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The Globalization and Business Performance of Corporate Value Chain*

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Taek-Ho Kwon
School of Business, Chungnam National University, South Korea
Hong-Gyue Park†
Department of International Trade, Chungnam National University, South Korea
Hyuk-Soo Cho
Department of International Trade, Chungnam National University, South Korea

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Abstract

Purpose – This paper empirically investigates the relationship between the corporate value chain and performance of non- financial businesses of South Korean stock market companies. It aims to explore the evidence that can be used to infer the relationship between value chains and corporate performance in the case of firms forming a value chain with other companies with the means of an equity investment or a special business relationship.

Design/methodology – Non-financial corporations listed from 2011 to 2017 on the securities market of South Korea are analyzed. The data used for analysis are found for transactions with the related party by year for all the corporations of non-financial industries in the securities market. Multiple analysis attempts are conducted including the relationship between the value chain and productivity, corporate value, risk-adjusted corporate value, and mediation effects of productivity. The empirical model employs sixteen variables including the value chain index which identifies its impact on various aspects of business performances.

Findings – The results of this study clearly supports the phenomenon that corporate productivity and value are enhanced when the corporation expands its value chain established with domestic related firms and overseas companies. Such a positive effect is statistically significant even after the possible risk factors that accompany the expansion of value chain were considered, and productivity plays the role as a medicating variable in the effect of the value chain on the corporation values.

Originality/value – The findings of this study confirms that domestic companies' expansion of their value chain centered on the related firms overseas that helped them in terms of the maximization of their productivity and corporate values. This study shows that Korean government's policy on expanding the corporate GVC can enhance the productivity and value of firms. The expansion of value chain and its impact on business performance has not been explored thoroughly, although it is getting more and more important in the global trade operation.

Keywords: Business Performance, Corporate Value Chain, Globalization, Global Trade, Global Value Chain

JEL Classifications: F1, F4, G0

1. Introduction

The globalization of the enterprise value chain has continued to expand since it began accelerating in the 2000s (Choi et al., 2015). The expansion of the Global Value Chain (hereafter GVC) is not limited to the production areas, but it is also expanding to other areas

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† **Corresponding author:** ny1525@cnu.ac.kr

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such as financing, distribution, production, and marketing. Such a trend has a great influence on the globalization of the value chain that includes various aspects such as the expansion of Foreign Direct Investment(hereafter FDI), transfer of core technology, and the movement of human capital. The GVC is defined in various ways. Generally, the GVC of end goods is defined as a set of all the activities necessary for the production of end goods (Timmer et al., 2015). Accordingly, the GVC may be considered as a much larger concept than the concept of Supply Chain Management (SCM), as it is limited to the distribution and supply chain. With the arrival of the fourth industrial revolution, industrial boundaries are blurring, and convergence trends are spreading in all directions.

This promotes the activating GVC concept and research. Considering these factors, this study sets up a hypothesis that the performance of a business can be increased if it establishes a GVC by expanding the enterprise value chain globally. This study attempted to test the hypothesis by analyzing the empirical data. The detailed composition of the enterprise value chain of a business can be represented by its business relationships with other firms and its special relationship with related companies. In particular, South Korean corporations are well known for their vigorous value chain activities that are centered on their related companies. When a company establishes a value chain with other firms, it may have flexibility in controlling the value chain, but this arrangement has a problem of weak persistence. A value chain of a company with other firms can be identified through its business relationships. However, a company's transactions with the related companies in the case of the value chain being established by equity investment or with a related company in a special relationship may be irrelevant to the change in the corporate value. The transactions of a company with the related firms may be used as a mean to achieve the non-economic objectives of the corporation without the reflecting corporate value chain. Accordingly, it is necessary to additionally review the appropriateness of the transactions of a corporation with its related companies for the purpose that the value chain is pursuing to use business relationships for identifying the value chain.

This study attempted to investigate the influence of GVC (built by companies by expanding their value chain established with related domestic companies to the related firms overseas) on the corporations' productivity and market values. The findings of this study may provide evidence that can be used to infer the relationship between value chains and corporate performance in the case of a corporations forming a value chain with other companies with the means of an equity investment or a special business relationship. In this study, it is confirmed that the expansion of GVC have contributed to the enhancement of corporate values. Chapter 2 summarizes previous studies on corporate value chain and business performance, followed by explanation of research model in Chapter 3. Chapter 4 investigates the analysis results and Chapter 5 concludes the whole paper.

2. Literature Review

GVC is a concept in which traditional corporate value chain activities are globally expanded. Specifically, it refers to activities in which the whole process of corporate value chain such as the design, purchase, production, distribution, sales, and services of the product are conducted in the global market. The proliferation of GVC provides important implications related to corporate management strategies. Owing to the nature of GVC, it can be an important connection in which the recognition of and effective response to global environmental changes can lead to improvement in the corporate performance, and the global expansion of a company through GVCs should focus on creating high added value (Lee Joon-Ho, Jeong-Il Choi and Ok-Dong Lee 2014). The reason for choosing this area to

focus is that the distribution of added value creation depends on the labor division structure among nations and firms in the GVC. Improvement in business performance can be obtained through the accurate understanding of the distribution structure of value-added, and the establishment and implementation of strategies that can realize the creation of added value.

GVC has become a primary topic of research and analytical attention in business and other social science areas (Kano et al., 2020). According to previous studies, corporations can profitably strengthen and exploit their unique firm-specific advantages via GVC activities (Buckley 2009; Laplume, Peterson and Pearce, 2016). GVC participation may have implications on the firm and country performances. In a firm level, GVC participation provides various opportunists to access better resources, technology, know-how, trade networks, etc. (Gereffi, 2014). In a country level, developing countries can integrate with the GVC network as a means of achieving higher economic growth. In addition, GVC participation enable developed countries to maximize efficiency and optimize industrial connectivity around the world. As the result, GVC participation across all countries has increased significantly (Reddy, Chundakkadan and Sasidharan, 2020). It is required for firms to be more competitive and innovative (Schmitz, 2005). In addition, policymakers in individual countries are trying to push for greater integration in the GVC participation (Reddy, Chundakkadan and Sasidharan, 2020).

