

Does the supply chain matter in the ownership structure?

Evidence from Korean business groups*

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Abstract

This study investigates the impact of the supply chain on the inter-corporate ownership structure among member firms within business groups. Previous literature suggests that profitable firms directly owned by the controlling shareholders are at the top of the pyramidal structure. However, profitability may be endogenously determined based on related party transactions. Specifically, suppliers within the business group may generate higher profits through exclusive sales contracts with member firms. Based on a sample of large business groups in Korea, I find that suppliers are more likely to be located in the upper part of the pyramid. This result is more prominent in the relatively smaller groups (less than 10 trillion KRW in total assets), but it disappears in the top five business groups. This suggests that the incentive of controlling shareholders to expropriate corporate opportunity may be an important factor in structuring business groups.

JEL classification: L22, L23, G32, G34

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

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1. Introduction

Several studies in corporate finance worldwide, have revealed significant cross-sectional variations in ownership structures. According to Kim (2013), in countries other than the United States (US) and the United Kingdom (UK), the ownership structure of a business group is spread worldwide, where the business group represents the form in which firms belong to the group, and their equity structure is intertwined. How a firm is owned and controlled is a key variable of interest in economic research both as independent and dependent variables. Ownership structure affects corporate performance and economic development, which, in turn, are influenced by the socioeconomic, legal, and financial market environment.

There are several views on how the ownership structure is formed. In the early stages of research, most studies focus on the impact of ownership structure on corporate performance or decision-making (Bertrand et al., 2002; Claessens et al., 2002; Joh, 2003). Additionally, literature indicates that the ownership structure is regarded as endogenous (Almeida et al., 2011; Masulis et al., 2011). They argue that controlling shareholders select the ownership structure for several reasons. Particularly, Almeida *et al.* (2011) suggest the *selection hypothesis* to explain the formation of business groups. It hypothesizes that profitable firms are selected to be owned directly by controlling shareholders (the upper part of the pyramid). However, firms with low profitability are selected to be owned through affiliates in the business group (lower part of the pyramid) rather than directly.

This paper argues that this selection hypothesis may have overlooked essential factors. The high profitability of the firms at the top of the pyramid may be endogenously determined based on the business model or strategy, such as related party transactions. The firm's profitability may not be fundamentally high but may appear high. The firm's high profitability may not be because of its superior operational capabilities, but because of the supply chain,

specifically as an exclusive supplier within its business group. Suppliers within the business group may generate higher profits through exclusive sales contracts with member firms. The firm at the top in the pyramid may not be profitable unless it is a monopoly supplier to affiliates in the group.

Thus, this study presents a new industrial organizational approach, where the *supply chain* within the business group investigates whether it has a vital role in the inter-corporate ownership structure. According to results, the controlling shareholder places the *supplier* higher on the pyramid than the *customer*. This indicates that high profitability may be induced by a position where profits are concentrated in the structure of the supply chain. Therefore, it also implies that the ownership structure can be formed as an incentive of expropriating corporate opportunity.

Korean large-scale business group data are used to test the above hypothesis empirically. The Korean Fair Trade Commission (KFTC) officially announces the detailed transactions and ownership data of all affiliated firms (public and private) in the large business group. Using this novel data from 2009 to 2016, I construct variables for the supply chain and a position in the pyramid structure. First, the supply chain is identified through the transaction matrix between affiliates in a business group. Using this transaction dataset, for each firm in the business group, I construct variables that are the ratio of sales and purchases between affiliates to its total revenue, respectively. According to a threshold in these variables, the *supplier* or *customer* is assigned to firms within the business group. Second, based on Almeida *et al.* (2011), I calculate a *position* in the pyramid, a particular type of ownership structure in a business group, that measures the distance between the controlling shareholder and its affiliates. The variable *position* quantifies where the firm is located within the pyramid.

The univariate analysis is first conducted to show the statistical difference between the

supplier and the *customer* overall. The supplier shows higher ultimate ownership and lower value of the position than the customer. Since a firm with a small position value means that it is close to controlling shareholders, on average, it implies that the controlling shareholders own the supplier more directly than the customer in the business group. Next, the association between the supply chain and the ownership structure is investigated. I find evidence that controlling shareholders tend to place the supplier above the customer in the pyramid. This finding implies that the high profitability of firms at the top of the pyramid is endogenous, and the key is the supply chain because the suppliers can generate high profits through exclusive sales contracts with member firms.

In addition to the primary analysis, a sub-sample test dividing the whole sample into three sub-groups based on the total assets of affiliates within the groups is conducted. According to the enforcement decree of KFTC, which raises the criteria for designating large-scale business groups from five trillion to ten trillion KRW, 10 trillion KRW can be a threshold to define whether a group is large enough to require stronger regulation. According to the results conditional on group size, the supply chain effect is more prominent. Still, profitability loses the explanatory power in the relatively smaller group (less than 10 trillion KRW in total assets). In contrast, the supply chain effect disappears, and profitability remains in the top five business groups.

This result questions the selection hypothesis proposed by Almeida *et al.* (2011). In their study, the firms with high financial constraints (low-profitable firms) are located at the bottom of the pyramid because they have difficulty in external financing. Therefore, controlling shareholders do not own them directly, but do so through their subsidiaries to ease financial constraints. According to this explanation, the smaller sized groups which are more likely to have higher financial constraints than the larger groups should show a more pronounced

selection effect. However, in my sub-sample test, the profitability effect does not appear in a small group, but the supply chain effect is strong. However, in the larger groups, the profitability effect appears, but the supply chain effect does not, which is inconsistent with the selection hypothesis. It implies that the position within the group can be formed by expropriation of corporate opportunity, that is, incentives for tunneling in the relatively small-sized business group (less than 10 trillion KRW in total assets). The suppliers that have taken the opportunity also grow along with the group, and the actual profitability is realized. Accordingly, both the supply chain and profitability account for the position simultaneously in the business group, with the total assets exceeding 10 trillion KRW, excluding the top five groups. However, since the suppliers within the group have already grown expropriating corporate opportunity, they will no longer exist as suppliers in the group in the top five groups. Therefore, the Top five groups present that the profitability variable rather than the supply chain explains position in the group, which can be evidence of the formation of a dynamic business group.

Moreover, as there is a possibility that cross-sectional compounders or omitted variable concerns may exist, an additional analysis is conducted to address the endogeneity problem. I identify the firm that switches to a supplier in the full sample to investigate how the firm that changes its status in the supply chain affects position changes. The firm that switches to a supplier has a statistically significant impact on the decrease in position but not increase in position. There is no statistical difference in the firm characteristics between supplier and others one year before changing to the supplier. This dismisses the possible claim that the firm switched to a supplier may have endogenously changed the status of the supply chain due to the nature of a certain firm,

As the results suggest that high profitability may be induced by a position where profits

are concentrated in the structure of the supply chain within the business group, additional analysis is conducted to show the association between the supply chain and profit as well as cost. Therefore, it is found that suppliers are more profitable and spend less than customers within the business group. Additionally, each of the suppliers with customers is compared with a matched sample of externally audited firms outside the business group based on size, year, and industry. Therefore, the supplier in the business group presents significantly higher profit volume and profit margin as well as lower SG&A and advertising cost than the matched sample. However, the customer in the business group shows lower profit margins, but profit volume and cost lose their statistical significance. This suggests that the effect of the supply chain is asymmetric and that the supplier is more influential than the customer.

