplier firms to be located closer to the family, and generate high profitability.

The remainder of the paper is organized as follows. Section 2 reviews previous research and develops our key hypothesis. Section 3 describes the data and variables used in this study. Section 4 presents our main findings and additional robustness tests. Section 5 concludes.

2. Hypothesis development and background

2.1. The formation of ownership structure in the business group

Earlier studies on international corporate ownership mostly focus on its impact on financial performance and valuation. These studies take advantage of cash-flow rights and control rights held by the controlling shareholders, or a wedge between the two, as proxies for

ownership structure and the degree of agency problem. Bertrand *et al.* (2002) document that a firm where its controlling shareholder holds high cash flow rights exhibits a higher firm value than those with lower cash flow rights. This is driven by a shift in its resources from the firm with low cash flow rights to the firm with high cash flow rights. Claessens *et al.* (2002) argue that in addition to cash flow rights, the difference between control rights and cash flow rights, or wedge, may better capture the degree of agency problem, and find a negative relationship between the wedge and firm value. Similarly, Joh (2003) reports a negative relationship between wedge and profitability for a sample of Korean firms.

Subsequent studies started to examine how ownership structure is determined as a function of other factors. Almeida *et al.* (2011) argue that the ownership structure is not random, but rather reflects the intention of controlling shareholders who establish such structure with a specific purpose. Controlling shareholders build the pyramid taking into account various characteristics of each member firm, the most important one of which is profitability. Specifically, the pyramid structure is formed by placing low profitable firms below and high profitable firms above in the pyramid. Low profitability indicates a smaller amount of pledgeable income, which suggests a potential difficulty in raising external capital. Thus, the controlling shareholder seeks to use the internal capital of other group member firms to finance investment in the newly added firm at the bottom of the pyramid. With this mechanism, the controlling shareholder may utilize the internal funds of existing affiliates to control the less profitable firm instead of directly owning them. In contrast, the high profitable firm may use its internal capital, and if necessary, finance externally using its pledgeable income as collateral to finance investment. This motive is further explored by Masulis *et al.* (2011) who examine more comprehensive data than Almeida *et al.* (2011). They propose the benefits of internal funding within the pyramid and argue that the pyramid is a useful structure for maintaining control and easing funding constraints.

In this paper, we present a new explanation for the high profitability of the firms directly owned by the controlling families, based on a within-group supply chain. The supplier within the group generates revenue by delivering raw or intermediate goods to its affiliates. Since the suppliers have reliable customers with guaranteed sales, they do not face strong competition nor do they need to engage in intense marketing activities. Conceptually, any potential surplus from this relationship, if any, should belong to all shareholders of the business group member firms. But, if this surplus is concentrated in certain family firms, such a phenomenon may well constitute an expropriation of corporate opportunity, a legal doctrine well established in common law tradition. Taken together, we argue that ownership structure within a business group may arise as a result of controlling shareholders' incentive to expropriate a valuable corporate opportunity. We state our key hypothesis as follows.

Hypothesis: Controlling shareholder places *supplier* firms, i.e. those who supply to other member firms within the business group, higher in the pyramid, or closer to the family, than *customer* firms.

High profitability may be attributed to many potential factors, e.g. operational efficiency, managerial ability, etc. While Almeida *et al.* (2011) take profitability as given, we extend their logic and ask what may be driving this high profitability. We propose one possible channel which may explain the cross-sectional variation in profitability among member firms in a pyramidal business group. That is, the controlling families can set up a within-group supply chain where the supply contracts are exclusive and guaranteed. By taking this business opportunity themselves, family firms located at the top of the pyramid may enjoy high profitability.

Our argument is also different from the traditional tunneling explanation. Studies prior

to Almeida et al. (2011) argue that controlling families set up pyramids to exploit firms located at the bottom where they have low cash flow rights. In contrast, we focus on the firms at the top of the pyramid, which may benefit from RPTs as a group-wide supplier.

2.2. Vertical integration and supply chain

In all manufacturing industries, one of the critical decisions that must be made during operation is either 'to make' or 'to buy.' When a company makes and sells a product, the manager decides whether to make intermediary goods or purchase them from the outside. Specifically, the company may (1) establish a factory to operate the production department internally (manufacturing department or assembly division), or (2) have contracts with arm's length subcontractors. In economies with business groups, there is a third option. That is (3) to set up an affiliated firm in charge of production and purchase intermediates from that affiliate. Case (1) represents 'make,' (2) implies 'buy,' and (3) refers to a specific type of 'buy,' not from outside, but from other affiliates in the business group.

When the supplier firm is wholly-owned by the customer firm, we refer to this structure as vertical integration, suggested by Grossman and Hart (1986) as a solution to a potential hold-up problem under incomplete contracts. Vertical integration is one of the competitive strategies that gives a firm complete control over one or more stages in the production networks. A firm owns both the value chains between its upstream supplier and downstream customers in a vertically integrated structure. With this structure, a firm can achieve a competitive advantage through price differentiation or non-price differentiation. The vertical integration makes it easier to secure confidentiality related to trade secrets, priorities in production and sales, and internally accumulate relevant know-how compared to non-vertically integrated groups.

For example, an automobile company may create (or acquire) firm A that produces auto parts (backward integration), firm B that handles the logistics of completed cars, and firm

C that is in charge of sales and after-sales services for cars (forward integration). One of the renowned examples of backward integration is General Motors (GM)'s acquisition of Fisher Body. GM first obtained 60 percent of the Fisher Body in 1919 and bought the remaining 40 percent in 1926. Fisher Body was incorporated into the GM assembly division in 1984.

Unlike the GM-Fisher Body case, many suppliers in business groups are not fully integrated with the parent. When the supplier and the customer belong to the same business group but have different shareholders, conflict of interest and agency problems naturally arise.

Figure 1 illustrates the ownership structure of Hite Jinro, a South Korean multinational beverage, brewing, and distillery business group in the year 2012. Seoyoung E&T that produces a variety of equipment for extracting draft beer and operating beer such as draft beer coolers (raw emitter) and Hite Industry that supplies packaging glass containers are defined as suppliers in the group. Seoyoung E&T is 94.7% directly owned by the controlling family, while the family holds 54.7% cash flow rights in Hite Industry. In contrast, Hite Jinro, High Scott, Jinro Soju, and Hite Jinro Beverage are defined as customers in the group, which are owned roughly 30% by controlling shareholders. This suggests that there is a possibility of agency problem arising from differences in ownership of each affiliate when less-than-full vertical integration occurs within a business group.

--- Insert Figure 1 ---

2.3. Supply chain in finance

Although research on the supply chain has been mostly conducted in the operations management field, finance scholars have also examined this issue. Earlier studies try to connect product networks and asset prices, which focus on the predictability of stock returns through customer-supplier links (Cohen and Frazzini, 2008; Menzly and Ozbas, 2010) or across

different production layers (Gofman *et al.,* 2018). There is also a growing literature on the consumer-supplier-relationship related to corporate finance. Socially responsible corporate customers can apply similar socially responsible business behavior to their suppliers (Dai *et al.,* 2019). There is a spillover effect of the initial public offering (IPO) along supply chains (Kutsuna *et al.,* 2016; Bae *et al.,* 2019). The customer-supplier relationship significantly influences firms' financial conditions, encompassing aspects like financial distress (Lian, 2017), capital structure (Oliveira et al., 2017), and cost of capital (Cai and Zhu, 2020). It may also extend to financial strategies such as tax avoidance (Cen et al., 2017) and cash holdings (Bae and Wang, 2015).

However, there are limited studies that examine the relationship between ownership and supply chain. Among the few, institutional ownership along the supply chain has been shown to impact supplier innovation (Yi et al., 2023), earnings management (Gao et al., 2024), and the duration of their supply chain relationships (Freeman, 2021). This study attempts to fill this gap.

3. Data

3.1. Data Source and Sample Selection

This section describes the data sources and variables used for the empirical analysis. The sample period ranges from 2009 to 2016 since related party transaction data within the business group required to create the supply chain became publicly available in 2009 due to the introduction of the business group disclosure system of the Korean Fair Trade Commission (KFTC). The transaction matrix between affiliates within a business group is collected from the Data Analysis, Retrieval, and Transfer System (DART), which is managed by the Financial Supervisory Service (FSS). We use this matrix to construct our main and control variables.

Ownership data is obtained from eGroup, a database of extensive business group information disclosure systems managed by KFTC. We obtain the companies' annual financial data from DataGuide provided by FnGuide, a local data source comparable to Compustat.

3.2. Variable Construction

This section explains the construction of each variable used in the analysis. Table 1 briefly summarizes the definition of the variables.

3.2.1. Supply chain

The supply chain is identified through the transaction matrix between affiliates in a business group. Most of the existing research on related party transactions in Korea resort to data from TS2000, which only provides transactions between a public firm and other member firms. However, our hand-collected data includes all transactions between all affiliates, both public and private firms, which allows us to create a complete picture of all RPTs within the business group. This data also provides information on how much firms *buy* and *sell* between all affiliates in the business group. This large-scale group-level database on the transaction between affiliates allows us to construct the supply chain variables within business groups and to identify *suppliers* or *customers* in the business group based on the ratio of sales and purchases between affiliates to its total sales. We consider four different definitions of *supplier* as follows.

A. BS (Buy & Sell between affiliates)

According to the buy & sell (BS) criterion, *supplier* is identified as a firm that buys from affiliates less than the median and sells to affiliates more than the median (buy less sell more, or BLSM). The *customer* is identified as a firm that buys from affiliates more than the median and sells to affiliates less than the median within the business groups (buy more sell less, or BMSL). Our second definition is more acute. *Supplier* (BS) is an indicator variable that

takes a value of 1 if a firm is identified as a supplier (BLSM), and 0 if a firm is identified as Customer (BMSL). For all other cases, this variable is treated as missing. The advantage of the first definition *supplier* (BLSM) and *customer* (BMSL) is that the whole sample can be used. However, using the second definition, *supplier* (BS), has the disadvantage of reducing the sample size in half, while having the advantage of providing a cleaner *supplier* effect over the *customer*.