An analysis of the value chain activities of global corporations shows various forms of GVC. According to Dedrick, Kraemer, and Linden (2009), Apple's iPod is produced through the connection between the original development manufacturer and the contract manufacturer. However, major South Korean corporations show GVC-related characteristics that are different from that of Apple mentioned above. The GVC type of major South Korean corporations including Samsung tend to build GVC centered on management relationships with related companies.

In addition, from the perspective of global trade, traditional trade paradigm focused on improving the usability of the product, reducing the lead time, rapid market launching of the product, and obtaining low transaction costs. However, today's new trade paradigm has been transformed into a decentralized structure by focusing on the global supply chain to increase the efficiency of the GVC. From a cost-based business perspective, the paradigm is transforming the business into an innovation-based business (Kim Chang-Bong, Kyong-Chol Yol and Sang-An Park, 2020). Changes in the trade paradigm also greatly influence the GVC. As the value chain is globalized, its advantages and disadvantages coexist, and major previous studies showing these advantages and disadvantages are summarized below.

2.1 Value Chain and Business Performance

Kim Yong-Kyun (2018) stated that domestic Korean companies should recognize that a value chain can be created through moving or upgrading to high value added activities within the GVC. He pointed out that GVC-centered industrial development policies will guarantee a freer trade. In addition, he stated that government policies that try to promote the participation of Small and Medium-sized Enterprises (hereafter SMEs) should be focused on building the social competence of the SMEs from the perspective of enterprise ecosystem to create the overall sustainable global competitiveness of South Korean industrial ecosystem even though policies directly linked to industries and corporations are also important. According to Oh Go-Eun and Moo-Sup Jung (2018), promising South Korean unicorn companies were found to globalize sales section and a financial value chain (through overseas sales or investment) at the majority of times rather than logistics among the GVC. Considering these factors, the types of participation of South Korean unicorn companies in the GVC were divided into two types: one that attracts foreign capital mainly in the form of

project finance and the other that enters overseas markets. Corporations are positively impacted due to building such types of GVC and participating in the value chain in the global market. Economic opening and reduction in trade costs can be realized as a series of processes connected as a chain in which products are produced and ultimately sold to the customers in the GVC.

The participation of a company in the GVC does not always have a positive effect. Corporations can be exposed to various risks through GVC participation. As the process of corporate value chain is conducted in various countries, companies can be directly exposed to market risks related to those countries. For example, the production part of the enterprise value chain is widely conducted in the developing countries (emerging markets) like China and India. Despite the advantages of low production costs and market dynamics in the developing countries, the uncertainty of the market in these countries may have negative effects on the GVC activities of the corporation. It may also lead to the devaluation of the companies.

Corporate decisions in the global market are influenced by various factors. The variability of the financial market can be large depending on the individual country, and corporations can be directly exposed to the exchange risk because of this factor. Another uncertainty regarding the developing countries is their institutional environment. The institutional environment of developing countries can be explained using the institutional theory. The representative characteristics of the developing countries comprise the strong institutional environment represented by the government policies and regulations of these countries. According to the institutional theory, the institutional environment includes regulative, cognitive, and normative institutions. This theory emphasizes strategic conformity. Corporations can reduce market uncertainty through strategic conformity to the institutional environment and realize their competitive advantages (Hoskisson et al., 2000). If corporations expand their value chain to the global market, they will be exposed to various market risks such as exchange rate fluctuations and face challenges due to the institutional environment. The value of corporations can be reduced because of these factors. In conclusion, as the risks and disadvantages due to the globalization of the enterprise value chains clearly exist, the researchers of this study determined that it was necessary to conduct an empirical analysis of the South Korean corporations' GVC participation.

The originality of the research can be found specially on the Korean business environment. The Korean economy has an export driven structure which highly dependent on foreign markets. This led to a formation of special ties and relationships with other companies within and out of the conglomerates. Considering a huge amount of business activities with these companies, this research focuses on the expansion of the domestic value chain to international one. Based on the research variables suggested by previous research, his attempt will shed light on the effectiveness of building global value chain and the performance of various companies in the context of the Korean economy.

2.2 Value chain and productivity

According to Hur Jung, Hae-Yeon Yoon, and Yong-Dae Lee (2018), corporations' participation in the GVC can have a positive effect on the employment, sales, added value, and productivity growth of the firm. In particular, the effect of such GVC participation may be different depending on the trading partners and trading channels (Hur Jung, Hae-Yeon Yoon and Yong Dae Lee, 2018). According to Kummritz (2016), GVC participation can be divided into two types, forward and backward, and the forward participation can generate a greater added value and increased labor productivity than the backward participation. Baldwin and Yan (2014) also reported a positive relationship between a corporation's GVC participation

and its productivity. According to their study, corporations participating in GVC showed a relatively higher increase in their productivity than the corporations that did not participate in GVC (Baldwin and Yan, 2014). Kim In-Chul, Young-Min Kim, and Yang-Shin Park (2016) and Choi Hee-Seon et al. (2015) also reported positive effects of GVC participation on the firms' productivity. Kim In-Chul, Young-Min Kim, and Yang-Shin Park (2016) defined GVC participation of a firm according to its import and export status and explained the relationship of GVC participation with corporate productivity, while Choi Hee-Seon et al. (2015) showed positive ripple effects of GVC activities on the industry using knowledge-based industry data. Moreover, intercorporate network construction and external link enhancement through the expansion of GVC may also play an important role in the increase of the corporate values. According to Kim Yong-Kyun (2018), foreign investment companies with weak political connection in Vietnam where political risk level is high will experience various difficulties. However, foreign investment companies can increase protection of their property rights and information accessibility through the external network by forming and participating in the GVC, and their GVC participation will have a positive influence on their fixed capital investment (Kim Zu-Kweon, 2018). Accordingly, corporations that secure active connectivity at home and abroad can increase their corporate value through GVC expansion.