This paper contributes to two strands of literature: supply chain and ownership structure. It provides a new explanation for the overlooked point of the ownership structure in the previous literature. The study attempts to explain the ownership structure using the supply chain, which was previously studied in operations management. More recently, research about supply chain or supplier and customer relationship has spurred in finance. While studies related to asset pricing or financial decision are active, the link between ownership structure and supply chain has not been analyzed. Thus, this undiscovered link connecting ownership structure with industrial organization literature is highlighted in this paper.

This paper is organized as follows. Section 2 discusses the hypothesis development and background. Section 3 describes the data and explains the various measures used in this study. Section 4 presents our main findings and discusses additional robustness tests providing the research design. Section 5 concludes the paper.

2. Hypothesis development and background

2.1. The formation of ownership structure in business group

Previous studies focus on the consequences of a company's ownership structure. The mainstream research links the ownership structure with corporate financial performance. The papers in the early stage use the concept of cash-flow right, control right, or a wedge, which indicates the difference between control rights and cash-flow rights as a proxy for ownership structure and claim that those affect the performance and valuation of group member firms. Bertrand *et al.* (2002) argue that a firm with high cash flow right shows a higher firm value than that with lower cash flow right. This is because the firm value increases by shifting its resources from the firm with a low cash flow right to the firm with high cash flow right. Claessens *et al.* (2002) insist that aside from cash flow right, the difference between control right and cash flow right, wedge, should be considered. In their results, there is a negative relationship between the wedge and firm value. Likewise, Joh (2003) shows the negative relation between wedge and profitability in Korea.

Subsequent studies focus on how the ownership structure is determined. Almeida *et al.* (2011) argue that the ownership structure is not an exogenous one, as assumed in previous studies. Still, it reflects the intention of controlling shareholders who establish the structure on a specific basis. In other words, controlling shareholders build the pyramid according to various firm characteristics, and the critical factor which they suggest is profitability. The pyramid structure is formed by placing low profitable firms below and large profitable firms above in the pyramid. Low profitability indicates a smaller amount of pledgeable income, suggesting that raising external capital may be difficult. Thus, the controlling shareholder seeks to use the internal capital of other group members to finance investment in the newly added firm. With this mechanism, the controlling shareholder wants to exploit the internal funds of other affiliates by owning the less profitable firm through their affiliates instead of directly owning

them. In contrast, a highly profitable firm may use its internal capital, and if necessary, it is relatively easy to finance externally using its collateral income. This investment motive hypothesis is further investigated by Masulis *et al.* (2011). Using more extensive data than Almeida *et al.* (2011), they propose the benefits of internal funding within the pyramid, arguing that the pyramid is a useful structure in maintaining control and easing funding constraints.

I present a new explanation for the hypotheses in this paper, different from the existing ones. Including the supplier and customer relationship from an industrial organization's perspective presents interesting findings. Rather than merely high and low profitability, the ownership structure may be affected by the supply chain within the business group. The supplier within the group generates revenue by delivering raw or intermediate goods to its affiliates. It has reliable customers and does not need to promote to get business opportunities. Therefore, the decision about how to take corporate opportunity rather than the profitability channel presented previously also affects the ownership structure. In other words, the ownership structure can be formed as an incentive of expropriating corporate opportunity. The central hypothesis presented in this paper is as follows.

Hypothesis: The controlling shareholder places the *supplier* above the pyramid rather than the *customer*.

The findings of Almeida *et al.* (2011) may have potentially overlooked certain essential details. Accordingly, the firm with high profitability is at the top of the pyramid, and the lower one is at the bottom. However, the firm's profitability may not be fundamentally high, but it may appear high. The firm's high profitability is not because of its superior operational capabilities, but because it is an exclusive supplier within its business group. In other words, the firm at the top of the pyramid may not be able to generate profitability unless it is a monopoly supplier to affiliates in the group. Sales generated within the business group may

result in high profitability.

Additionally, Almeida *et al.* (2011) argue that the reason why firms with high financial constraints (low-profitable firms) are located at the bottom of the pyramid is that these firms have difficulty in accessing external financing. Based on this selection hypothesis, the smaller sized groups which are more likely to have higher financial constraints than the larger groups should show a more pronounced selection effect. However, in my analysis, the selection effect does not appear in a small group, but the supply chain effect is strong.

Almeida *et al.* (2011) argue that the formation of pyramid structures is not intended for tunneling, but the controlling shareholder selects it. In contrast, this study proposes that it is a selection for tunneling, and the controlling shareholders choose to place the supplier at the top of the pyramid to enjoy high profitability by monopolizing their affiliates through exclusive sales contracts within the business group. Therefore, the results of Almeida *et al.* (2011) can be driven by the tunneling outcomes and the industrial organization-based channel, the supply chain, which is more important in explaining the ownership structure in the business group.

2.2. Vertical integration and supply chain

In all manufacturing industries, one of the critical corporate decisions that must be made during operation is ‘make or 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), (2) have contracts with subcontractors, and (3) set up an affiliated firm in charge of production and purchase intermediates from the affiliate. The case (1) stands for ‘make,’ (2) means ‘buy,’ and (3) refers

to the type of 'buy,' not from outside, but from other affiliates in the business group, which is commonly referred to as vertical integration. Cases (1) and (2) are not discussed because they deviate from the content of this paper.

In case (2), however, various issues can be discussed, which are addressed by Kim *et al.* (2020). From the controlling shareholders' perspectives, the supplier from outside (case 2) and supplier within the business group (case 3) is different. For transactions with a subcontractor, such as case (2), formal equity ownership issue is not intertwined. Still, according to Kim *et al.* (2020), the customer exploits the subcontractor exercising their control beyond the ownership. In contrast, if purchased from affiliates within the group, such as case (3), suppliers and customers rely on the ownership of controlling shareholders. Therefore, agency problems may exist. My paper deals with case (3), creating an affiliated firm in charge of producing intermediate or final goods, and constructing a vertically integrated structure. For example, comparing Samsung Electronics with Apple, while Apple outsources display panels, batteries, and mobile processors Samsung Electronics is supplied by affiliates such as display panels from Samsung Display, batteries from Samsung SDI, and mobile processors from division in Samsung Electronics. There is a big difference in the sourcing policy of the two companies. Apple was the first company to make an iPhone, the world's first successful smartphone, but Samsung has the edge in manufacturing competitiveness. Samsung is rapidly pursuing Apple's iPhone, and some indicators, such as sales, have already outpaced Apple.

As the example of Samsung Electronics and Apple shows, vertical integration is one of the competitive strategies that give 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 buyers 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. Besides, firms can reduce transaction costs, enabling efficient business processing.

There are types of vertical integration strategies. For example, an automobile company creates (or acquires) 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 representative examples of backward integration is that General Motors (GM) acquired Fisher Body, a company that makes automobile bodies to solve the hold-up problem. However, there is a difference between the US and Korea in this vertical integration. In this example, in the US, when GM acquired Fisher Body and vertically integrated, GM obtained 60 percent of the Fisher Body in 1919 and bought the remaining 40 percent in 1926. Since Fisher Body was incorporated into the GM assembly division in 1984, it no longer exists as a GM division.