B. NS (Netsell between affiliates)

We next create a netsell variable by subtracting purchases from the sales between affiliates. Within a business group, the firm is defined as a *supplier* (NS), our third definition, if the netsell variable is higher than the median; otherwise, it is defined as a *customer*. In our last definition, *supplier* (NS>0) takes the value of when the netsell variable is greater than zero.

3.2.2. Ownership structure

We create our ownership structure variables, namely ultimate ownership and position, following Almeida *et al.* (2011). We briefly explain the variables below based on Figure 2.

A. Ultimate ownership (cash flow rights)

Business groups are controlled by families (controlling shareholders) who hold stakes in the group affiliates directly or indirectly through other affiliates in the group. Thus, the ultimate ownership, referring to the cash flow rights of the controlling shareholders, is defined as the sum of indirect holdings through their affiliates in addition to direct holdings as shown in Figure 2.

B. Position

Position is a variable that represents the location of each firm within the pyramid structure. If the controlling shareholder builds a business group using the pyramid structure, there is a firm directly owned by the controlling shareholder (firm A), and another firm

indirectly owned through other affiliates (firm B), as shown in figure 2. Since the controlling shareholder directly owns firm A, it is the first layer of the pyramid. Firm B is the second layer because it is owned through firm A. However, since the direct ownership of the controlling shareholder in firm B also exists, the position is determined by the cash flow rights-weighted average of layers.

--- Insert Figure 2 ---

3.2.3. Other Variables

Following the existing literature on ownership structure in business groups, we control for other firm characteristics that may affect a firm's ownership structure. All variables are computed for firm *i* over its fiscal year *t*. The control variables include (1) firm size (*Size*) measured by the natural logarithm of the total asset; (2) firm age (*Age*) is measured by log of the number of years since the company's establishment; (3) public company (*List*) equals one if the company is listed (either in KSE, the main bourse or KOSDAQ, the tech bourse); 0 otherwise; (4) leverage (*Lev*) is measured by the ratio of book value of total debt to total assets; (5) profitability (*Ebit/assets*) is measured by the ratio of operating income to total assets; (6) profit margin (*Ebit/sales*) is measured by ratio of operating income to sales, and (*Ebitda/sales*) is measured by ratio of operating income before depreciation and amortization to sales; (7) profit volume (*signed Ln(ebit), signed Ln(ebitda)*) is measured by taking the logarithm of the absolute value of *ebit* or *ebitda* and then assigning them the original sign; (8) cost variable, (*Cogs/sales*) is the ratio of cost of goods sold to sales, (*Sga/sales*) is the ratio of selling, general and administrative expenses to sales, and (*Ad_promo/sales*) is the ratio of advertising and promotional cost to sales.

--- Insert Table 1 ---

3.3. Descriptive summary

Table 2 presents the summary statistics of key variables for each firm-year observation. All continuous variables are winsorized at the top and bottom 1% of each variable's distribution to minimize the impact of outliers. Related party transactions within the business group are measured with RPT, RP_sell, RP_buy, and RP_netsell to identify the *supplier* and *customer*. The mean value of the supply chain based on BS criterion, *supplier* (BLSM), and *customer* (BMSL), are 0.246 and 0.248, respectively. This implies that 24.6% (24.8%) of our sample firms are identified as *supplier* (*customer*) based on the buy-more-sell-less criterion. Mean values for *supplier* (NS) and *supplier* (NS>0), which are based on net sell and as such are less acute than buy-more-sell-less, are 0.485 and 0.537, respectively.

The controlling shareholders ultimately own 28.5% of the cash flow rights in the affiliates across all firm-years in our sample. The mean (median) *position* of a firm is 2.394 (2.261), and the 75th percentile of the *position* variable is 3.000, which indicates that the pyramid structure has, on average, more than two layers and about 25% of firms are more than three layers away from the controlling shareholders in the pyramid.

--- Insert Table 2 ---

4. Empirical results

4.1 Univariate analysis

Table 3 presents statistical differences in key variables between *supplier* and *customer*. Panel A is based on the BS (Buy & Sell) criterion, and Panel B is based on the NS (Netsell) criterion. As mentioned in section 3.2.1, the BS criterion is more acute than the NS criterion in identifying supplier firms. As such, the magnitude of the differences based on the BS criterion is larger than that of the NS criterion.

The results from Panel A of Table 3 indicate that controlling shareholders have higher ultimate ownership in supplier firms than in customer firms. Moreover, supplier firms are more closely located to the controlling shareholders than customer firms, as reflected in lower values of position. In addition, suppliers are less likely to be listed and are smaller in size than customers. The results from Panel B of Table 3 are largely similar to those from Panel A. Overall, the univariate results are consistent with our hypothesis that controlling shareholders are more likely to hold direct ownership in suppliers than in customers.

--- Insert Table 3 ---

4.2 The supply chain and ownership structure

Table 4 provides a multivariate analysis of how the supply chain is associated with the ownership structure after controlling for other potential factors. According to Almeida *et al.* (2011), less profitable firms are more likely to be placed in the lower part of the pyramid. In this section, we first replicate the previous findings documented by Almeida et al. (2011). Then we incorporate various measures of *supplier* as additional explanatory variables to formally test our main hypothesis. We measure *position* following Almeida et al. (2011) and control for size, age, listed status, and leverage. We use operating income scaled by assets to measure profitability. Additionally, we include year and industry fixed effects, where the industry classification corresponds to a two-digit Korea standard industry code (KSIC). We also control for business group fixed effects to exploit within-group variation, as *position* and *ultimate ownership* likely reflect group-level decisions. The standard errors are clustered at the firm level. Specifically, we estimate the following equation based on OLS.

$$Position_{i,t} = \alpha \cdot profitability_{i,t-1} + \beta \cdot supplier_{i,t} + \boldsymbol{Controls_{i,t-1}} + \sum_t year_t + \sum_k industry_k + \sum_j group_j + \varepsilon_{i,t}. \quad (1)$$

The results from Column (1) of Table 4 indicate that the coefficient on profitability is significantly negative, which is consistent with the *selection hypothesis* (Almeida et al., 2011). In Columns (2) and (3) we add supplier and customer variables to the baseline profitability specification and find that *supplier (BLSM)* is negatively correlated with *position,* while *customer (BMSL)* is positively correlated. This implies that controlling shareholders tend to place the supplier higher in the pyramid than the customer. We also find similar results when using different definitions of suppliers in Columns (5), (6) and (9).

In Columns (7) and (8), we consider sales and purchases separately. *Sell (Buy) High* is a dummy variable indicating whether a company sells (buys) more to (from) affiliates than the median value in the group. Column (7) indicates that a firm that sells more to affiliates in the group is placed higher in the pyramid. Column (8) reports that a firm that buys more from affiliates is placed lower in the pyramid. Overall, multivariate results are consistent with our hypothesis that suppliers tend to be located closer to the controlling shareholders.

--- Insert Table 4 ---

4.3 The supply chain and ownership structure conditional on group size

In this section, we classify all business groups in our sample into three sub-groups based on the total assets of affiliates, and repeat our main analysis for each of the three sub-groups. This is to verify whether the selection effect or supplier effect is more pronounced in larger business groups or smaller business groups. Panel A of Table 5 presents the results for relatively smaller business groups, i.e. those whose aggregated total assets are less than 10 trillion KRW. Panel B presents the results for medium-sized business groups, whose aggregated total assets are more than 10 trillion KRW, but are not one of the top 5 groups. Panel C presents the results for the largest top 5 business groups, e.g. Samsung.

The results from Panel A of Table 5 indicate that profitability *(Ebit/assets)* no longer explains *position* in smaller business groups, which is inconsistent with the selection hypothesis. On the other hand, coefficients on supply chain variables, namely *suppliers* and *customers,* remain statistically significant. This result implies that in relatively small business groups, the supply chain may play a more important role in explaining *position* than profitability.

In Panel B of Table 5 where the sample includes intermediate-size business groups, both profitability and supply chain variables remain statistically significant. In Panel C, where we report the results for the largest top 5 business groups, supply chain no longer explains *position*, but profitability does.

According to Almeida et al. (2011), the reason that firms with high financial constraints (low-profitable firms) are located at the bottom of the pyramid is that these firms have difficulty in external financing. Accordingly, the smaller-sized business groups should exhibit a more pronounced selection effect since they are more likely to be financially constrained than larger business groups. However, in our sub-sample test, the selection effect is more pronounced in larger business groups and actually disappears in smaller business groups.

We propose an alternative explanation for this finding. When the business group is initially formed and is still relatively small, the families exclusively take the corporate opportunity of supplying to other member firms. At this stage, family supplier firms are not more profitable than other member firms. But as time passes, guaranteed supply contracts contribute to the profitability and operational efficiency of the suppliers, during which we observe both the selection effect and supply chain effect. Once the business group becomes extremely large, such as Samsung, suppliers not only supply to member firms, but also to outside business group customers.

For example, Samsung SDI, which is the main battery producer within the business group, not only supplies to Samsung Electronics, which is a key customer, but also to Hyundai

Motors for their electric vehicles. At this stage, within a business group supply chain no longer explains *position*, but profitability does. In short, controlling families initially set up supplier firms on their own and make them grow and become more profitable with the help of other (public) member firms. Another typical example is Hyundai Glovis, a logistics company within Hyundai Motors group, which was initially set up as a family firm with only two shareholders whose sales mostly depend on Hyundai Motors. Overall, these results suggest that controlling family's incentive to expropriate corporate opportunities may be a key determinant of group-level ownership structure.

--- Insert Table 5 Panel A, B, and C ---

4.4. The channel: analysis of profit and cost along the supply chain

The results so far suggest that the high profitability of firms located higher in the pyramid may be induced by the supplier effect within the business group. In this section, we conduct additional analysis to further tease out how the supply chain may affect profitability.