Many previous studies reported positive effects of a corporate's value chain activities and the positive impact of its participation in the GVC on its productivity. However, previous studies have some limitations. Most studies explained the effect of GVC participation on corporations at the national and industry level. Research that can confirm a positive economic performance such as the GVC-participation related productivity at an individual corporate level is limited. Furthermore, the GVC data of previous studies have been not suitable in accurately reflecting the value chain activities of corporations. For example, Kim In-chul, Young-Min Kim and Yang-Shin Park (2016) quantitatively measured GVC activities according to a firm's import and export status. However, the data are limited in showing the accurate definition and characteristics of the GVC activities. In addition, previous studies have never attempted to examine the impact of productivity as a mediation variable connecting value chain and performance. Therefore, this study found this as a research gap which will light up the value of productivity in the overall undisclosed structure of value chain and business performance.

3. Research Content and Analysis Model

This paper adopts various econometric methods such as the OLS, fixed effects, random effects, and the Hausman-Taylor model for Equation (2). First, we must note that OLS analysis may be biased due to unobserved individual factors. Fixed and random effects models, however, are known to effectively control these country-specific factors in regards to bilateral trade flows. In this case, however, the fixed effects model is more appropriate for Equation (2), if the null hypothesis of the Hausman test is rejected. This means that any unobserved individual factors must be correlated with other explanatory variables.

3.1. Research Content

This study analyzes the influence of a value chain established by a corporation with the related companies on the corporation's business performance. Corporate transaction data may be helpful for identifying the corporate value chain. However, as corporations do not disclose all of their transaction details, identifying the corporate value chain through the means of the transaction data outside is limited.

Corporate trade terms for transactions with other businesses in which the corporation is invested or related businesses that have a special relationship with the company may be different from the terms for transactions following general contractual relationships in which the market price (arm's length price) is applied. As such transactions performed by the corporation can affect the concerned parties related to the corporation, the relevant authority stipulates such types of transactions as internal transactions, and it requires the disclosure of an itemized statement in the financial statements. An itemized statement of an internal transaction can be an indicator of the level of the corporate value chain activities. However, it is identified by focusing on the internal transactions of the corporation, which are the corporation's transactions with the related companies, may result in identifying only a part of the value chain as compared to the identification of the value chain for all transactions. However, value chain research focused on internal transactions of corporations with the related companies may have a significance of its own. The reason for corporations to build value chains is to increase the value of the corporation by increasing productivity. What is different or original about this study is that it reflects the unique business relationships of Korean companies that are widely implemented through internal transaction with related companies. Value chain is built based on these relationships and transactions in Korea. This special phenomenon is widespread in the Korean context, and this study takes this factor into account and has attempted to analyze with threefold category which are participation of domestic, international, and both value chains. This is the first study to identify the impacts, and the result can justify and reveal to which direction of global activities should be going for Korean companies.

The reason for corporations to build value chains is to increase the value of the company by increasing productivity. However, the goal of the corporations' transactions with the related companies may include noneconomic goals in addition to economic goals to maximize their business performance. The noneconomic goals of corporations for conducting transactions with the related companies can be explained from the perspectives of tunneling and propping. Tunneling is a concept used to explain the behavior of a controlling shareholder transferring his or her wealth to a person with whom he or she has a special relationship to extort the wealth of the minority shareholders (Johnson, Porta, Lopez-de-Silanes and Shleifer, 2000). If a company adjusted the terms and conditions of the transactions to extort the wealth of the other corporation through a transaction with its related company, the transaction will falsely signify that the corporate productivity and value of the dominant firm have increased. However, if the related company does not have 100% of the subsidiary share, unilateral transactions to extort the wealth of the related company are not likely to be continued. If a corporation can maintain better transactions than the market conditions with the related company, it needs to be understood from the perspective of it being a more successful value chain as compared to the corporation that extorts the wealth of the related company. The reason for a corporation being able to make favorable transactions than the market conditions is likely to be enjoy the mutual benefits with other shareholders in the related company, and this can be interpreted as the value chain of the corporation having enough efficiency.

On the other hand, if the corporation has the complete ownership of the subsidiary, no conflict connected to the transaction conditions with the related company is expected. The transfer of wealth from a related company (ultimately gained by the completely owned subsidiary) ultimately has the same characteristics as that of the transfer of performance within the corporation. However, even this case can be considered as a successful result of the company's participating in the GVC because there is an outcome to the transfer of wealth. Eventually, even if the corporation's transactions with the related company can be explained

from the perspective of tunneling (which is different from conducting transactions with the related companies to achieve economic goals), it can also be interpreted based on the effect of the value chain on the corporation. Accordingly, even in the case that a transaction with the related company can be explained from the perspective of tunneling, the value chain built by a corporation with the related company can be considered to positively influence the productivity and value of the corporation.

Corporations can use transactions with the related companies as a temporary mean to help a related company that is in financial distress, for example, for the purpose of propping the related company. If the purpose of the transaction with a related company is to support the related company in temporary financial distress, the transaction will negatively influence the productivity of the corporation. Furthermore, if such a corporate decision is not positively evaluated in the market, the value of the corporation may decrease. Therefore, if a company makes a transaction with related firms for propping the company, that transaction will negatively influence the productivity and value of the corporation.