Generally, in the US, it is common to own 100% of subsidiaries not only in vertical integration but also in general M&A cases, whereas in Korea, the parent company rarely takes 100% of its affiliates, which causes various agency problems. Seoyoung E&T that produces a variety of equipment for extracting draft beer and operation of beer such as draft beer cooler (raw emitter) and Hite Industry that supplies packaging glass containers are defined as suppliers in the group. These companies are owned by controlling shareholders with 100% and 60% shares, respectively. However, Hite Jinro, High Scott, Jinro Soju, and Hite Jinro beverage are defined as customers in the group, which are owned by controlling shareholders with about 30% shares. Therefore, this suggests that there is a possibility of agency problems arising from differences in ownership of each affiliate if vertical integration occurs within a business group.

--- Insert Figure 1 ---

2.3. Supply chain in finance

Although research on the supply chain has been conducted in operations management, it also has been spurred in finance. The initial studies try to connect product networks and asset prices, which focus on the predictability of stock returns through supplier-customer links (Cohen and Frazzini (2008); Menzly and Ozbas 2010) or across different production layers (Gofman *et al.* 2018). Besides, there is a growing literature about the supplier-consumer 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). However, there is a lack of research connecting the supply chain with the ownership structure. Therefore, this study attempts to fill the research 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 due to the introduction of the business group disclosure system of the Korean Fair Trade Commission (KFTC) in 2009. 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), to construct the main and control variables. Ownership data is obtained from eGroup, a database of extensive business group information disclosure

systems managed by KFTC. The annual financial data from the Dataguide provided by Fnguide is used.

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 are analyzed by obtaining data from TS2000, which serves only transactions between listed and unlisted companies. Transactions between unlisted companies are not provided. However, my hand-collected data includes all transactions between all affiliates, public and private firms. Moreover, a critical feature of this data source is that it collects information on how much firms buy and sell between all affiliates in the business group from the Fair Trade Commission Disclosure. This large-scale group-level database on the transaction between affiliates allows me to construct the supply chain variables within business groups and to assign *suppliers* or *customers* for the firm in the business group based on the ratio of sales and purchases between affiliates to its total sales. The supply chain variables, *supplier*, and *customer* are defined based on two criteria.

A. BS (Buy & Sell between affiliates)

According to the (Buy and Sell between affiliates) BS criterion, *supplier* (BLSM) is identified as a firm that buys from affiliates less than median and sells to affiliates more than median. The *customer* (BMSL) is identified as a firm that buys from affiliates more than

median and sells to affiliates less than median within the business groups. Moreover, *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). The advantage of the *supplier* (BLSM) and *customer* (BMSL) is that the whole sample can be used. However, using a *supplier* (BS) has the disadvantage of reducing the number of samples in half, while having the advantage of providing a *supplier* effect over the *customer*.

B. NS (Netsell between affiliates)

A netsell variable is created by subtracting purchases from the sales between affiliates. Within a business group, the firm is defined as a supplier (NS) if the netsell variable is higher than the median; otherwise, it is defined as a customer. The supplier (NS>0) which indicates a firm whose netsell variable is greater than zero, is added for the robustness check.

The variables based on two criteria have similar meanings but differ such that the BS is a more rigorous measure that separates purchases from and sales to affiliates. However, NS includes the concept of the aggregated part compared to BS, which does not clearly distinguish between buying and selling, respectively, because it subtracts purchases from sales between affiliates.

3.2.2. Ownership structure

The methodology of computing ownership structure variables, ultimate ownership, and position, is based on Almeida *et al.* (2011). Their paper can be referred, on how to build the variables in detail. I briefly explain the variables.

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.

--- Insert Figure 2 ---

B. Position

The *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 above. 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, as the direct ownership of the controlling shareholder in firm B exists, the position is determined by the weighted average of direct and indirect ownership as follows.

$$Position_A = \frac{0.4}{0.4} \times 1 = 1 \quad (1)$$

$$Position_B = \frac{0.1}{0.3} \times 1 + \frac{0.2}{0.3} \times 2 = 1.7 \quad (2)$$

In short, position implies a kind of layer that adjusts direct and indirect ownership of controlling shareholders.

3.2.3. Other Variables

Following the existing literature on ownership structure in business groups, I control for 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 the number of years

since the company's establishment, and this measure is logged; (3) public company (*List*) equals the value of one if the company is listed (either in KSE or KOSDAQ); 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 assigns them the original sign; (8) cost variables, (*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 critical variables for 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 supply chain based on BS criterion, *supplier* (BLSM), and *customer* (BMSL), are 0.246 and 0.248, respectively. It means that by definition of the *supplier* (*customer*), on average, 24.6% (24.8%) is allocated to the *supplier* (*customer*). Moreover, the *supplier* (NS) and (NS>0) are 0.485 and 0.537, respectively. The numerical difference between the two criterion BS and NS is owing to their definition described in section 3.2.1.

The controlling shareholders ultimately own 28.50% of the shares in the affiliates across all firm-years in my 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 an 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

This section shows univariate and multivariate analysis to show whether the supply chain plays a vital role in the ownership structure.

4.1 Univariate results

Table 3 shows the statistical differences in key variables between *supplier* and *customer*. Panel A is the result of the BS criterion, and Panel B is the result of the NS criterion. As mentioned in section 3.2.1, BS is a variable measured in a more rigorous method than NS. Thus, the magnitude of the difference resulted from the BS criterion is higher than that of the NS criterion.

--- Insert Table 3 ---

As the results of the two panels show similar patterns, the results are described based on panel A and panel B is considered for a robustness check. The supplier shows higher ultimate ownership and lower value of the position than the customer. Controlling shareholders own the supplier more than the customer and place the supplier in an upper position in the pyramid within their business group. Moreover, the supplier has less proportion of being listed and smaller in size than the customer. A higher proportion of a privately held company of the supplier can result in a smaller size.

4.2 The supply chain and ownership structure

Table 4 provides estimates of how the supply chain is associated with the ownership structure. According to Almeida *et al.* (2011), who propose the selection hypothesis, the less profitable firm is more likely to be selected and placed in the lower pyramid by the controlling shareholder. In this section, the previous findings based on the empirical model by Almeida *et al.* (2011) are replicated, and the results for interpreting this phenomenon from a different perspective are presented. I measure *position* following their methodology and control for size, age, listed status, and leverage. I use operating income scaled by assets to measure profitability. Additionally, I include year and industry fixed effects, where the industry classification corresponds to a two-digit Korea standard industry code (KSIC). I also control for business group fixed effects to exploits within-group variation, as *position* and *ultimate ownership* are representative corporate decisions made at the group level in South Korea. The standard errors are clustered at the firm level.

$$Position_{i,t} = \alpha \cdot profitability_{i,t-1} + \beta \cdot supplier_{i,t} + \mathbf{Controls}_{i,t-1} + \sum_t year_t + \sum_k industry_k + \sum_j group_j + \varepsilon_{i,t}. \quad (3)$$

--- Insert Table 4 ---

Column 1 indicates that α in Eq. (3) is significantly negative, which supports the *selection hypothesis* (Almeida *et al.*, 2011). However, columns 2 to 6 show an additional perspective to interpret the same phenomenon proposed by Almeida *et al.* (2011). Controlling for profitability (Ebit/assets), columns 2 and 3 indicate that the *supplier (BLSM)* is negatively correlated with the *position*, and *customer (BMSL)* is positively correlated with the *position*. A firm with a small position value implies that controlling shareholders tend to place the supplier

in a higher position in the pyramid than the customer. Besides, supplier (NS), supplier (NS>0), and supplier (BS) also present negative coefficients.