Table 6 presents the relation between the supply chain and the magnitude of the profit. Panel A shows the results for EBIT as a measure of profit volume, and Panel B shows the results using EBITDA. Columns (1) and (2) indicate that the *supplier*(BLSM) is positively correlated with profit volume, and *customer*(BMSL) is negatively correlated with profit volume. Coefficients on *supplier*(NS), *supplier*(NS>0), and *supplier*(BS) are also similarly positive. The result is particularly surprising given that suppliers are significantly smaller than customers as documented in the univariate results of Table 3.

--- Insert Table 6 ---

Table 7 shows the relation between the supply chain and profit margin. Panel A presents the results using EBIT/sales as a measure of profit margin, and Panel B provides the results using EBITDA/sales. Columns (1) and (2) of Table 7 indicate that the *supplier* (BLSM) is positively correlated with profit margin while *customer* (BMSL) is negatively correlated. As in Table 7, the coefficients on *supplier*(NS), *supplier*(NS>0), and *supplier*(BS) are also significantly positive.

In Table 6 where we focus on the magnitude of the profit, *supplier* variable has a stronger effect than *customer* variable. When the *supplier* and the *customer* variables are included together in Column (3) of Table 6, the *customer* loses explanatory power. In contrast, the results from Table 7 where we focus on profit margin indicate that the *customer* effect is stronger than the *supplier* effect. When both variables are included in Column (3) of Table 7, the *customer* still retains significant explanatory power.

--- Insert Table 7 ---

We next examine how the supply chain may affect cost savings which in turn would affect profitability. Profit margin is measured by the ratio of operating income to sales, where operating profit is calculated by subtracting COGS (cost of goods sold) and SG&A (selling, general, and administrative expenses) from sales. We explore whether the difference in profit margin between *supplier* and *customer,* shown in Table 7, may be driven by differences in COGS or differences in SG&A. For example, if the supplier's high profit margin is derived from cost competitiveness, the supplier should realize lower COGS than the customer. Conversely, if the customer's low profit margin is due to the high cost of intermediate goods, they will realize high COGS.

To the contrary, the results from Table 8 indicate that the COGS of the *supplier* is

actually higher, and that of the *customer* is not statistically different from other firms. This result suggests that the difference in profit margin documented in Table 8 is not driven by the cost competitiveness of the two.

--- Insert Table 8 ---

Table 9 presents the relationship between the supply chain and SG&A costs. The results from Columns (1) and (2) of Table 9 indicate that the *supplier* spends less SG&A, while the *customer* spends more. Moreover, the magnitude of the *customer*'s coefficient is larger than that of the *supplier*. This suggests that the difference in the profit margin between suppliers and customers may be driven by differences in SG&A expense. That is, suppliers within the business group do not have to incur any marketing costs, which may contribute to their profitability.

--- Insert Table 9 ---

In Table 10, we directly test this conjecture by examining the relationship between supply chain and advertising and promotional costs. A promotion expense is a cost included in SG&A, and a firm incurs this expense to market its products or services to consumers. It consists of giveaways, free samples, or other promotional strategies to help boost sales and revenue. The results from Table 10 reveal that advertising and promotional costs also exhibit a similar pattern as SG&A. That is, *suppliers* pay smaller advertising and promotional expenses than *customers*. This implies that the supplier within the business group may enjoy a higher profit margin by generating easy sales within the business group without incurring much marketing costs. Overall, the results are consistent with our hypothesis that group-level ownership may reflect the controlling shareholder's incentive to expropriate corporate opportunity.

--- Insert Table 10 ---

4.5. Robustness Tests

This section presents additional robustness tests to address potential endogeneity. Our first robustness test examines how changes in supplier status affect changes in position. We construct another independent variable, *Become a supplier,* for the firm that switches to a supplier during the sample period. We also create *position increase* variable which takes the value of one if the position increases by more than 0.10 from one year to the next, and zero otherwise. The variable *position decrease* takes the value of one if the position decreases by more than 0.10 from one year to the next, and zero, otherwise.

We first make sure that there is no difference in firm characteristics prior to becoming a supplier. Panel A of Table 11 illustrates that there is no statistical difference in the firm characteristics between the supplier and others one year before becoming a supplier. Panel B of Table 11 reports the result of a univariate comparison between *become a supplier* and others. The results indicate *position decrease* is more likely to occur when a firm becomes a supplier within the business group.

--- Insert Table 11 ---

In Table 12, we regress *position increase* and *position decrease* on *become a supplier* after controlling for other factors. In columns (1) and (2), dependent variables take a value of one if the position changes by 0.10 in the next period in either way, following Almeida et al. (2011). In the remaining columns, we allow the threshold to change in defining a decrease or increase. Specifically, in Columns (3) and (4), dependent variables take a value of one if position changes in the next period are within the top 10% in our sample in either way. In columns (5) and (6), dependent variables take a value of one if position changes in the next

period are within the top 25% in either way.

The results from Table 12 indicate while becoming a supplier does not affect position increase, it does affect position decrease at 10% statistical significance, regardless of the threshold to define the decrease. This implies that once a firm becomes a supplier, it is more likely to be located closer to the controlling shareholder, consistent with the hypothesis that controlling shareholders tend to place the suppliers in the upper part of the pyramid.

--- Insert Table 12 ---

Our second robustness test consists of a matched sample analysis. Specifically, we compare the suppliers and customers to matched firms outside the business group, respectively. The matched sample consists of externally audited firms, both public and private, excluding business group member firms, and is selected to match each supplier and customer in the business group based on size, year, and industry. If the supplier is not part of the group, they would need to incur SG&A or marketing costs as an independent entity, and their profitability may be lower than their business group counterparts.

Table 13 reports a univariate comparison between business group member firms and their non-business group matched firms. Panel A compares suppliers while Panel B compares customers. The results from Panel A of Table 13 suggest that suppliers in the business group exhibit significantly higher profit volume and margin as well as lower cost compared to the matched sample. In strict contrast, Panel B of Table 13 indicates that customers in the business groups show a lower profit margin and higher cost than the matched sample.

--- Insert Table 13 ---

In Table 14, we compare suppliers and customers with their non-business group counterparts in a multivariate analysis. Panel A reports the profits and costs of business group suppliers compared to the matched sample of externally audited firms outside the business group. *Supplier_matched* is a dummy that takes the value of 1 if a firm is defined as a supplier within the business group, and 0 if a firm is in the matched sample. The results from Panel A of Table 14 indicate that suppliers in the business group exhibit significantly higher profit volume and margin as well as lower SG&A and advertising costs than the matched sample after controlling for other factors.

In Panel B, we repeat the analysis for customer firms. *Customer_matched* is a dummy that takes a value of 1 if a firm is defined as a customer within the business group, and 0 if a firm is in the matched sample. The results from Panel B of Table 14 indicate that customers in the business group exhibit a lower profit margin, but profit volume and cost no longer remain statistically significant. This suggests that the effect of the supply chain is asymmetric and that the supplier effect is stronger than the customer effect.

--- Insert Table 14 ---

4.6 Regulation effect

The aforementioned Hyundai Glovis case initiated a big controversy in Korea and the government adopted a new regulation that bans such expropriation of corporate opportunities. Specifically, the Korea Fair Trade Commission included a new clause, Article 23-2, in the Fair Trade Act in August 2013, which became effective in 2015. In Table 15, we include the *After2015* dummy, which is an indicator variable that takes the value one if the period is after the enactment of Article 23-2 of the Fair Trade Act, and zero otherwise. We also interact this period dummy with the *supplier* and *customer* variables to test whether the tendency to locate

the suppliers closer to the controlling family is mitigated after the regulation. The results from Table 15 indicate that after the new regulation that limits the expropriation of corporate opportunities, the tendency of the controlling shareholders to place the supplier at the top of the pyramid is mitigated.

--- Insert Table 15 ---

5. Conclusion

This study investigates how the supply chain may affect the ownership structure of business group member firms in Korea. We resort to detailed related-party transactions data to identify the supplier and the customer within a business group. We find that controlling shareholders place the supplier firms closer to them or higher in the pyramid. Our findings suggest that the high profitability of the companies at the top of the pyramid documented in the previous literature may not be randomly determined but is endogenous. We argue that the high profitability of firms closely located to the controlling family may reflect a supply chain effect, where families directly own suppliers within the business group which generates exclusive intra-group sales without much marketing costs.

We also find that the supply-chain effect is more pronounced in relatively smaller business groups (less than 10 trillion KRW in total assets), but disappears in the top 5 business groups. This implies that the incentives for expropriating corporate opportunities, namely to supply to other member firms, determine where suppliers are located in the initial stages of business group formation. As the business group grows, the suppliers also grow with the help of other member firms, which increases the suppliers' profitability. At this stage, i.e. for intermediate-sized business groups, we observe both the selection effect (profitability determines position), and supply chain effect (being a supplier determines position). Once the

business group becomes very large so that suppliers not only supply to member firms but also to arm's length customers outside the business group, the selection effect dominates the supplier effect, so that profitability explains position but being a supplier does not.

We next examine more closely what may be driving the high profitability of suppliers. We find that suppliers tend to pay smaller SG&A expenses, especially advertisement and promotion expenses. Since suppliers within the business group do not have to engage in tough marketing, such a reduction in costs may contribute to high profitability. We also implement various robustness tests including a change-on-change specification and a matched sample analysis.

We contribute to the literature on business groups by linking the controlling shareholder's incentive to expropriate corporate opportunities with within-group supply chain construction and ultimately group-level ownership structure. In the process, we highlight the importance of related party transactions in determining cross-sectional variation in profitability as well as the controlling shareholder's ownership in member firms. Further examination of how the degree of agency problem or conflict of interest shapes group-level ownership would be an interesting topic for future study.

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Figure 1

The ownership structure of Hite Jinro in 2012.

This figure illustrates a summary of the ownership structure of the large business group, the Hite Jinro in 2012. Shaded boxes indicate suppliers and dotted boxes mean customers in the group.