The reason for corporations to consider building a value chain may be because of their expectation that the value chain will positively affect their business performance and their market value. This study established the following hypothesis regarding a corporate value chain and its business performance.

Hypothesis I: The value chain built by a corporation focusing on the relationship with a related company positively affects the corporation's productivity.

The corporate value chain has the effect of increasing the corporation's productivity, but it can also make the corporation more vulnerable to risks. If a corporation made an equity investment in a related company, it can put itself in a situation in which the risks might increase in terms of a deteriorating capital structure or increasing investment risks. Furthermore, the corporation can face unintended exchange or country risks in the process of expanding its business activities overseas. If the effect of increased risks offsets the effect of increased corporate productivity, the value of the corporation may not increase despite its increased productivity.

The reason for corporations expanding their value chain activities focusing on related companies was that there was enough evidence to support their decision of expansion or an expectation that the value chain increases their corporate values. This study established the following hypothesis regarding the value chain and corporate values.

Hypothesis II: The value chain built by a corporation focusing on the relationship with a related company positively affects the corporate values.

3.2. Analysis Model

The relationship between the corporate value chain and productivity was analyzed using equation (1) below. *Product* is corporate productivity, which is replaced with the productivity of capital. The productivity of capital was calculated by dividing the value added by total assets. The value added was calculated as follows: income and loss before income tax + amortization except for depreciation expense and asset impairment losses + employee wages + taxes and dues + rent and lease + interest cost - interest return - dividends income. The productivity of capital was calculated with the data obtained from TS2000 (a corporation database). Considering the existence of extreme values in the productivity of capital, the smallest and largest 1% of data were winsorized in the analysis. *VCIndx* is the value chain index.

Control variables are composed of factors influenced by economies of scale, learning by doing, and technological level. According to Syverson (2011), and Disney, Haskel and Heden (2002), the variable of size of firms is represented in the variable *Size*, research and development expense ratio *Rndr* that reflected the corporate competitiveness, operating earning rate *Oppr* that reflected the business activity performance of the corporation, firm age *Lnyr* reflects the level of corporate experience. The control variable of the productivity equation includes size of the firm, firm age *Lnyr*, net foreign currency debt ratio *NFDet*. The variable of largest shareholder ownership *TpOwn* and conglomerate dummy variable *ChaebDum* were variables that controlled the governance structure. Export ratio *EXPtr*, which represents international management activities, and corporations' export activities may bring in the expansion of productivity due to the economy of scale or learning effects due to the increase in demand for the products. Net foreign currency debt ratio may reflect the level of corporate involvement in FDI. In addition, the industry and year dummy variable *IDYrDum* were included as the control variables. Subscripts i and t were used to differentiate corporations and time, respectively. The ε is the residual of the regression equation. If the result of estimation δ1 is a significant positive value, it is interpreted as the corporate value chain positively influencing corporate productivity.

$$\begin{aligned} Product_{i,t} = {} & \delta_0 + \delta_1 VCIndx_{i,t} + \delta_2 Size_{i,t} + \delta_3 Rndr_{i,t} + \delta_4 Oppr_{i,t} + \\ & \delta_5 Lnyr_{i,t} + \delta_6 NFDet_{i,t} + \delta_7 TpOwn_{i,t} + \delta_8 ChaebDum_{i,t} + \\ & \delta_9 EXPtr_{i,t} + dIdYrDum_{i,t} + \epsilon_{i,t} \end{aligned} \quad (1)$$

If the corporate value chain positively influences the productivity, the value chain may appear to positively influence the corporate value. The influence of the corporate value chain activities on corporate value was estimated using equation (2). *Tbinq* (Tobin's q) is the proxy variable for corporate value. Considering that corporate value is closely related to corporate productivity, the control variables used in equation (1) were used, and general variables widely used in corporate value equations were added. The ratio of shares owned by foreign investors (*Fown*) was added to control the influence of foreign investors on the corporate value. Dividend propensity (*Divdndr*) was included as a control variable to control the influence of the corporate payout policy on corporate value. Considering the relationship between corporate capital structure and corporate values, the debt ratio (*Detr*) was used as a control variable. If γ1 is estimated to be a significant positive value, it is interpreted as the corporate value chain positively influencing the corporate value.

$$\begin{aligned} Tbinq_{i,t} = {} & \gamma_0 + \gamma_1 VCIndx_{i,t} + \gamma_2 Size_{i,t} + \gamma_3 Detr_{i,t} + \gamma_4 Rndr_{i,t} + \\ & \gamma_5 Oppr_{i,t} + \gamma_6 Lnyr_{i,t} + \gamma_7 Fown_{i,t} + \gamma_8 NFDet_{i,t} + \gamma_9 TpOwn_{i,t} + \\ & \gamma_{10} ChaebDum_{i,t} + \gamma_{11} EXPtr_{i,t} + \gamma_{12} Divdndr_{i,t} + gIdYrDum_{i,t} + \epsilon_{i,t} \end{aligned} \quad (2)$$

If a corporation expands its production activity to form relationships with other companies and create value chains by conducting transactions with the other corporations, and if the productivity of the corporation increases due to these value chains, the corporate value might be positively influenced. If the capital structure is weakened due to the use of the capital finance to form a related company, or if the flexibility of corporate activities is reduced due to the formation of a related company, the corporate risk may increase, and the corporate value may be negatively influenced. If a corporation expands its value chain activities overseas, it will face the additional problem of being vulnerable to the exchange risk.