The *supplier* and *customer* are variables that consider both sales and purchases between affiliates within the group, but columns 7 and 8 analyze sales and purchase 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 in a higher position than a firm that sells less. However, a firm that buys more from affiliates is placed in a lower position than a firm that buys less from affiliates in the business group.

4.3 The supply chain and ownership structure conditional on group size

In this section, the whole sample is divided into three sub-groups based on the total assets of affiliates. Previously, business groups with total assets of more than five trillion KRW were designated as large business groups and regulated. However, it has been highlighted that sanctions against large companies, such as the Samsung Group, with assets of several hundred trillion KRW, and startups such as Kakao Group, which have just exceeded five trillion KRW, on a similar basis are unfair. Therefore, the Korean Fair Trade Commission (KFTC) has announced the revision of enforcement decree, that business groups with total assets of five trillion KRW or more are defined as groups subject to disclosure. Groups with total assets of 10 trillion or more are defined as groups subject to the limitations on mutual investment. It implies that 10 trillion KRW can be a cutoff to define whether a group is large enough to require stronger regulation. According to this enforcement decree, Panel A and Panel B present business groups with total assets less than 10 trillion KRW, and more than 10 trillion KRW, respectively, excluding the top 5 groups. Panel C indicates the result of the top 5 business

groups, respectively.

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

In Panel A, the key variable that explains the *position* proposed by Almeida et al. (2011), profitability (*Ebit/assets*), does not show the results in the sub-sample consisting of business groups with total assets less than 10 trillion KRW. However, supply chain variables, *suppliers* and *customers*, reveal statistically significant results. It implies that in a relatively small business group, the supply chain plays a more important role in describing the position than the profitability. While Panel B presents that both profitability and supply chain variables account for the *position*, Panel C indicates that in the top 5 business groups based on total assets, the supply chain variables lose explanatory power, and only the profitability variable describes the position.

This result questions the selection hypothesis proposed by Almeida et al. (2011). In their paper, the reason why 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 groups which are more likely to have higher financial constraints than the larger groups should show a more pronounced selection effect. However, in my sub-sample test, the profitability effect is not realized in a small group, but the supply chain effect is strong. However, the profitability effect appears, but the supply chain effect does not appear in the larger groups, which is inconsistent with the selection hypothesis. It implies that a selection for tunneling forms the position within the group, that is, expropriation of corporate opportunity. The controlling shareholders may choose to place the supplier at the top of the pyramid to enjoy high profitability by monopolizing their affiliates through exclusive sale contracts within the business group. As the group grows and the total assets of the group

exceed 10 trillion KRW, the suppliers that have taken the opportunity also grow, and the actual profitability appears. Accordingly, both the supply chain and profitability account for the position simultaneously. In the top five groups, since the suppliers within the group have already developed expropriating of corporate opportunity, there is a high probability that they will no longer exist as suppliers in the group. Therefore, the top 5 groups present that the profitability variable rather than the supply chain explains the position in the group.

4.4. Endogeneity control

This section presents additional analysis to address the endogeneity issue. There is a possibility that cross-sectional compounder or omitted variable concern may exist. I construct another independent variable, *Become a supplier*, for the firm that switches to a supplier in the full sample to investigate how the firm that changes its status in the supply chain affects position changes. Moreover, the variables of change in position are constructed according to the previous literature. The variable *position increase* 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.

Statistical difference is provided to the firm characteristics, a year before changing to a supplier to dismiss the possible claim that the firm switching to a supplier may have endogenously changed the status of the supply chain due to the nature of a specific firm.

--- Insert Table 6 Panel A and B ---

Panel A of Table 6 illustrates that there is no statistical difference in the firm's characteristics between the supplier and others one year before changing to the supplier. Panel

B of Table 6 reports the result of univariate analysis to show the statistical differences in key variables between *become a supplier* and *others*. It presents that the mean value of *position decrease* of firms that switch to a supplier is larger than others in the business group.

--- Insert Table 7 ---

In Table 7, the variable position with position increase and position decrease in Eq. (3) is replaced. Dependent variables indicate a change in position in both directions, increasing and decreasing, and the value of one is given to the firm whose position changes in the next period based on a specific threshold value. In column (1) and (2), dependent variables take a value of one if position changed by 0.10 in the next period in either way, following Almeida et al. (2011). Additionally, I add measures of the position changes using a different threshold in either way, for example, firms with the top 10% and 25% of position change in the next year. In column (3) and (4), dependent variables take a value of one if position changes in the next period are the top 10% within my sample in either way. In column (5) and (6), dependent variables take a value of one if position changes in the next period are the top 25% within my sample in either way.

Therefore, the firm that becomes a supplier has a statistically significant impact on the decrease in position but not increase in position. It implies that the firm which becomes a supplier is more likely to be at the top of the pyramid. Thus, it is consistent with the hypothesis that controlling shareholders tend to place the supplier in the upper part of the pyramid.

4.5. The supply chain and profit

As results suggest that high profitability may be induced by a position where profits are concentrated in the structure of the supply chain within the business group, I conduct

additional analysis to show the association between the supply chain and profit.

--- Insert Table 8 ---

Table 8 shows the relation between the supply chain and profit volume. Panel A shows the results using 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. Besides, *supplier*(NS), *supplier*(NS>0), and *supplier*(BS) also present positive coefficients.

--- Insert Table 9 ---

Table 9 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 9 indicate that the *supplier*(BLSM) is positively correlated with profit margin and *customer*(BMSL) is negatively correlated with it. Besides, *supplier*(NS), *supplier*(NS>0), and *supplier*(BS) also present positive coefficients.

There is a significant difference in the results of profit margins compared to profit volume. In the results of profit volume (Table 8), the *supplier* has a more significant magnitude of coefficients than the *customer*. As shown in column 3 of Table 8, when the *supplier* and the *customer* are considered as independent variables simultaneously, the *customer* loses explanatory power. However, in the results of the profit margin (Table 9), the *customer* has a bigger magnitude of coefficients than the *supplier*. Moreover, column 3 of Table 9 indicates that even when the *supplier* and the *customer* are simultaneously considered as independent variables, the *customer* still retains significant explanatory power.

4.6. The supply chain and cost

Profit margin is measured by the ratio of operating income to sales, where operating profit is calculated by subtracting COGS and SG&A from sales. This section identifies whether the difference in profit margin between *supplier* and *customer*, shown in Table 9, is due to COGS or SG&A. First, the relation between the supply chain and the COGS is investigated. 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.

--- Insert Table 10 ---

Contrary to expectations, Table 10 indicates that COGS of the supplier is higher, and that of the customer does not have a statistically significant difference. This result suggests that the difference in profit margin shown in Table 9 does not come from the cost competitiveness of the two.