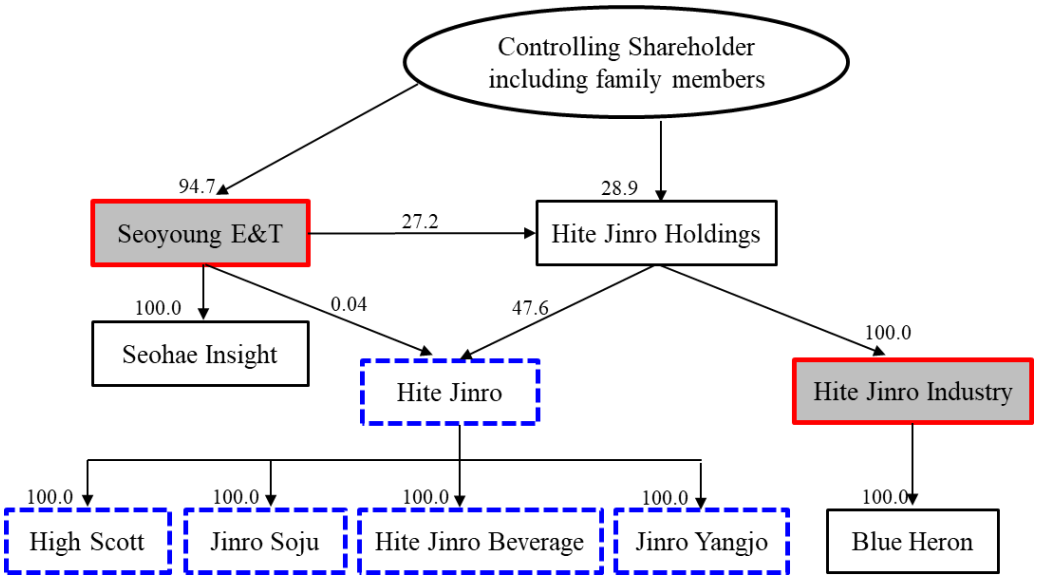


Figure 2

The example of calculating ultimate ownership and position.

This figure presents a simple example of calculating the ultimate ownership (cash flow rights) and position. The ultimate ownership which refers to the cash flow rights of the controlling shareholders is defined as the sum of indirect holdings through their affiliates in addition to direct holdings. The position is a variable that represents the location of each firm within the pyramid structure determined by the weighted average of direct and indirect ownership with layers in the pyramid.

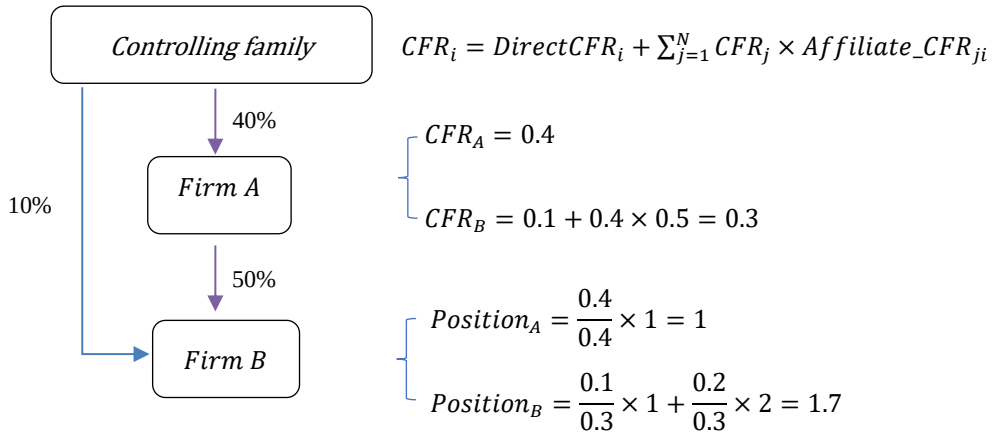


Table 1

Variable Definitions

This table provides the definitions of the variables used in this study.

Variable	Definition
measure of supply chain	
Supplier(BLSM)	1, if a firm's RP_buy is less than median and RP_sell is more than median; 0 otherwise
Customer(BMSL)	1, if a firm's RP_buy is more than median and RP_sell is less than median; 0 otherwise
Supplier(NS)	1, if RP_netsell is greater than the median within the business group; 0 otherwise
Supplier(NS>0)	1, if RP_netsell is greater than zero within the business group; 0 otherwise
Supplier(BS)	1, if a firm's RP_buy is less than the median and RP_sell is more than the median (Buy Less and Sell More); 0, if a firm's RP_buy is more than the median and RP_sell is less than the median (Buy More and Sell Less)
Sell High	1, if RP_sell is greater than the median
Buy High	1, if RP_buy is greater than the median
RPT	The sum of purchases and sales between affiliates scaled by its total sales
RP_sell	The amount of sales to affiliates scaled by its total sales
RP_buy	The amount of purchase from affiliates scaled by its total sales
RP_netsell	The ratio of subtracting purchases from the sales between affiliates to its total sales
measure of ownership	
Ultimate ownership	The sum of indirect holdings through their affiliates in addition to direct holdings; Defined in the text in detail
Position	A measure of distance how far away from controlling shareholders in a pyramidal structure. Defined in the text in detail
control variables	
Size	Natural logarithm of total assets
Age	Natural logarithm of the number of years since the company's establishment
List	1, if the company is listed. (either in KSE or KOSDAQ); 0 otherwise
Lev	The ratio of book value of total debt to total asset
Ebit/asset	The ratio of operating income to total asset
Ebit/sales	The ratio of operating income to total sales
Ebitda/sales	Ratio of operating income before depreciation and amortization to total sales
Signed Ln(ebit)	Natural logarithm of the absolute value of ebit and the original sign is assigned
Signed Ln(ebitda)	The natural logarithm of the absolute value of ebitda and the original sign is assigned
Cogs/sales	The ratio of cost of goods sold(GOGS) to total sales
Sga/sales	Ratio of sales, general, and administrative(SG&A) cost to total sales
Ad_promotion/sales	The sum of advertisement and promotion expense scaled by total sales

Table 2

Summary Statistics

This table reports summary statistics for the sample firm-year observations constructed using all affiliated firms (public and private) in the large business groups. The sample observations are from 2009 to 2016. Variables are organized into three categories: measure of supply chain, measure of ownership, and control variables. For the measure of the supply chain, the transaction matrix between affiliates within a business group is hand-collected from the DART. Ownership data are from the Korean Fair Trade Commission (KFTC) and financial and accounting variables are from DataGuide provided by Fnguide. Detailed definitions of variables are provided in Table 1.

	MEAN	SD	p25	p50	p75	N
measure of supply chain						
Supplier(BLSM)	0.246	0.431	0.000	0.000	0.000	6016
Customer(BMSL)	0.248	0.432	0.000	0.000	0.000	6016
Supplier(NS)	0.485	0.500	0.000	0.000	1.000	6016
Supplier(NS>0)	0.537	0.499	0.000	1.000	1.000	6016
Supplier(BS)	0.498	0.500	0.000	0.000	1.000	2971
RPT	0.515	0.905	0.080	0.277	0.707	6016
RP_sell	0.273	0.335	0.006	0.093	0.481	6016
RP_buy	0.236	0.800	0.014	0.055	0.173	6016
RP_netsell	0.042	0.842	-0.057	0.002	0.355	6016
measure of ownership						
Ultimate ownership	0.285	0.266	0.093	0.194	0.384	5807
Position	2.394	0.905	1.955	2.261	3.000	5702
Delta_position	-0.006	0.269	-0.002	0.000	0.001	4345
control variables						
Size	26.033	1.933	24.481	25.794	27.350	6016
Age	2.664	0.925	2.079	2.708	3.401	6012
List	0.243	0.429	0.000	0.000	0.000	6016
Lev	0.514	0.238	0.332	0.531	0.685	6015
Ebit/assets	0.043	0.086	0.006	0.037	0.079	6016
Ebit/sales	0.003	0.550	0.008	0.041	0.103	6016
Ebitda/sales	0.023	0.542	0.013	0.050	0.120	6016
Signed Ln(ebit)	11.337	14.452	15.355	17.682	19.426	6016
Signed Ln(ebitda)	12.382	13.744	15.953	17.925	19.622	6016
Cogs/sales	0.807	0.256	0.713	0.858	0.923	5289
Sga/sales	0.265	0.387	0.053	0.106	0.300	6007
Ad_promotion/sales	0.016	0.044	0.000	0.001	0.008	6016

Table 3

Univariate results

This table reports the statistical differences in key variables between the *supplier* and *customer*. The sample firm-year observations are constructed using all affiliated firms (public and private) in the large business group from 2009 to 2016. Panel A is the result of the BS(Buy & Sell) criterion and Panel B is the result of the NS(Netsell) criterion. With the BS criterion, *Supplier*(BLSM) is identified as a firm which buys from affiliates less than the median and sells to affiliates more than the median; *Customer* (BMSL) is identified as a firm which buys from affiliates more than the median and sells to affiliates less than the median. With the NS criterion, *Supplier* is identified as a firm whose netsell variable is greater than the median within the business group; *Customer* is identified as a firm whose netsell variable is less than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. Detailed definitions of variables are provided in Table 1.