Risk adjustment Tobin's q is calculated by dividing Tobin's q by the total corporate risk, and the exchange risk adjustment Tobin's q is obtained by taking exchange risk into the formula instead of total corporate risk. The total risk was calculated using the annual standard deviation of the daily adjusted stock returns.

Exchange exposure is defined as the absolute value of exchange exposure coefficient estimated by the daily adjusted stock return and the daily won–dollar exchange fluctuation rate. Equation (3) below is the estimation equation of the exchange exposure coefficient. Stock return and exchange fluctuation rate are represented as r and er, respectively. Subscripts i and t were used to differentiate corporations and time, respectively. Positive β1 represents the positive exchange exposure in which the corporate value increases (decreases) when exchange rate increases (decreases), while negative β1 shows negative exchange exposure in which corporate value decreases (increases) when exchange rate increases (decreases). The absolute value of β1 is a coefficient that represents the level of influence of exchange rate fluctuations on the corporate value.

$$r_{i,t} = \beta_{0i} + \beta_{1i} er_t + \omega_{i,t} \quad (3)$$

To determine if increased corporate productivity maintains its significant relationship with the corporate value chain even after risks are considered, the productivity of capital was adjusted into the total risk and exchange risk. Subsequently, risk-adjusted productivity and exchange risk-adjusted productivity of the capital variable were created to analyze the relationship of the productivity with the value chain.

4. Empirical Analysis

4.1. Data Collection

Non-financial corporations listed on the securities market of South Korea are analyzed. The data analyzed was for the period from 2011 to 2017. To obtain the data of the corporations' transactions with the related companies, TS2000 (a corporation database, http://www.kocoinfo.com) was used. The corporations' transaction data with the related companies used in the analysis were the data of a corporation conducting transactions with all its related companies each year (this data were organized by sales, purchases, profits, and expenses and then summed up). In the analysis of the data, records that reported relationships such as executives, employees, and others were excluded.[1]

The data used for analysis were searched for transactions with the related party (referred to as transactions with the related companies hereafter) by year for all the corporations of non-financial industries in the securities market. The value chain index (calculated using transaction content) was used for identifying the level of value chain activities performed through transactions with the related companies. For example, LG Electronics reported a total of 45 transactions with related companies in 2017. Out of these 45 companies, 24 companies are located overseas. From the perspective of the analysis company, among the related companies located overseas, 23 conducted sales transactions, 18 conducted purchase transactions, eight conducted revenue transactions, and 21 conducted cost transactions. In this study, each related company-transaction type is considered as a part of the value chain.

[1] TS2000 provides "the bonds, liabilities, and transaction with related party" in the annotation of the business report. From this data, the transaction data was extracted for use.

For example, LG Electronics reports sales, purchase, profit, and cost transactions with "LG Electronics Vietnam Haiphong Co. LTD". In this case, it is judged that LG Electronics conducts four types of value chain activities with LG electronics Mobilecomm USA INC. LG Electronics reports sales and cost transactions with LG Electronics Mobilecomm U.S.A. INC. In this case, it is judged that LG Electronics conducts two types of value chain activities. Calculating the transactions with the related companies in this manner, LG Electronics was found to conduct 70 (based on the related company-transaction type data) overseas value chain activities in 2017. Overseas value chain index of LG Electronics was calculated by taking the natural logarithmic value of "number of value chain activities + 1." The value chain index of LG Electronics (that shows the company's value chain activities conducted with the related companies overseas) was approximately 4.26[=Ln (71)]. As the larger the corporation, the more diverse the value chain the corporation can have, the value chain index calculated in this manner can become a variable that simply represents the scale of the corporation. Considering this fact, value chain index is standardized into the natural logarithmic value of sales amount for using it in the analysis. If the detailed reports of transactions of a corporation with the related companies were not available, they were supplemented by referencing financial reports in the analysis.

The definition and measurement of variables (including value chain index) are presented in Table 1.

Table 1. Definition and Measurement of Variables

Definition of variables	Measurement
Value chain index (*VCIndx*)	Transactions conducted by a corporation with the related companies were determined in the unit of related company-transaction type (sales, purchases, profits, and costs), and Ln (number of transactions+1) / Ln (sales amount) was calculated.
Productivity of capital (investment efficiency, *Product*)	Productivity of capital (value added/total assets), Value added = Income and loss before income tax + amortization except for depreciation expense and asset impairment losses + employee wages + taxes and dues + rent and lease + interest cost - interest return - dividends income.
Enterprise value (*Tbinq*)	(Market values of common shares and preferred shares + book value of debt) / Total assets.
Size(*Size*)	ln (total assets).
Debt ratio (*Detr*)	Total debt / total assets.
Research and development expense ratio (*Rndr*)	Paid research and development expenses / Total sales.
Operating margin ratio (*Oppr*)	Operating margin/Total sales.
Age of corporation (*Lnyr*)	Ln (Analysis year – established year + 1).
Foreign ownership (*Fown*)	Number of common stocks owned by foreigners / Total number of common stocks.
Net foreign currency debt ratio (*NFDet*)	(Debts denominated in foreign currency - assets denominated in foreign currency) / Total assets.
Largest shareholding ratio (*TpOwn*)	(Number of common stocks owned by the largest shareholders and related parties) / Total number of common stocks.

Table 1. (Continued)

Definition of variables	Measurement
Conglomerate Dummy(*ChaebDum*)	Whether the corporation belongs to a conglomerate group was determined based on the 30 largest conglomerate groups announced by the Fair Trade Commission every year. If the corporation was included in the conglomerate group of that year, "1" was assigned; otherwise, "0" was assigned.
Export ratio (*EXPtr*)	Export / Total sales.
Dividend propensity (*Divdndr*)	Dividends/Net income.
Total risk	The annual standard deviation of the daily adjusted stock returns.
Exchange risk	The absolute value of exchange exposure coefficient estimated by stock returns and exchange fluctuation rate.