--- Insert Table 11 ---

Second, Table 11 shows the relation between the supply chain and SGA costs. Columns 1 and 2 indicate that *supplier* spends less SG&A, while *customer* spends more. Moreover, the magnitude of the customer's coefficient is more significant than that of the supplier. This suggests that the difference in the coefficient of profit margin is due to this SG&A expense.

Besides, a promotion expense is a cost included in SG&A, and a firm incurs this expense to market their products or services to consumers. It ranges from giveaways, free samples, or other promotional strategies to help boost sales and revenue.

--- Insert Table 12 ---

Table 12 shows the relation between the supply chain and the advertising and promotional cost. The results reveal that advertising and promotional costs also have a similar

pattern as SG&A. It implies that the supplier within the business group has a higher profit margin by enabling easy sales generation and reducing various costs compared to the customer. Therefore, it also implies that the ownership structure can be formed as an incentive of expropriating corporate opportunity.

4.7. Matched sample analysis

In sections 4.5 and 4.6, I investigate the effect of supply chain on profit and cost by comparing the supplier and customer in the business group. This section demonstrates this association by comparing the supplier and customer to matched firms outside the business group, respectively. The matched sample consists of externally audited firms, excluding those in the business group and is selected to match the supplier and customer in the business group based on size, year, and industry. In this section, It raises the hypothesis that if the supplier is not part of the group, SG&A or marketing costs that an independent entity must pay will be paid less when it belongs to a business group, and that this cost reduction will eventually lead to increased profitability.

--- Insert Table 13 ---

Table 13 reports univariate results of the matched sample to show the statistical differences in key variables between samples in the business group and an outside group. Panel A suggests the supplier in the business group presents significantly higher profit volume and -margin as well as lower cost than the matched sample. Panel B indicates the customer in the business group shows a lower profit margin and higher cost than the matched sample.

--- Insert Table 14 ---

Table 14 shows how the supply chain affects profit and cost 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. *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 supplier in the business group presents significantly higher profit volume and -margin as well as lower SG&A and advertising costs than the matched sample. Similar to the result of the comparison between the supplier and the customer in the business group, the result of panel A is also the same when compared with the matched sample from outside the business group. However, Panel B indicates how the customer affects profit and cost compared to the matched sample outside of the business group. *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 customer in the business group shows a lower profit margin, but profit volume and cost lose their statistical significance. This suggests that the effect of the supply chain is asymmetric and that the supplier is more influential than the customer.

4.8 Regulation effect

Being aware of the behavior of the controlling shareholders who expropriate corporate opportunity and benefit from minority shareholders, the Fair Trade Commission established the Article 23-2 in August 2013, and this law came into effect in 2015. *After2015* is an indicator variable that takes the value one if the period after the Article 23-2 of the Fair Trade Act is enforced, and zero otherwise.

--- Insert Table 15 ---

Table 12 reports the effect of the law on the relationship between supply chain and

position. Column 2 indicates that after the law that regulates expropriating corporate opportunity, the controlling shareholders place the supplier at the lower part of the pyramid.

5. Conclusion

This study investigates how the supply chain affects the ownership structure in the Korean business group. Affiliates-level transaction data are used to identify the supplier and the customer to construct the supply chain within the business group. The result indicates that the controlling shareholder places the supplier higher than the customer on the pyramid. This evidence questions the previous study claiming that profitable firms are at a higher place on the pyramid. My finding suggests the high profitability of the companies at the top of the pyramid is endogenous, and the key is the supply chain because the suppliers generate high profits through exclusive sales contracts with member firms.

Moreover, this supply-chain effect is more prominent in the relatively small-sized group (less than 10 trillion KRW in total assets), but it disappears in the top 5 business groups. It implies that the position within the group can be formed by expropriation of corporate opportunity, that is, incentives for tunneling in the relatively small-sized business group (less than 10 trillion KRW in total assets) that are recently designated as large business groups. As the group grows, the suppliers that have taken the opportunity also grow, and the actual profitability will appear. Accordingly, both supply chain and profitability account for the position simultaneously in the business group, with the total assets exceed 10 trillion KRW excluding the top 5 groups. However, since the suppliers within the group have already grown expropriating corporate opportunity, they will no longer exist as suppliers in the group in the top 5 groups. Therefore, the top 5 groups present that the profitability variable rather than the supply chain explains position in the group. This suggests that controlling shareholders'

incentive to expropriate corporate opportunity may be an important factor in structuring business groups.

To address the endogeneity issue, the firm that switches to a supplier in the full sample was identified to investigate how the firm that changes its status in the supply chain affects position changes. The firm that changes its status in the supply chain to a supplier has a statistically significant impact on the decrease in position but not increase in position. It implies that the firm which becomes a supplier is more likely to be at the top of the pyramid. Thus, the fact that suppliers are chosen to be at the top of the pyramid is supported. The ownership structure is likely to be formed as an incentive for the expropriating corporate opportunity.

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Figure 1

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.

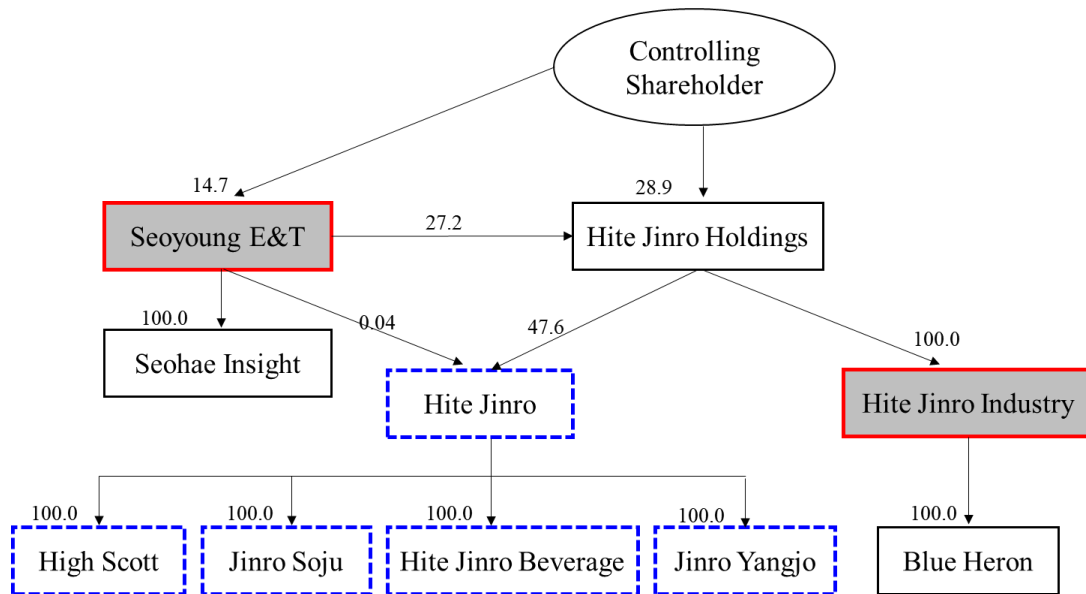


Figure 2

The example of calculating ultimate ownership.

This figure presents a simple example of calculating the ultimate ownership (cash flow right). 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.