Panel A. BS (Buy & Sell) criterion

	Supplier(BLSM)			Customer(BMSL)			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Ut_own	0.338	0.217	1465	0.254	0.181	1437	0.000	0.000
Position	2.287	2.173	1444	2.418	2.248	1406	0.000	0.000
Size	25.565	25.206	1478	26.517	26.439	1493	0.000	0.000
Age	2.621	2.639	1475	2.644	2.773	1493	0.491	0.186
List	0.164	0.000	1478	0.330	0.000	1493	0.000	0.000
Lev	0.515	0.531	1478	0.513	0.526	1493	0.775	0.677
Ebit/assets	0.047	0.038	1478	0.043	0.041	1493	0.285	0.969
Ebit/sales	0.072	0.038	1478	-0.109	0.047	1493	0.000	0.388
Ebitda/sales	0.086	0.044	1478	-0.082	0.057	1493	0.000	0.021
Sga/sales	0.209	0.088	1476	0.342	0.144	1492	0.000	0.000
Ad_promo/sales	0.010	0.000	1478	0.025	0.002	1493	0.000	0.000

Panel B. NS (Netsell) criterion

	Supplier(NS)			Customer(NS)			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Ut_own	0.306	0.203	2864	0.265	0.189	2943	0.000	0.000
Position	2.353	2.240	2818	2.435	2.297	2884	0.001	0.002
Size	25.691	25.365	2918	26.354	26.259	3098	0.000	0.000
Age	2.647	2.708	2914	2.680	2.773	3098	0.160	0.032
List	0.183	0.000	2918	0.300	0.000	3098	0.000	0.000
Lev	0.509	0.526	2917	0.518	0.535	3098	0.180	0.285
Ebit/assets	0.044	0.037	2918	0.041	0.037	3098	0.206	0.389
Ebit/sales	0.057	0.039	2918	-0.049	0.044	3098	0.000	0.641
Ebitda/sales	0.074	0.046	2918	-0.024	0.055	3098	0.000	0.055
Sga/sales	0.231	0.093	2913	0.296	0.127	3094	0.000	0.000
Ad_promo/sales	0.011	0.000	2918	0.021	0.001	3098	0.000	0.000

Table 4

Ownership structure and supply chain

This table presents the results of OLS regression of the position on the supplier to show how the supply chain is associated with the ownership structure (Eq. (1)). *Position* represents the location of each firm in the pyramid structure. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Dependent variable: Position								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ebit/assets	-0.5934***	-0.5676***	-0.5983***	-0.5706***	-0.6043***	-0.5990***	-0.5911***	-0.5877***	-0.3807
	(-2.875)	(-2.770)	(-2.897)	(-2.785)	(-2.922)	(-2.896)	(-2.856)	(-2.865)	(-1.524)
Supplier(BLSM)		-0.2099***		-0.2001***					
		(-5.045)		(-4.825)					
Customer(BMSL)			0.0902**	0.0329					
			(2.218)	(0.816)					
Supplier(NS)					-0.1736***				
					(-4.758)				
Supplier(NS>0)						-0.1793***			
						(-4.670)			
Sell High							-0.0889**		
							(-2.355)		
Buy High								0.1336***	
								(3.873)	
Supplier(BS)									-0.2348***
									(-4.100)
Size	-0.1130***	-0.1163***	-0.1163***	-0.1174***	-0.1198***	-0.1202***	-0.1143***	-0.1181***	-0.1264***
	(-7.361)	(-7.574)	(-7.459)	(-7.554)	(-7.681)	(-7.721)	(-7.394)	(-7.650)	(-5.951)
Age	-0.1119***	-0.1100***	-0.1079***	-0.1086***	-0.1061***	-0.1052***	-0.1119***	-0.1047***	-0.0997***
	(-4.892)	(-4.894)	(-4.680)	(-4.791)	(-4.663)	(-4.619)	(-4.902)	(-4.584)	(-3.365)
List	-0.1025	-0.1207*	-0.1098*	-0.1225*	-0.1209*	-0.1152*	-0.1166*	-0.1038	-0.1271
	(-1.595)	(-1.909)	(-1.714)	(-1.939)	(-1.900)	(-1.809)	(-1.829)	(-1.623)	(-1.528)
Leverage	0.0999	0.0970	0.0983	0.0965	0.0844	0.0880	0.0971	0.0998	-0.1166
	(1.089)	(1.074)	(1.075)	(1.069)	(0.926)	(0.967)	(1.060)	(1.103)	(-0.905)
Observations	5,430	5,430	5,430	5,430	5,430	5,430	5,430	5,430	2,705
R-squared	0.456	0.464	0.457	0.465	0.463	0.463	0.458	0.461	0.467
Year & Group & Ind	YES	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5

Ownership structure and supply chain (sub-sample test)

This table presents the sub sample test of Table 4. Each panel shows the results of subgroups classified into business groups based on the total assets of affiliates. Panel A presents business groups with total assets less than 10 trillion KRW, Panel B reveals business groups with total assets more than 10 trillion KRW excluding the top 5 groups, and Panel C indicates the result of the top 5 business groups, respectively. *Position* represents the location of each firm in the pyramid structure. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

Panel A: Business groups with total assets less than 10 trillion won

	Dependent variable: Position								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ebit/assets	-0.0847	-0.0845	-0.1331	-0.1132	-0.0504	-0.0566	-0.0657	-0.1274	-0.3824
	(-0.276)	(-0.282)	(-0.431)	(-0.373)	(-0.166)	(-0.187)	(-0.214)	(-0.420)	(-0.845)
Supplier(BLSM)		-0.3004***		-0.2450***					
		(-4.474)		(-3.741)					
Customer(BMSL)			0.2435***	0.1444**					
			(3.919)	(2.517)					
Supplier(NS)					-0.3227***				
					(-5.406)				
Supplier(netsell>0)						-0.2792***			
						(-4.505)			
Sell High							-0.2728***		
							(-4.504)		
Buy High								0.1596***	
								(2.786)	
Supplier(BS)									-0.4023***
									(-4.744)
Size	-0.1481***	-0.1475***	-0.1522***	-0.1501***	-0.1466***	-0.1503***	-0.1429***	-0.1536***	-0.0743**
	(-4.336)	(-4.496)	(-4.506)	(-4.569)	(-4.417)	(-4.472)	(-4.327)	(-4.551)	(-1.983)
Age	-0.1043***	-0.1136***	-0.0897**	-0.1032***	-0.0988***	-0.1043***	-0.1015***	-0.1013***	-0.1038**
	(-2.715)	(-3.141)	(-2.328)	(-2.818)	(-2.706)	(-2.857)	(-2.739)	(-2.658)	(-2.406)
List	0.0858	0.0792	0.0711	0.0717	0.0517	0.0585	0.0556	0.0903	-0.2211*
	(0.741)	(0.726)	(0.625)	(0.657)	(0.475)	(0.531)	(0.510)	(0.790)	(-1.786)
Leverage	0.4154**	0.4050***	0.3605**	0.3743**	0.3320**	0.3630**	0.3847**	0.3919**	0.2098
	(2.545)	(2.632)	(2.267)	(2.443)	(2.171)	(2.363)	(2.463)	(2.444)	(1.024)
Observations	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	679
R-squared	0.481	0.504	0.495	0.509	0.513	0.504	0.505	0.489	0.530
Year & Group & Ind	YES	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5 (*continued*)

Panel B: Business groups with total assets more than 10 trillion won (excluding top 5 groups)									
	Dependent variable: Position								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ebit/assets	-0.7830***	-0.7472***	-0.7917***	-0.7488***	-0.7971***	-0.7756***	-0.7832***	-0.7797***	-0.7046*
	(-2.684)	(-2.599)	(-2.718)	(-2.611)	(-2.729)	(-2.650)	(-2.692)	(-2.681)	(-1.842)
Supplier(BLSM)		-0.2119***		-0.2094***					
		(-3.543)		(-3.535)					
Customer(BMSL)			0.0630	0.0088					
			(1.119)	(0.160)					
Supplier(NS)					-0.1825***				
					(-3.531)				
Supplier(netsell>0)						-0.1684***			
						(-2.998)			
Sell High							-0.0936*		
							(-1.716)		
Buy High								0.1009**	
								(2.106)	
Supplier(BS)									-0.2484***
									(-2.961)
Size	-0.1203***	-0.1221***	-0.1216***	-0.1223***	-0.1280***	-0.1285***	-0.1212***	-0.1223***	-0.1444***
	(-5.241)	(-5.369)	(-5.248)	(-5.337)	(-5.536)	(-5.532)	(-5.269)	(-5.310)	(-4.242)
Age	-0.0712**	-0.0672**	-0.0677*	-0.0667**	-0.0607*	-0.0588*	-0.0695**	-0.0655*	-0.0400
	(-2.063)	(-2.008)	(-1.949)	(-1.979)	(-1.776)	(-1.713)	(-2.026)	(-1.905)	(-0.794)
List	-0.1617*	-0.1702*	-0.1646*	-0.1705*	-0.1699*	-0.1676*	-0.1730*	-0.1583*	-0.0091
	(-1.697)	(-1.811)	(-1.735)	(-1.818)	(-1.805)	(-1.778)	(-1.824)	(-1.673)	(-0.075)
Leverage	0.2026	0.1941	0.1995	0.1938	0.1895	0.1980	0.1978	0.1987	0.0087
	(1.556)	(1.510)	(1.530)	(1.505)	(1.461)	(1.524)	(1.517)	(1.535)	(0.046)
Observations	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	1,157
R-squared	0.489	0.497	0.490	0.497	0.497	0.496	0.491	0.492	0.525
Year & Group & Ind	YES	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5 (*continued*)

Panel C: Top 5 business groups based on total assets									
	Dependent variable: Position								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ebit/assets	-0.6747*	-0.6666*	-0.6719*	-0.6654*	-0.6696*	-0.6749*	-0.6677*	-0.6247	-0.4901
	(-1.685)	(-1.653)	(-1.676)	(-1.650)	(-1.667)	(-1.690)	(-1.675)	(-1.560)	(-1.112)
Supplier(BLSM)		-0.0314		-0.0281					
		(-0.389)		(-0.357)					
Customer(BMSL)			0.0206	0.0147					
			(0.236)	(0.170)					
Supplier(NS)					-0.0357				
					(-0.481)				
Supplier(netsell>0)						-0.1072			
						(-1.338)			
Sell High							0.0779		
							(1.007)		
Buy High								0.1033	
								(1.352)	
Supplier(BS)									-0.0421
									(-0.340)
Size	-0.1025***	-0.1034***	-0.1035***	-0.1040***	-0.1041***	-0.1061***	-0.1011***	-0.1087***	-0.1266***
	(-3.979)	(-3.970)	(-3.902)	(-3.897)	(-3.926)	(-4.079)	(-3.912)	(-4.192)	(-3.173)
Age	-0.1656***	-0.1657***	-0.1655***	-0.1656***	-0.1657***	-0.1656***	-0.1631***	-0.1618***	-0.1859***
	(-3.484)	(-3.478)	(-3.473)	(-3.470)	(-3.472)	(-3.444)	(-3.464)	(-3.401)	(-2.938)
List	-0.0993	-0.1039	-0.1024	-0.1056	-0.1058	-0.1130	-0.0769	-0.1000	-0.1060
	(-0.828)	(-0.863)	(-0.852)	(-0.875)	(-0.880)	(-0.938)	(-0.641)	(-0.833)	(-0.609)
Leverage	-0.2032	-0.2016	-0.2007	-0.2000	-0.2027	-0.2100	-0.2043	-0.1872	-0.5088**
	(-1.093)	(-1.086)	(-1.082)	(-1.079)	(-1.092)	(-1.135)	(-1.097)	(-1.016)	(-2.077)
Observations	1,758	1,758	1,758	1,758	1,758	1,758	1,758	1,758	869
R-squared	0.479	0.479	0.479	0.479	0.479	0.481	0.480	0.481	0.477
Year & Group & Ind	YES	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 6