Source: Authors' choice of variables for this study.

The number of sample corporations that had transactions with the related companies was organized according to the characteristics of the transaction (by year) and presented in Table 2. Panel A shows the summary of the number of corporations that had transactions with the related companies based on the characteristics of the transactions, and Panel B shows the summary of the calculated averages of value chain indices by transaction types in this study. Transaction characteristics were classified into the following: total transaction, transactions with domestic related companies, transactions with overseas related companies, transactions with domestic related companies only, transactions with overseas related companies only, and transactions with domestic and overseas companies. Non-trading was the case when a corporation did not have any transaction with the related companies.

Panel A indicates that the number of corporations that had transactions with the related companies decreased in 2012 as compared to the data of the previous year, but this number tended to gradually increase in both domestic and overseas markets subsequently. Based on the 2012 data, the number of sample corporations increased by approximately 11% during the analysis period. However, the number of corporations that conducted transactions with the related companies increased by approximately 15%. This indicates that the number of corporations making transactions with the related companies was increasing. Based on the average number of corporations, the total number of sample companies were 622, out of which 500 corporations (approximately 80%) conducted transactions with the related companies. The number of corporations that conducted internal trading with domestic and overseas related companies was 482 (approximately 77%) and 304 (approximately 49%), respectively. The number of corporations that conducted transactions only with domestic or foreign related companies was 195 (approximately 31%) and 18 (approximately 3%), respectively. On the other hand, 287 (approximately 46%) corporations conducted transactions with domestic as well as overseas related companies. The average value chain indices by transaction type presented in Panel B shows a gradual increase over time.

A corporation's transaction status with the related companies by type is summarized in Table 2. It shows that the number of corporations conducting transactions with the related companies during the analysis period increased, and the level of transaction also expanded. These findings indicated that the value chain activities of corporations during the analysis period were generally increasing.

Compared to other statistical methods, the analysis of this research is based on the adoption

of traditional variables such as *TpWon*, *Tbing*, *Size,* and *Rndr,* and new variables like *ChaebDum* which represents unique Korean business environment that has not been adopted in previous research. The combination of different variables shall shed light on the unexplored academic domain specially connected to business activities of related companies of Korean conglomerates or other firms in the market. As stated before, in order to correctly identify the internal transaction of business activities of Korean context, these variables can be used to find out the impact of various business activities on performance and productivity. The result of the regression analysis is the by far the best way to identify the impact of participation of value chains because these variables can be differently applied into three areas which are domestic, global, and both value chains. Based on extensive data collection.

Table 2. Transactions of Corporations with the Related Companies according to the Transaction Type by Year

A. Number of Transaction Companies

Year	Total transac-tions	Transactions with domestic companies	Transactions with overseas companies	Transactions only with domestic companies	Transactions only with overseas companies	Transactions with domestic and overseas companies	No transac-tion	Total sample
2011	516	497	263	253	19	244	60	576
2012	472	453	286	186	19	267	126	598
2013	488	468	309	179	20	289	127	615
2014	478	463	293	185	15	278	147	625
2015	479	463	302	177	16	286	154	633
2016	521	506	338	183	15	323	121	642
2017	545	525	340	205	20	320	119	664
Average	500	482	304	195	18	287	122	622

B. Value Chain Indexes by Transaction Types

Year	Total transact-tions	Transacti-ons with domestic companies	Transactions with overseas companies	Transacti-ons only with domestic companies	Transacti-ons only with overseas companies	Transactions with domestic and overseas companies
2011	0.116	0.106	0.079	0.100	0.085	0.135
2012	0.126	0.114	0.085	0.110	0.085	0.140
2013	0.129	0.116	0.086	0.112	0.090	0.142
2014	0.131	0.118	0.089	0.115	0.093	0.145
2015	0.132	0.120	0.088	0.115	0.094	0.145
2016	0.134	0.122	0.088	0.119	0.082	0.145
2017	0.134	0.122	0.090	0.121	0.077	0.146
Average	0.129	0.117	0.086	0.113	0.087	0.143

Source: Authors' collection of TS2000 data.

The distribution characteristics of variables are presented in Table 3. The number of corporation-year data having the variables that can be used in the study were 4,353. Since the TS2000 provides transactional data of companies with special related parties on bonds, debt, transactional information, this research analyzes the most recent data of non-financial companies in the Korean stock market from 2011 to 2017. It includes most of the listed non-financial companies in the Korean stock market including internal transaction of related companies. It combines vast majority of the sample, it justifies the assumption that the sample

can be a representative of the population for this research. The productivity of capital (the proxy variable of productivity) was winsorized at the 1% and 99% levels. The average of Tobin q, the proxy variable for corporate value, was 1.186 while the median was 0.969, which indicated that some high-performing corporations influenced the average-performing corporations. The value chain indices were calculated using all the corporations, including companies that did not have internal trading with the related companies. The average asset of the corporations was KRW 2.34 trillion, while the median was KRW 348 billion, which indicated that the large corporations significantly influenced the average values. While the debt ratio was 41.3% of the total asset, the research and development expense ratio was 1.9% of the sales, and the operating margin ratio was 5.8% of the sales. The average age of a corporation was 39 years, and foreign ownership was 10% on average. However, the median was 4.2%, indicating that foreign ownership was also affected by high values. The average net foreign debt was –0.9%, which indicated that corporations had more foreign currency assets than foreign currency loans. The largest shareholder ownership of a corporation in the sample was 43.7%, the export ratio was 22.8%, and the dividend propensity was 24.9%. The total risk estimated using the standard deviation of stock returns was 2.6%, the exchange exposure was -0.669, which means that the corporate value reduced (increased) by 0.6% when the won-dollar exchange rate increased (decreased) by 1%.