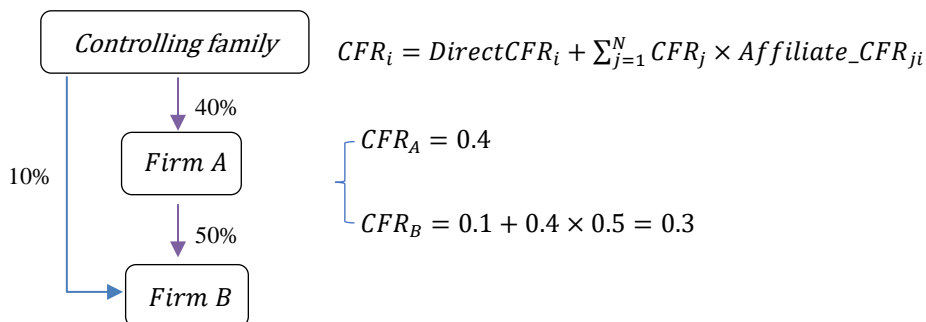


Table 1

Variable Definitions

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

Variable	Definition
<i>measure of supply chain</i>	
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 median and RP_sell is more than median (Buy Less and Sell More); 0, if a firm's RP_buy is more than median and RP_sell is less than median (Buy More and Sell Less)
Sell High	1, if RP_sell is greater than median
Buy High	1, if RP_buy is greater than median
RPT	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
<i>measure of ownership</i>	
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 pyramidal structure. Defined in the text in detail
<i>control variables</i>	
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	Ratio of book value of total debt to total asset
Ebit/asset	Ratio of operating income to total asset
Ebit/sales	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)	Natural logarithm of the absolute value of ebitda and the original sign is assigned
Cogs/sales	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	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 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
<i>measure of supply chain</i>						
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
<i>measure of ownership</i>						
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
<i>control variables</i>						
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 Buy & Sell(BS) criterion and Panel B is the result of the Netsell(NS) criterion. With BS criterion, *Supplier*(BLSM) is identified as a firm which buys from affiliates less than median and sells to affiliates more than median; *Customer* (BMSL) is identified as a firm which buys from affiliates more than median and sells to affiliates less than median. With 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. Buy & Sell

	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. Netsell

	Supplier(BLSM)			Customer(BMSL)			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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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*** (-2.875)	-0.5676*** (-2.770)	-0.5983*** (-2.897)	-0.5706*** (-2.785)	-0.6043*** (-2.922)	-0.5990*** (-2.896)	-0.5911*** (-2.856)	-0.5877*** (-2.865)	-0.3807 (-1.524)
Supplier(BLSM)		-0.2099*** (-5.045)		-0.2001*** (-4.825)					
Customer(BMSL)			0.0902** (2.218)	0.0329 (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*** (-7.361)	-0.1163*** (-7.574)	-0.1163*** (-7.459)	-0.1174*** (-7.554)	-0.1198*** (-7.681)	-0.1202*** (-7.721)	-0.1143*** (-7.394)	-0.1181*** (-7.650)	-0.1264*** (-5.951)
Age	-0.1119*** (-4.892)	-0.1100*** (-4.894)	-0.1079*** (-4.680)	-0.1086*** (-4.791)	-0.1061*** (-4.663)	-0.1052*** (-4.619)	-0.1119*** (-4.902)	-0.1047*** (-4.584)	-0.0997*** (-3.365)
List	-0.1025 (-1.595)	-0.1207* (-1.909)	-0.1098* (-1.714)	-0.1225* (-1.939)	-0.1209* (-1.900)	-0.1152* (-1.809)	-0.1166* (-1.829)	-0.1038 (-1.623)	-0.1271 (-1.528)
Leverage	0.0999 (1.089)	0.0970 (1.074)	0.0983 (1.075)	0.0965 (1.069)	0.0844 (0.926)	0.0880 (0.967)	0.0971 (1.060)	0.0998 (1.103)	-0.1166 (-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 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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 (-0.276)	-0.0845 (-0.282)	-0.1331 (-0.431)	-0.1132 (-0.373)	-0.0504 (-0.166)	-0.0566 (-0.187)	-0.0657 (-0.214)	-0.1274 (-0.420)	-0.3824 (-0.845)
Supplier(BLSM)		-0.3004*** (-4.474)		-0.2450*** (-3.741)					
Customer(BMSL)			0.2435*** (3.919)	0.1444** (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*** (-4.336)	-0.1475*** (-4.496)	-0.1522*** (-4.506)	-0.1501*** (-4.569)	-0.1466*** (-4.417)	-0.1503*** (-4.472)	-0.1429*** (-4.327)	-0.1536*** (-4.551)	-0.0743** (-1.983)
Age	-0.1043*** (-2.715)	-0.1136*** (-3.141)	-0.0897** (-2.328)	-0.1032*** (-2.818)	-0.0988*** (-2.706)	-0.1043*** (-2.857)	-0.1015*** (-2.739)	-0.1013*** (-2.658)	-0.1038** (-2.406)
List	0.0858 (0.741)	0.0792 (0.726)	0.0711 (0.625)	0.0717 (0.657)	0.0517 (0.475)	0.0585 (0.531)	0.0556 (0.510)	0.0903 (0.790)	-0.2211* (-1.786)
Leverage	0.4154** (2.545)	0.4050*** (2.632)	0.3605*** (2.267)	0.3743** (2.443)	0.3320** (2.171)	0.3630** (2.363)	0.3847** (2.463)	0.3919** (2.444)	0.2098 (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*** (-2.684)	-0.7472*** (-2.599)	-0.7917*** (-2.718)	-0.7488*** (-2.611)	-0.7971*** (-2.729)	-0.7756*** (-2.650)	-0.7832*** (-2.692)	-0.7797*** (-2.681)	-0.7046* (-1.842)
Supplier(BLSM)		-0.2119*** (-3.543)		-0.2094*** (-3.535)					
Customer(BMSL)			0.0630 (1.119)	0.0088 (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*** (-5.241)	-0.1221*** (-5.369)	-0.1216*** (-5.248)	-0.1223*** (-5.337)	-0.1280*** (-5.536)	-0.1285*** (-5.532)	-0.1212*** (-5.269)	-0.1223*** (-5.310)	-0.1444*** (-4.242)
Age	-0.0712** (-2.063)	-0.0672** (-2.008)	-0.0677* (-1.949)	-0.0667** (-1.979)	-0.0607* (-1.776)	-0.0588* (-1.713)	-0.0695** (-2.026)	-0.0655* (-1.905)	-0.0400 (-0.794)
List	-0.1617* (-1.697)	-0.1702* (-1.811)	-0.1646* (-1.735)	-0.1705* (-1.818)	-0.1699* (-1.805)	-0.1676* (-1.778)	-0.1730* (-1.824)	-0.1583* (-1.673)	-0.0091 (-0.075)
Leverage	0.2026 (1.556)	0.1941 (1.510)	0.1995 (1.530)	0.1938 (1.505)	0.1895 (1.461)	0.1980 (1.524)	0.1978 (1.517)	0.1987 (1.535)	0.0087 (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)

	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

Univariate analysis of become 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 indicates 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 7

Become a supplier and position changes

This table shows the effect of changes the status in supply chain on the position changes. Dependent variables are changes in position in both directions, increasing and decreasing. In column (1) and (2), dependent variables take a value of one if position changed by 0.10 in the next period in either way, following Almeida et al.(2011). In column (3) and (4), dependent variables take a value of one if position changes in the next period is the top 10% in either way. In column (5) and (6), dependent variables take a value of one if 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 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.