The supply chain and profit volume

This table shows the relation between the supply chain and the profit volume. In Panel A, the dependent variable is the signed natural logarithm of earnings before interest, and tax (EBIT). In Panel B, the dependent variable is the signed natural logarithm of earnings before interest, tax, depreciation, and amortization (EBITDA). *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

Panel A.	Dependent variable: Signed LN(ebit)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	1.8265***		1.5515***					
	(3.309)		(2.728)					
Customer(BMSL)		-1.3595**	-0.9224					
		(-2.210)	(-1.452)					
Supplier(NS)				1.8595***				
				(3.562)				
Supplier(netsell>0)					1.7781***			
					(3.317)			
Sell High						1.4686***		
						(2.727)		
Buy High							-0.9116*	
							(-1.854)	
Supplier(BS)								2.4761***
								(3.209)
Size	1.4330***	1.4548***	1.4620***	1.4747***	1.4709***	1.4234***	1.4414***	1.3191***
	(6.386)	(6.448)	(6.497)	(6.516)	(6.504)	(6.300)	(6.457)	(4.486)
Age	1.6541***	1.6085***	1.6152***	1.6143***	1.6083***	1.6732***	1.6185***	1.3202***
	(4.455)	(4.311)	(4.345)	(4.345)	(4.321)	(4.476)	(4.374)	(2.753)
List	-0.8181	-0.8558	-0.7655	-0.7756	-0.8490	-0.7451	-0.9556	0.6596
	(-0.941)	(-0.975)	(-0.877)	(-0.885)	(-0.974)	(-0.853)	(-1.094)	(0.581)
Leverage	-1.4297	-1.4214	-1.4164	-1.3028	-1.3440	-1.4127	-1.4413	-1.3618
	(-1.112)	(-1.097)	(-1.101)	(-1.014)	(-1.043)	(-1.095)	(-1.113)	(-0.805)
Observations	5,723	5,723	5,723	5,723	5,723	5,723	5,723	2,816
R-squared	0.152	0.151	0.153	0.153	0.152	0.152	0.150	0.187
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 6 (*continued*)

Panel B.	Dependent variable: Signed LN(ebitda)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	1.7202***		1.4510***					
	(3.247)		(2.657)					
Customer(BMSL)		-1.3118**	-0.9030					
		(-2.311)	(-1.540)					
Supplier(NS)				1.7822***				
				(3.613)				
Supplier(netsell>0)					1.6625***			
					(3.259)			
Sell High						1.3845***		
						(2.706)		
Buy High							-0.8807*	
							(-1.922)	
Supplier(BS)								2.4500***
								(3.346)
Size	1.5388***	1.5605***	1.5673***	1.5793***	1.5741***	1.5298***	1.5477***	1.5048***
	(7.369)	(7.405)	(7.453)	(7.475)	(7.443)	(7.271)	(7.455)	(5.586)
Age	1.7272***	1.6828***	1.6891***	1.6887***	1.6844***	1.7451***	1.6924***	1.2290***
	(4.809)	(4.665)	(4.700)	(4.703)	(4.678)	(4.825)	(4.732)	(2.676)
List	-1.3662*	-1.3992*	-1.3147	-1.3230	-1.3961*	-1.2973	-1.4954*	0.1187
	(-1.693)	(-1.717)	(-1.624)	(-1.628)	(-1.725)	(-1.602)	(-1.843)	(0.112)
Leverage	-0.1340	-0.1257	-0.1209	-0.0122	-0.0539	-0.1180	-0.1448	-0.4973
	(-0.109)	(-0.102)	(-0.099)	(-0.010)	(-0.044)	(-0.096)	(-0.117)	(-0.298)
Observations	5,723	5,723	5,723	5,723	5,723	5,723	5,723	2,816
R-squared	0.151	0.150	0.152	0.152	0.152	0.151	0.150	0.190
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 7

The supply chain and profit margin

This table shows the relation between the supply chain and the profit margin. In Panel A, the dependent variable is earnings before interest, and tax (EBIT) scaled by sales. In Panel B, the dependent variable is earnings before interest, tax, depreciation, and amortization (EBITDA) scaled by sales. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

Panel A.	Dependent variable: Ebit/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	0.0940***		0.0494***					
	(4.519)		(2.889)					
Customer(BMSL)		-0.1636***	-0.1497***					
		(-4.189)	(-3.864)					
Supplier(NS)				0.1131***				
				(4.334)				
Supplier(netsell>0)					0.1104***			
					(4.200)			
Sell High						0.0794***		
						(3.064)		
Buy High							-0.1128***	
							(-4.847)	
Supplier(BS)								0.2211***
								(4.503)
Size	0.0181**	0.0226**	0.0228**	0.0209**	0.0207**	0.0176**	0.0211**	0.0162
	(2.064)	(2.544)	(2.568)	(2.373)	(2.368)	(2.004)	(2.407)	(1.169)
Age	0.0731***	0.0666***	0.0668***	0.0706***	0.0701***	0.0741***	0.0676***	0.0648**
	(4.244)	(4.012)	(4.033)	(4.165)	(4.122)	(4.280)	(3.992)	(2.374)
List	-0.0091	-0.0034	-0.0005	-0.0051	-0.0094	-0.0047	-0.0154	0.1028**
	(-0.311)	(-0.112)	(-0.017)	(-0.171)	(-0.317)	(-0.155)	(-0.535)	(2.004)
Leverage	0.0669	0.0689	0.0691	0.0748	0.0724	0.0679	0.0666	0.1172
	(0.965)	(1.002)	(1.008)	(1.073)	(1.040)	(0.975)	(0.964)	(1.064)
Observations	5,723	5,723	5,723	5,723	5,723	5,723	5,723	2,816
R-squared	0.093	0.104	0.105	0.097	0.096	0.092	0.098	0.152
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 7 (*continued*)

Panel B.	Dependent variable: Ebitda/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	0.0841***		0.0408**					
	(4.056)		(2.397)					
Customer(BMSL)		-0.1567***	-0.1452***					
		(-4.053)	(-3.789)					
Supplier(NS)				0.1038***				
				(4.000)				
Supplier(netsell>0)					0.1009***			
					(3.847)			
Sell High						0.0728***		
						(2.831)		
Buy High							-0.1071***	
							(-4.642)	
Supplier(BS)								0.2104***
								(4.310)
Size	0.0191**	0.0235***	0.0237***	0.0217**	0.0216**	0.0187**	0.0220**	0.0189
	(2.204)	(2.675)	(2.694)	(2.493)	(2.488)	(2.153)	(2.539)	(1.381)
Age	0.0681***	0.0618***	0.0620***	0.0658***	0.0654***	0.0690***	0.0629***	0.0587**
	(3.996)	(3.761)	(3.778)	(3.919)	(3.881)	(4.030)	(3.748)	(2.171)
List	-0.0113	-0.0054	-0.0030	-0.0075	-0.0114	-0.0071	-0.0168	0.0968*
	(-0.391)	(-0.180)	(-0.100)	(-0.253)	(-0.391)	(-0.238)	(-0.594)	(1.913)
Leverage	0.0650	0.0669	0.0671	0.0722	0.0700	0.0659	0.0647	0.1153
	(0.942)	(0.980)	(0.984)	(1.042)	(1.011)	(0.952)	(0.942)	(1.055)
Observations	5,723	5,723	5,723	5,723	5,723	5,723	5,723	2,816
R-squared	0.096	0.107	0.108	0.100	0.099	0.096	0.101	0.151
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 8

The supply chain and cost of goods sold (cogs)

This table shows the relation between the supply chain and the cost of goods sold (cogs). The dependent variable is the cost of goods sold (cogs) scaled by sales. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Dependent variable: Cogs/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	0.0309**		0.0320***					
	(2.561)		(2.705)					
Customer(BMSL)		-0.0045	0.0038					
		(-0.326)	(0.280)					
Supplier(NS)				0.0195*				
				(1.659)				
Supplier(netsell>0)					0.0087			
					(0.701)			
Sell High						0.0260**		
						(2.020)		
Buy High							-0.0003	
							(-0.034)	
Supplier(BS)								0.0144
								(0.739)
Size	-0.0055	-0.0059	-0.0057	-0.0053	-0.0057	-0.0057	-0.0060	-0.0140**
	(-1.182)	(-1.247)	(-1.209)	(-1.113)	(-1.222)	(-1.212)	(-1.278)	(-2.240)
Age	-0.0181**	-0.0180**	-0.0179**	-0.0183**	-0.0181**	-0.0175**	-0.0178**	-0.0023
	(-2.278)	(-2.293)	(-2.283)	(-2.309)	(-2.295)	(-2.202)	(-2.254)	(-0.213)
List	0.0031	0.0003	0.0029	0.0023	0.0007	0.0043	-0.0000	-0.0249
	(0.163)	(0.016)	(0.152)	(0.121)	(0.037)	(0.228)	(-0.002)	(-0.954)
Leverage	0.0944***	0.0949***	0.0943***	0.0963***	0.0953***	0.0960***	0.0948***	0.1268***
	(3.078)	(3.090)	(3.075)	(3.154)	(3.114)	(3.142)	(3.085)	(3.002)
Observations	5,054	5,054	5,054	5,054	5,054	5,054	5,054	2,479
R-squared	0.278	0.276	0.278	0.277	0.276	0.278	0.276	0.310
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 9