Table 3. Variable Distribution Characteristics

Variable	Average	Minimum	25%	Median	75%	Maximum
Productivity of capital	0.145	-0.253	0.076	0.133	0.204	0.626
Tobin's q	1.186	0.194	0.784	0.969	1.264	12.068
Value chain index	0.104	0.000	0.062	0.119	0.151	0.248
Asset	2,234	7	164	348	960	198,241
(KRW 1 billion)						
Debt ratio	0.413	0.018	0.243	0.411	0.567	0.919
Research and development expense ratio	0.019	0.000	0.000	0.003	0.016	4.769
Operating margin ratio	0.058	-5.079	0.012	0.040	0.083	0.973
Age of corporation	39	2	28	41	51	120
Foreign ownership	0.100	0.000	0.011	0.042	0.141	0.897
Net foreign currency debt ratio	-0.009	-0.383	-0.022	0.000	0.003	0.281
Largest shareholder ownership	0.437	0.000	0.315	0.439	0.546	0.900
Export ratio	0.228	0.000	0.000	0.064	0.430	1.000
Dividend propensity	0.249	0.000	0.000	0.133	0.308	2.974
Total risk	0.026	0.004	0.018	0.023	0.031	0.204
Exchange exposure	-0.669	-3.752	-0.957	-0.527	-0.226	2.343

Source: Authors' calculation using TS2000 data.

Correlation coefficients among variables are presented in Table 4. The productivity of capital is positively correlated with the Tobin's q, asset, operating profit, foreign ownership, largest shareholder ownership, dividend propensity, and exchange exposure coefficient. However, it is negatively correlated with the debt ratio, age of corporation, net foreign currency debt ratio, export ratio, and total risk. Tobin's q is positively correlated with the value chain index, research and development expense ratio, operating margin ratio, foreign ownership, dividend propensity, total risk, and exchange exposure. On the other hand, it is negatively correlated with the debt ratio, age of corporation, net foreign currency debt ratio, largest shareholder ownership, and export ratio. The value chain index is positively correlated with the asset operating margin ratio, foreign ownership, largest shareholder ownership, and dividend propensity. It is negatively correlated with the debt ratio, age of corporation, and total risk.

In the correlation coefficient estimates presented in Table 4, it can be seen that the value chain index is significantly correlated with Tobin's q, which is a proxy variable for corporate value. However, its correlation with the productivity of capital, which is a proxy variable for productivity, is insignificant. The correlations among corporate characteristic variables were confirmed using regression model analysis after controlling for these variables.

Table 4. Correlation Coefficients among the Variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Productivity of capital (1)	1.00													
Tobin's q (2)	***0.17***	1.00												
Value chain index (3)	0.01	***0.03***	1.00											
Asset (4)	*0.04*	-0.02	***0.17***	1.00										
Debt ratio (5)	***-0.06***	***-0.06***	***-0.02***	***0.16***	1.00									
Research and development expense ratio (6)	-0.02	***0.11***	0.02	-0.02	***-0.05***	1.00								
Operating margin ratio (7)	***0.17***	***0.04***	***0.08***	0.01	***-0.25***	***-0.14***	1.00							
Age of corporation (8)	***-0.11***	***-0.12***	***-0.08***	***0.07***	***-0.03***	0.00	0.00	1.00						
Foreign ownership (9)	***0.17***	***0.20***	***0.04***	***-0.08***	***-0.16***	0.02	***0.14***	***-0.07***	1.00					
Net foreign currency debt ratio (10)	***-0.06***	***-0.05***	0.03	***0.04***	***0.14***	***-0.05***	0.01	***0.06***	0.02	1.00				
Largest shareholder ownership (11)	***0.03***	***-0.13***	***0.13***	0.02	***-0.13***	***-0.08***	***0.16***	***-0.05***	***-0.14***	***0.09***	1.00			
Export ratio (12)	***-0.05***	***-0.06***	0.02	***0.13***	***0.09***	0.00	***-0.05***	***-0.03***	***-0.04***	***-0.17***	***-0.10***	1.00		
Dividend propensity (13)	***0.05***	***0.03***	***0.04***	0.01	***-0.17***	-0.03	***0.15***	***0.06***	***0.08***	0.02	***0.11***	***-0.06***	1.00	
Total risk (14)	***-0.14***	***0.20***	***-0.11***	***0.03***	***0.24***	***0.05***	***-0.20***	***-0.04***	***-0.21***	***-0.07***	***-0.20***	***0.03***	***-0.17***	1.00
Exchange exposure (15)	***0.05***	***0.06***	0.01	-0.10	***-0.15***	-0.01	0.03	0.02	0.00	-0.02	***0.11***	***-0.12***	***0.09***	***-0.28***

Notes: 1. Bold and italic faced coefficients are statistically significant at $p<0.05$.
2. $^{*}p<0.1$, $^{**}p<0.05$, $^{***}p<0.001$.

Source: Authors' calculation using the data of TS2000.

The influence of the value chains of a corporation (built by the corporation using the relationship with related companies) on corporate productivity was estimated by equation (1). Considering that the data shows the panel data format for each year, coefficients were estimated by calculating firm-clustered standard errors (Peterson, 2009). The analysis results are presented in Table 5. The overall value chain is the sum of all value chains. For domestic only value chains, the value chain indices were used only when value chains exist domestically but not abroad. For overseas only value chain, the value chain indices were used when value chains exist overseas but do not exist domestically. Domestic and foreign value chains are the cases when value chains exist both domestically and overseas simultaneously. When creating value chain variables, all values except for value chain indices were set to zero.