Dependent var:	Standards in previous literature		Top 10 percentile change		Top 25 percentile change	
	Increase	Decrease	Increase	Decrease	Increase	Decrease
Position change	(1)	(2)	(3)	(4)	(5)	(6)
Become a supplier	0.0007 (0.045)	0.0336* (1.904)	0.0059 (0.310)	0.0365* (1.698)	0.0183 (0.710)	0.0490* (1.807)
Ebit/asset	-0.0215 (-0.417)	0.0625 (1.286)	-0.0363 (-0.553)	0.0172 (0.268)	-0.1463 (-1.642)	-0.1106 (-1.301)
Size	-0.0053** (-2.019)	-0.0061** (-2.449)	0.0003 (0.084)	-0.0078** (-2.184)	0.0031 (0.637)	-0.0071 (-1.417)
Age	0.0028 (0.724)	0.0007 (0.165)	-0.0050 (-0.827)	-0.0085 (-1.462)	-0.0066 (-0.804)	-0.0020 (-0.240)
List	0.0537*** (3.040)	0.0128 (0.773)	0.0316 (1.356)	-0.0094 (-0.420)	0.0208 (0.624)	-0.0076 (-0.242)
Leverage	0.0066 (0.645)	0.0182* (1.722)	0.0093 (0.608)	0.0190 (1.268)	0.0197 (0.907)	0.0187 (0.828)
Constant	0.1662** (2.500)	0.2336*** (3.123)	0.0465 (0.489)	0.4469*** (3.884)	0.0149 (0.115)	0.6799*** (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 8

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 signed natural logarithm of earning before interest, tax (EBIT). In Panel B, the dependent variable is signed natural logarithm of earning 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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*** (3.309)		1.5515*** (2.728)					
Customer(BMSL)		-1.3595** (-2.210)	-0.9224 (-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*** (6.386)	1.4548*** (6.448)	1.4620*** (6.497)	1.4747*** (6.516)	1.4709*** (6.504)	1.4234*** (6.300)	1.4414*** (6.457)	1.3191*** (4.486)
Age	1.6541*** (4.455)	1.6085*** (4.311)	1.6152*** (4.345)	1.6143*** (4.345)	1.6083*** (4.321)	1.6732*** (4.476)	1.6185*** (4.374)	1.3202*** (2.753)
List	-0.8181 (-0.941)	-0.8558 (-0.975)	-0.7655 (-0.877)	-0.7756 (-0.885)	-0.8490 (-0.974)	-0.7451 (-0.853)	-0.9556 (-1.094)	0.6596 (0.581)
Leverage	-1.4297 (-1.112)	-1.4214 (-1.097)	-1.4164 (-1.101)	-1.3028 (-1.014)	-1.3440 (-1.043)	-1.4127 (-1.095)	-1.4413 (-1.113)	-1.3618 (-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 8 (continued)

Panel B.	Dependent variable: Signed LN(ebitda)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	1.7202*** (3.247)		1.4510*** (2.657)					
Customer(BMSL)		-1.3118** (-2.311)	-0.9030 (-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*** (7.369)	1.5605*** (7.405)	1.5673*** (7.453)	1.5793*** (7.475)	1.5741*** (7.443)	1.5298*** (7.271)	1.5477*** (7.455)	1.5048*** (5.586)
Age	1.7272*** (4.809)	1.6828*** (4.665)	1.6891*** (4.700)	1.6887*** (4.703)	1.6844*** (4.678)	1.7451*** (4.825)	1.6924*** (4.732)	1.2290*** (2.676)
List	-1.3662* (-1.693)	-1.3992* (-1.717)	-1.3147 (-1.624)	-1.3230 (-1.628)	-1.3961* (-1.725)	-1.2973 (-1.602)	-1.4954* (-1.843)	0.1187 (0.112)
Leverage	-0.1340 (-0.109)	-0.1257 (-0.102)	-0.1209 (-0.099)	-0.0122 (-0.010)	-0.0539 (-0.044)	-0.1180 (-0.096)	-0.1448 (-0.117)	-0.4973 (-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 9

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 earning before interest, tax (EBIT) scaled by sales. In Panel B, the dependent variable is earning 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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*** (4.519)		0.0494*** (2.889)					
Customer(BMSL)		-0.1636*** (-4.189)	-0.1497*** (-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** (2.064)	0.0226** (2.544)	0.0228** (2.568)	0.0209** (2.373)	0.0207** (2.368)	0.0176** (2.004)	0.0211** (2.407)	0.0162 (1.169)
Age	0.0731*** (4.244)	0.0666*** (4.012)	0.0668*** (4.033)	0.0706*** (4.165)	0.0701*** (4.122)	0.0741*** (4.280)	0.0676*** (3.992)	0.0648** (2.374)
List	-0.0091 (-0.311)	-0.0034 (-0.112)	-0.0005 (-0.017)	-0.0051 (-0.171)	-0.0094 (-0.317)	-0.0047 (-0.155)	-0.0154 (-0.535)	0.1028** (2.004)
Leverage	0.0669 (0.965)	0.0689 (1.002)	0.0691 (1.008)	0.0748 (1.073)	0.0724 (1.040)	0.0679 (0.975)	0.0666 (0.964)	0.1172 (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 9 (continued)

Panel B.	Dependent variable: Ebitda/sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier(BLSM)	0.0841*** (4.056)		0.0408** (2.397)					
Customer(BMSL)		-0.1567*** (-4.053)	-0.1452*** (-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** (2.204)	0.0235*** (2.675)	0.0237*** (2.694)	0.0217** (2.493)	0.0216** (2.488)	0.0187** (2.153)	0.0220** (2.539)	0.0189 (1.381)
Age	0.0681*** (3.996)	0.0618*** (3.761)	0.0620*** (3.778)	0.0658*** (3.919)	0.0654*** (3.881)	0.0690*** (4.030)	0.0629*** (3.748)	0.0587** (2.171)
List	-0.0113 (-0.391)	-0.0054 (-0.180)	-0.0030 (-0.100)	-0.0075 (-0.253)	-0.0114 (-0.391)	-0.0071 (-0.238)	-0.0168 (-0.594)	0.0968* (1.913)
Leverage	0.0650 (0.942)	0.0669 (0.980)	0.0671 (0.984)	0.0722 (1.042)	0.0700 (1.011)	0.0659 (0.952)	0.0647 (0.942)	0.1153 (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 10

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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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** (2.561)		0.0320*** (2.705)					
Customer(BMSL)		-0.0045 (-0.326)	0.0038 (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 (-1.182)	-0.0059 (-1.247)	-0.0057 (-1.209)	-0.0053 (-1.113)	-0.0057 (-1.222)	-0.0057 (-1.212)	-0.0060 (-1.278)	-0.0140** (-2.240)
Age	-0.0181** (-2.278)	-0.0180** (-2.293)	-0.0179** (-2.283)	-0.0183** (-2.309)	-0.0181** (-2.295)	-0.0175** (-2.202)	-0.0178** (-2.254)	-0.0023 (-0.213)
List	0.0031 (0.163)	0.0003 (0.016)	0.0029 (0.152)	0.0023 (0.121)	0.0007 (0.037)	0.0043 (0.228)	-0.0000 (-0.002)	-0.0249 (-0.954)
Leverage	0.0944*** (3.078)	0.0949*** (3.090)	0.0943*** (3.075)	0.0963*** (3.154)	0.0953*** (3.114)	0.0960*** (3.142)	0.0948*** (3.085)	0.1268*** (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 11