The supply chain and SG&A cost

This table shows the relation between the supply chain and the SGA cost. The dependent variable is the SGA cost scaled by sales. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Dependent variable: SGA/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	-0.0933***		-0.0690***					
	(-5.865)		(-4.555)					
Customer(BMSL)		0.1008***	0.0813***					
		(4.716)	(3.819)					
Supplier(NS)				-0.0887***				
				(-5.530)				
Supplier(netsell>0)					-0.0865***			
					(-5.315)			
Sell High						-0.0666***		
						(-4.038)		
Buy High							0.0778***	
							(5.286)	
Supplier(BS)								-0.1510***
								(-5.441)
Size	-0.0118**	-0.0140**	-0.0143**	-0.0137**	-0.0136**	-0.0112**	-0.0134**	-0.0054
	(-2.109)	(-2.478)	(-2.551)	(-2.433)	(-2.424)	(-1.981)	(-2.410)	(-0.670)
Age	-0.0433***	-0.0396***	-0.0399***	-0.0414***	-0.0411***	-0.0442***	-0.0397***	-0.0608***
	(-3.974)	(-3.715)	(-3.749)	(-3.854)	(-3.810)	(-4.047)	(-3.684)	(-3.887)
List	-0.0020	-0.0026	-0.0067	-0.0035	-0.0001	-0.0044	0.0046	-0.0264
	(-0.093)	(-0.122)	(-0.307)	(-0.163)	(-0.005)	(-0.202)	(0.215)	(-0.830)
Leverage	-0.1507***	-0.1514***	-0.1518***	-0.1567***	-0.1548***	-0.1514***	-0.1500***	-0.2125***
	(-3.437)	(-3.450)	(-3.484)	(-3.556)	(-3.514)	(-3.428)	(-3.415)	(-3.150)
Observations	5,715	5,715	5,715	5,715	5,715	5,715	5,715	2,814
R-squared	0.292	0.294	0.299	0.294	0.292	0.288	0.291	0.301
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 10

The supply chain and Advertising and promotional costs

This table shows the relation between the supply chain and the Advertising and promotional costs. The dependent variable is the Advertising and promotional cost(AD_promotion) scaled by sales. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if the netsell variable is greater than the median within the business group, where a netsell variable is made by subtracting purchases from the sales between affiliates. *Sell (Buy) High* is a dummy variable that is given a value of one if a company sells (buys) more to (from) affiliates than the median value in the group. *Supplier*(BS) is a dummy that takes a value of 1 if a firm is identified as *Supplier*(BLSM), and 0 if a firm is identified as *Customer*(BMSL). All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Dependent variable: AD_promotion/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	-0.0062***		-0.0049***					
	(-3.617)		(-2.857)					
Customer(BMSL)		0.0058***	0.0044**					
		(2.804)	(2.108)					
Supplier(NS)				-0.0056***				
				(-3.191)				
Supplier(netsell>0)					-0.0054***			
					(-2.672)			
Sell High						-0.0052***		
						(-2.881)		
Buy High							0.0038**	
							(2.131)	
Supplier(BS)								-0.0094***
								(-3.703)
Size	0.0010	0.0009	0.0009	0.0009	0.0009	0.0011	0.0010	0.0022***
	(1.505)	(1.348)	(1.314)	(1.339)	(1.352)	(1.541)	(1.456)	(2.607)
Age	-0.0025**	-0.0023*	-0.0023*	-0.0024**	-0.0024*	-0.0026**	-0.0024*	-0.0065***
	(-2.039)	(-1.911)	(-1.932)	(-1.962)	(-1.933)	(-2.091)	(-1.935)	(-3.697)
List	0.0042	0.0043	0.0040	0.0042	0.0044	0.0040	0.0047	0.0088*
	(1.252)	(1.270)	(1.189)	(1.232)	(1.289)	(1.169)	(1.381)	(1.753)
Leverage	-0.0076	-0.0076	-0.0076	-0.0080	-0.0078	-0.0076	-0.0075	-0.0105*
	(-1.514)	(-1.526)	(-1.527)	(-1.585)	(-1.568)	(-1.529)	(-1.506)	(-1.742)
Observations	5,723	5,723	5,723	5,723	5,723	5,723	5,723	2,816
R-squared	0.281	0.281	0.283	0.281	0.281	0.281	0.280	0.377
Year & Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

Table 11

Univariate analysis of becoming a supplier

This table reports the statistical differences in key variables between *become a supplier* and others. *Become a supplier* indicates the firm that switches to a supplier in the full sample. Panel A suggests statistical differences in key variables a year before becoming a supplier. Panel B indiate statistical differences after becoming a supplier. According to the previous literature, the variable *position increase* takes the value of one if position increased by more than 0.10 from one year to the next, and zero otherwise. The variable *position decrease* takes the value of one if position decreased by more than 0.10 from one year to the next, and zero otherwise. Detailed definitions of other variables are provided in Table 1.

Panel A. One year before becoming a supplier

	Year Before Become a Supplier			Others			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Ut_own	0.312	0.202	250	0.284	0.194	5557	0.107	0.335
Position	2.398	2.310	249	2.394	2.258	5453	0.949	0.570
Position Increase	0.084	0.000	166	0.057	0.000	4179	0.143	0.143
Position Decrease	0.066	0.000	166	0.069	0.000	4179	0.876	0.876
Size	25.831	25.621	255	26.042	25.804	5761	0.088	0.114
Age	2.592	2.639	254	2.667	2.708	5758	0.204	0.444
List	0.177	0.000	255	0.246	0.000	5761	0.012	0.012
Lev	0.511	0.516	255	0.514	0.532	5760	0.826	0.905
Ebit/assets	0.039	0.034	255	0.043	0.037	5761	0.502	0.252
Ebit/sales	0.032	0.041	255	0.001	0.041	5761	0.384	0.932
ebitda/sales	0.055	0.048	255	0.022	0.050	5761	0.337	0.972
Sga/sales	0.251	0.095	255	0.265	0.107	5752	0.573	0.675
Ad_promo/sales	0.012	0.000	255	0.017	0.001	5761	0.109	0.009

Panel B. Become a supplier

	Become a Supplier			Others			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Ut_own	0.300	0.202	275	0.284	0.194	5532	0.353	0.648
Position	2.397	2.349	272	2.394	2.252	5430	0.956	0.666
Position Increase	0.061	0.000	248	0.058	0.000	4097	0.876	0.876
Position Decrease	0.101	0.000	248	0.067	0.000	4097	0.044	0.044
Size	25.829	25.556	275	26.043	25.804	5741	0.074	0.082
Age	2.714	2.708	274	2.662	2.708	5738	0.361	0.509
List	0.178	0.000	275	0.246	0.000	5741	0.011	0.011
Lev	0.508	0.509	275	0.514	0.532	5740	0.669	0.691
Ebit/assets	0.041	0.032	275	0.043	0.037	5741	0.742	0.502
Ebit/sales	0.049	0.043	275	0.001	0.041	5741	0.156	0.691
ebitda/sales	0.069	0.048	275	0.021	0.050	5741	0.152	0.857
Sga/sales	0.221	0.095	275	0.267	0.107	5732	0.057	0.302
Ad_promo/sales	0.011	0.000	275	0.017	0.001	5741	0.039	0.006

Table 12

Becoming a supplier and position changes

This table shows the effect of changes the status in the supply chain on the position changes. Dependent variables are changes in position in both directions, increasing and decreasing. In columns (1) and (2), dependent variables take a value of one if the position changed by 0.10 in the next period in either way, following Almeida et al.(2011). In columns (3) and (4), dependent variables take a value of one if the position changes in the next period is the top 10% in either way. In columns (5) and (6), dependent variables take a value of one if the position changes in the next period is the top 25% in either way. *Become a supplier* indicates the firm that changes its status to a supplier in the supply chain within the business group. All control variables are lagged and detailed definitions of variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Standards in previous literature		Top 10 pencentile change		Top 25 pencentile change	
Dependent var:	Increase	Decrease	Increase	Decrease	Increase	Decrease
Position change	(1)	(2)	(3)	(4)	(5)	(6)
Become a supplier	0.0007	0.0336*	0.0059	0.0365*	0.0183	0.0490*
	(0.045)	(1.904)	(0.310)	(1.698)	(0.710)	(1.807)
Ebit/asset	-0.0215	0.0625	-0.0363	0.0172	-0.1463	-0.1106
	(-0.417)	(1.286)	(-0.553)	(0.268)	(-1.642)	(-1.301)
Size	-0.0053**	-0.0061**	0.0003	-0.0078**	0.0031	-0.0071
	(-2.019)	(-2.449)	(0.084)	(-2.184)	(0.637)	(-1.417)
Age	0.0028	0.0007	-0.0050	-0.0085	-0.0066	-0.0020
	(0.724)	(0.165)	(-0.827)	(-1.462)	(-0.804)	(-0.240)
List	0.0537***	0.0128	0.0316	-0.0094	0.0208	-0.0076
	(3.040)	(0.773)	(1.356)	(-0.420)	(0.624)	(-0.242)
Leverage	0.0066	0.0182*	0.0093	0.0190	0.0197	0.0187
	(0.645)	(1.722)	(0.608)	(1.268)	(0.907)	(0.828)
Constant	0.1662**	0.2336***	0.0465	0.4469***	0.0149	0.6799***
	(2.500)	(3.123)	(0.489)	(3.884)	(0.115)	(3.724)
Observations	4,341	4,341	4,341	4,341	4,341	4,341
R-squared	0.118	0.153	0.052	0.043	0.077	0.083
Year & Group & Ind	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES

Table 13

Univariate results of the matched sample

This table reports the statistical differences in key variables between samples in the business group and the ouside group. The matched sample consists of externally audited firms outside the business group, and is selected to match the supplier and customer in the business group based on size, year, and industry. *Supplier*(BLSM) is a dummy that takes a value of 1 if a firm buys from affiliates less than the median and sells to affiliates more than the median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than the median and sells to affiliates less than the median, and 0 otherwise. Panel A suggests statistical differences between the supplier in the business group and the matched sample of externally audited firms out of the business group. Panel B indicates statistical differences between the customer in the business group and the matched sample of externally audited firms out of the business group. The statistical difference is reported in the p-value. Detailed definitions of other variables are provided in Table 1.