The supply chain and SGA 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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*** (-5.865)		-0.0690*** (-4.555)					
Customer(BMSL)		0.1008*** (4.716)	0.0813*** (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** (-2.109)	-0.0140** (-2.478)	-0.0143** (-2.551)	-0.0137** (-2.433)	-0.0136** (-2.424)	-0.0112** (-1.981)	-0.0134** (-2.410)	-0.0054 (-0.670)
Age	-0.0433*** (-3.974)	-0.0396*** (-3.715)	-0.0399*** (-3.749)	-0.0414*** (-3.854)	-0.0411*** (-3.810)	-0.0442*** (-4.047)	-0.0397*** (-3.684)	-0.0608*** (-3.887)
List	-0.0020 (-0.093)	-0.0026 (-0.122)	-0.0067 (-0.307)	-0.0035 (-0.163)	-0.0001 (-0.005)	-0.0044 (-0.202)	0.0046 (0.215)	-0.0264 (-0.830)
Leverage	-0.1507*** (-3.437)	-0.1514*** (-3.450)	-0.1518*** (-3.484)	-0.1567*** (-3.556)	-0.1548*** (-3.514)	-0.1514*** (-3.428)	-0.1500*** (-3.415)	-0.2125*** (-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 12

The supply chain and Advertising and promotional cost

This table shows the relation between the supply chain and the Advertising and promotional cost. 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than median, and 0 otherwise. *Supplier*(NS) is a dummy that takes a value of 1 if 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 which 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*** (-3.617)		-0.0049*** (-2.857)					
Customer(BMSL)		0.0058*** (2.804)	0.0044** (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 (1.505)	0.0009 (1.348)	0.0009 (1.314)	0.0009 (1.339)	0.0009 (1.352)	0.0011 (1.541)	0.0010 (1.456)	0.0022*** (2.607)
Age	-0.0025** (-2.039)	-0.0023* (-1.911)	-0.0023* (-1.932)	-0.0024** (-1.962)	-0.0024* (-1.933)	-0.0026** (-2.091)	-0.0024* (-1.935)	-0.0065*** (-3.697)
List	0.0042 (1.252)	0.0043 (1.270)	0.0040 (1.189)	0.0042 (1.232)	0.0044 (1.289)	0.0040 (1.169)	0.0047 (1.381)	0.0088* (1.753)
Leverage	-0.0076 (-1.514)	-0.0076 (-1.526)	-0.0076 (-1.527)	-0.0080 (-1.585)	-0.0078 (-1.568)	-0.0076 (-1.529)	-0.0075 (-1.506)	-0.0105* (-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 13.

Univariate results of the matched sample

This table reports the statistical differences in key variables between samples in the business group and outside 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 median and sells to affiliates more than median, and 0 otherwise. *Customer* (BMSL) is a dummy that takes a value of 1 if a firm buys from affiliates more than median and sells to affiliates less than 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 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*** (2.878)	1.9401*** (3.250)	0.0826*** (3.616)	0.0624*** (2.875)	0.0612*** (5.637)	-0.1638*** (-6.613)	-0.0067*** (-3.108)
Size	1.6886*** (6.082)	1.5715*** (5.739)	0.0323*** (3.212)	0.0334*** (3.440)	0.0085* (1.793)	-0.0388*** (-3.529)	0.0007 (0.782)
Age	1.4083*** (3.125)	1.5705*** (3.538)	0.0071 (0.439)	0.0010 (0.066)	0.0046 (0.648)	-0.0382** (-2.315)	-0.0014 (-0.847)
List	-1.2972 (-1.472)	-1.0475 (-1.256)	-0.0196 (-0.852)	-0.0201 (-0.898)	-0.0072 (-0.506)	0.0251 (0.930)	0.0031 (0.939)
Leverage	-8.6689*** (-7.253)	-7.5833*** (-6.338)	-0.3243*** (-4.043)	-0.2940*** (-3.848)	0.1049*** (4.183)	0.1335* (1.649)	0.0101* (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 (-0.669)	-0.3022 (-0.440)	-0.0920* (-1.912)	-0.0927** (-2.049)	-0.0087 (-0.633)	0.0549 (1.366)	0.0014 (0.513)
Size	1.4570*** (5.259)	1.6214*** (6.126)	0.0194 (0.890)	0.0200 (0.977)	-0.0006 (-0.103)	-0.0122 (-0.668)	0.0016 (1.355)
Age	2.1609*** (4.446)	2.2708*** (4.758)	0.1402*** (3.400)	0.1307*** (3.399)	-0.0147 (-1.458)	-0.1133*** (-3.293)	-0.0052** (-2.323)
List	0.5005 (0.509)	-0.2945 (-0.320)	0.0952* (1.732)	0.0763 (1.483)	-0.0121 (-0.660)	-0.0682 (-1.477)	0.0043 (0.952)
Leverage	-8.4270*** (-6.249)	-7.2597*** (-5.365)	0.0712 (0.536)	0.0772 (0.614)	0.1110*** (3.904)	-0.1693 (-1.376)	-0.0031 (-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*** (-2.967)	-0.5896*** (-2.894)	-0.6159*** (-2.998)	-0.6252*** (-3.038)	-0.6185*** (-3.006)	-0.6096*** (-2.959)	-0.6052*** (-2.965)	-0.4105* (-1.654)
Supplier(BLSM)		-0.2422*** (-5.340)						
Supplier(BLSM) x After2015		0.1244** (2.412)						
After2015		-0.0455* (-1.856)	-0.0197 (-0.763)	-0.0437 (-1.470)	-0.0170 (-0.499)	-0.0559* (-1.899)	-0.0168 (-0.537)	-0.0095 (-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*** (-7.348)	-0.1154*** (-7.543)	-0.1156*** (-7.431)	-0.1190*** (-7.654)	-0.1195*** (-7.685)	-0.1135*** (-7.369)	-0.1174*** (-7.622)	-0.1254*** (-5.910)
Age	-0.1101*** (-4.881)	-0.1081*** (-4.851)	-0.1057*** (-4.617)	-0.1040*** (-4.608)	-0.1029*** (-4.554)	-0.1102*** (-4.862)	-0.1025*** (-4.522)	-0.0984*** (-3.337)
List	-0.1060* (-1.653)	-0.1250** (-1.984)	-0.1140* (-1.782)	-0.1256** (-1.979)	-0.1196* (-1.881)	-0.1213* (-1.910)	-0.1080* (-1.692)	-0.1307 (-1.571)
Leverage	0.0991 (1.082)	0.0937 (1.040)	0.0973 (1.066)	0.0815 (0.895)	0.0865 (0.952)	0.0946 (1.033)	0.0985 (1.090)	-0.1235 (-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