Panel A. Supplier in the business group vs. Matched sample out of business group

	Supplier(BLSM)			Matched sample			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Size	25.432	25.206	1478	25.522	25.283	1486	0.131	0.160
Age	2.621	2.639	1475	2.707	2.773	1485	0.005	0.002
List	0.164	0.000	1478	0.205	0.000	1486	0.005	0.005
Lev	0.515	0.531	1478	0.594	0.585	1485	0.000	0.000
Ebit/sales	0.066	0.038	1478	-0.037	0.050	1418	0.000	0.006
Ebitda/sales	0.082	0.044	1478	-0.002	0.061	1418	0.000	0.000
Sga/sales	0.213	0.088	1476	0.358	0.128	1415	0.000	0.000
Ad_promo/sales	0.010	0.000	1478	0.017	0.001	1418	0.000	0.000
Signed Ln(ebit)	11.987	17.330	1478	9.640	17.050	1485	0.000	0.006
Signed Ln(ebitda)	12.896	17.484	1478	10.509	17.226	1485	0.000	0.005
Cogs/sales	0.826	0.884	1276	0.782	0.837	1206	0.000	0.000

Panel B. Customer in the business group vs. Matched sample out of business group

	Customer(BMSL)			Matched sample			P-value of difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Size	26.179	26.439	1493	26.134	26.333	1433	0.455	0.571
Age	2.644	2.773	1493	2.765	2.773	1429	0.000	0.002
List	0.330	0.000	1493	0.254	0.000	1433	0.000	0.000
Lev	0.513	0.526	1493	0.578	0.560	1433	0.000	0.000
Ebit/sales	-0.151	0.047	1493	-0.040	0.050	1371	0.001	0.024
Ebitda/sales	-0.114	0.057	1493	-0.003	0.063	1371	0.001	0.018
Sga/sales	0.409	0.144	1492	0.332	0.114	1369	0.011	0.000
Ad_promo/sales	0.026	0.002	1493	0.022	0.001	1371	0.045	0.001
Signed Ln(ebit)	10.975	18.274	1493	10.980	17.972	1432	0.994	0.240
Signed Ln(ebitda)	12.178	18.493	1493	12.009	18.147	1432	0.755	0.043
Cogs/sales	0.780	0.830	1334	0.787	0.846	1200	0.494	0.177

Table 14 Multivariate results of the matched sample

This table shows how the supply chain affects profit and cost in the matched sample. The matched sample consists of externally audited firms outside the business group, and is selected to match the supplier and customer in the business group based on size, year, and industry. *Supplier_matched* is a dummy that takes a value of 1 if a firm is defined as a supplier within the business group, and 0 if a firm is in the matched sample. *Customer_matched* is a dummy that takes a value of 1 if a firm is defined as a customer within the business group, and 0 if a firm is in the matched sample. Panel A suggests how the supplier affects profit and cost compared to the matched sample of externally audited firms outside the business group. Panel B indicates how the customer affects profit and cost compared to the matched sample. Detailed definitions of other variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

Panel A. Supplier in the business group vs. Matched sample out of business group

	Signed Ln(ebit)	Signed Ln(ebitda)	Ebit/sales	Ebitda/sales	Cogs/sales	Sga/sales	Ad_promo/sales
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
supplier_matched	1.7922***	1.9401***	0.0826***	0.0624***	0.0612***	-0.1638***	-0.0067***
	(2.878)	(3.250)	(3.616)	(2.875)	(5.637)	(-6.613)	(-3.108)
Size	1.6886***	1.5715***	0.0323***	0.0334***	0.0085*	-0.0388***	0.0007
	(6.082)	(5.739)	(3.212)	(3.440)	(1.793)	(-3.529)	(0.782)
Age	1.4083***	1.5705***	0.0071	0.0010	0.0046	-0.0382**	-0.0014
	(3.125)	(3.538)	(0.439)	(0.066)	(0.648)	(-2.315)	(-0.847)
List	-1.2972	-1.0475	-0.0196	-0.0201	-0.0072	0.0251	0.0031
	(-1.472)	(-1.256)	(-0.852)	(-0.898)	(-0.506)	(0.930)	(0.939)
Leverage	-8.6689***	-7.5833***	-0.3243***	-0.2940***	0.1049***	0.1335*	0.0101*
	(-7.253)	(-6.338)	(-4.043)	(-3.848)	(4.183)	(1.649)	(1.670)
Observations	2,958	2,958	2,892	2,892	2,478	2,887	2,892
R-squared	0.160	0.152	0.074	0.072	0.224	0.149	0.257
year & Ind FE	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES

Panel B. Customer in the business group vs. Matched sample out of business group

	Signed Ln(ebit)	Signed Ln(ebitda)	Ebit/sales	Ebitda/sales	Cogs/sales	Sga/sales	Ad_promo/sales
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
customer_matched	-0.4907	-0.3022	-0.0920*	-0.0927**	-0.0087	0.0549	0.0014
	(-0.669)	(-0.440)	(-1.912)	(-2.049)	(-0.633)	(1.366)	(0.513)
Size	1.4570***	1.6214***	0.0194	0.0200	-0.0006	-0.0122	0.0016
	(5.259)	(6.126)	(0.890)	(0.977)	(-0.103)	(-0.668)	(1.355)
Age	2.1609***	2.2708***	0.1402***	0.1307***	-0.0147	-0.1133***	-0.0052**
	(4.446)	(4.758)	(3.400)	(3.399)	(-1.458)	(-3.293)	(-2.323)
List	0.5005	-0.2945	0.0952*	0.0763	-0.0121	-0.0682	0.0043
	(0.509)	(-0.320)	(1.732)	(1.483)	(-0.660)	(-1.477)	(0.952)
Leverage	-8.4270***	-7.2597***	0.0712	0.0772	0.1110***	-0.1693	-0.0031
	(-6.249)	(-5.365)	(0.536)	(0.614)	(3.904)	(-1.376)	(-0.496)
Observations	2,921	2,921	2,860	2,860	2,530	2,857	2,860
R-squared	0.172	0.175	0.091	0.089	0.270	0.158	0.191
year & Ind FE	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES

Table 15

Effect of the law on the relation between supply chain and position

After2015 is an indicator variable that takes a value of 1 if the period after the Article 23-2 of the Fair Trade Act is enforced and 0 otherwise. All control variables are lagged and detailed definitions of control variables are provided in Table 1. T-values are reported in the parenthesis and are based on standard errors clustered at the firm level. ***, **. * indicate significance at 1%, 5%, and 10% level, respectively.

	Dependent variable: Position							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ebit/assets	-0.6071***	-0.5896***	-0.6159***	-0.6252***	-0.6185***	-0.6096***	-0.6052***	-0.4105*
	(-2.967)	(-2.894)	(-2.998)	(-3.038)	(-3.006)	(-2.959)	(-2.965)	(-1.654)
Supplier(BLSM)		-0.2422***						
		(-5.340)						
Supplier(BLSM) x After2015		0.1244**						
		(2.412)						
After2015		-0.0455*	-0.0197	-0.0437	-0.0170	-0.0559*	-0.0168	-0.0095
		(-1.856)	(-0.763)	(-1.470)	(-0.499)	(-1.899)	(-0.537)	(-0.250)
Customer(BMSL)			0.0874**					
			(1.993)					
Customer(BMSL) x After2015			0.0106					
			(0.223)					
Supplier(NS)				-0.1883***				
				(-4.808)				
Supplier(NS) x After2015				0.0575				
				(1.323)				
Supplier(netsell>0)					-0.1818***			
					(-4.399)			
Supplier(netsell>0) x After2015					0.0100			
					(0.215)			
Sell High						-0.1084***		
						(-2.695)		
Sell High x After2015						0.0807*		
						(1.829)		
Buy High							0.1351***	
							(3.639)	
Buy High x After2015							-0.0017	
							(-0.040)	
Supplier(BS)								-0.2535***
								(-4.132)
Supplier(BS) x After2015								0.0732
								(1.244)
Size	-0.1125***	-0.1154***	-0.1156***	-0.1190***	-0.1195***	-0.1135***	-0.1174***	-0.1254***
	(-7.348)	(-7.543)	(-7.431)	(-7.654)	(-7.685)	(-7.369)	(-7.622)	(-5.910)
Age	-0.1101***	-0.1081***	-0.1057***	-0.1040***	-0.1029***	-0.1102***	-0.1025***	-0.0984***
	(-4.881)	(-4.851)	(-4.617)	(-4.608)	(-4.554)	(-4.862)	(-4.522)	(-3.337)
List	-0.1060*	-0.1250**	-0.1140*	-0.1256**	-0.1196*	-0.1213*	-0.1080*	-0.1307
	(-1.653)	(-1.984)	(-1.782)	(-1.979)	(-1.881)	(-1.910)	(-1.692)	(-1.571)
Leverage	0.0991	0.0937	0.0973	0.0815	0.0865	0.0946	0.0985	-0.1235
	(1.082)	(1.040)	(1.066)	(0.895)	(0.952)	(1.033)	(1.090)	(-0.962)
Observations	5,430	5,430	5,430	5,430	5,430	5,430	5,430	2,705
R-squared	0.454	0.464	0.456	0.462	0.462	0.457	0.459	0.467
Group & Ind FE	YES	YES	YES	YES	YES	YES	YES	YES
Clustered by firm	YES	YES	YES	YES	YES	YES	YES	YES

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