Table 5. Value Chain and Productivity

Classification	Overall value chain	Domestic-only value chain	Overseas-only value chain	Domestic and overseas value chain
Value chain index	0.020 (0.383)	-0.168*** (-3.048)	-0.395** (-2.245)	0.135*** (3.207)
Scale	0.007** (2.046)	0.006* (1.670)	0.007** (2.008)	0.005 (1.428)
Research and development expense ratio	-0.013 (-0.832)	-0.012 (-0.770)	-0.012 (-0.789)	-0.014 (-0.947)
Operating margin ratio	0.117*** (4.778)	0.118*** (4.786)	0.115*** (4.751)	0.117*** (4.810)
Age of corporation	-0.009* (-1.656)	-0.008 (-1.631)	-0.009* (-1.687)	-0.008 (-1.502)
Net foreign currency debt ratio	-0.082** (-2.350)	-0.071** (-2.094)	-0.085** (-2.452)	-0.075** (-2.190)
Largest shareholder ownership	0.033 (1.419)	0.037 (1.611)	0.033 (1.416)	0.031 (1.344)
Conglomerate dummy	-0.001 (-0.116)	0.001 (0.053)	-0.001 (-0.112)	-0.001 (-0.047)
Export ratio	-0.012 (-1.004)	-0.015 (-1.178)	-0.010 (-0.853)	-0.015 (-1.197)
Constant	0.037 (0.508)	0.072 (0.975)	0.044 (0.614)	0.066 (0.897)
Industry, year	Included	Included	Included	Included
Observed value	4,353	4,353	4,353	4,353
Adjusted r-squared	0.296	0.300	0.298	0.301

Notes: 1. *p<0.1, **p<0.05, ***p<0.001.
Source: Authors' calculation using the data of TS2000.

When the relationship between value chain indices and productivity for all the samples was estimated, no significant relationship was found. If the relationship between value chain index and productivity was estimated when transactions were conducted only with related domestic companies, the resulting coefficient was –0.168, which was estimated to be significant at the 1% level. Thus, corporate productivity decreases if a value chain is built by a corporation only with related companies within the country. A similar relationship was found in the case of corporations building value chains only with foreign related companies (with coefficient

0.395). In the case of simultaneously having value chains with domestic and foreign related companies, the value chain coefficient was 0.135, which was estimated to be significant at 1%. These findings show that corporation's expansion of the value chain overseas has a positive effect on productivity.

The effect of the relationship between value chain and the corporate value is estimated using equation (2), and the results are presented in Table 6. These results indicate that value chain activities of corporations that are centered on related companies generally increase the corporate value. If the related company is the target of the value chain, and if it is present only in the country or overseas, the relationship between the value chain index and the corporate value was found to be insignificant. The reason for this result appears to be that the reduction in productivity is not significant enough to decrease the corporate value in light of the productivity result presented in Table 5.

Table 6. Value Chain and Corporate Value

Classification	Overall value chain	Domestic-only value chain	Overseas-only value chain	Domestic and overseas value chain
Value chain index	0.733**	-0.136	-1.278	0.682**
	(2.053)	(-0.318)	(-1.073)	(2.015)
Scale	-0.067**	-0.063**	-0.065**	-0.073***
	(-2.527)	(-2.410)	(-2.440)	(-2.711)
Debt ratio	0.338***	0.333***	0.335***	0.326***
	(2.673)	(2.639)	(2.647)	(2.593)
Research and development expense ratio	0.608***	0.623***	0.623***	0.611***
	(3.370)	(3.430)	(3.421)	(3.354)
Operating margin ratio	0.219	0.221	0.215	0.220
	(1.252)	(1.267)	(1.234)	(1.252)
Age of corporation	-0.102***	-0.106***	-0.106***	-0.101***
	(-2.706)	(-2.826)	(-2.832)	(-2.718)
Foreign ownership	1.322***	1.304***	1.339***	1.314***
	(3.644)	(3.574)	(3.600)	(3.646)
Net foreign currency debt ratio	-0.263	-0.249	-0.268	-0.223
	(-1.255)	(-1.183)	(-1.289)	(-1.069)
Largest shareholder ownership	-0.284*	-0.255	-0.258	-0.273*
	(-1.747)	(-1.581)	(-1.597)	(-1.681)
Conglomerate dummy	0.001	0.006	0.005	0.008
	(0.010)	(0.069)	(0.060)	(0.096)
Export ratio	-0.087	-0.082	-0.072	-0.092
	(-1.070)	(-1.020)	(-0.901)	(-1.132)
Dividend propensity	0.033	0.034	0.034	0.033
	(0.629)	(0.651)	(0.647)	(0.637)
Constant	2.516***	2.539***	2.563***	2.670***
	(4.724)	(4.760)	(4.782)	(4.938)
Industry, year				
Observed value	4,353	4,353	4,353	4,353
Adjusted r-squared	0.204	0.202	0.202	0.205

Notes: 1. *p<0.1, **p<0.05, ***p<0.001.
Source: Authors' calculation using TS2000 data.

However, if the related companies are present both domestically and overseas, the value chain index is estimated to be significantly positive (0.682). The results presented in Table 5 and Table 6 show that if a corporation builds a value chain in the country and overseas, there is an increase in the corporate productivity and value.

As described in Chapter 3, corporations may face additional risks if they expand their value chain activities overseas. Such an increase in risk, (unlike the result of an increase in productivity), may act as a factor that decreases the corporate value. Analysis was performed to determine if the positive effect of domestic and overseas value chain on productivity and corporate value is maintained even after the risks were considered. To examine the effect of risk(or exchange risk) on the test results, we construct total risk(or exchange risk) adjusted productivity and total risk(or exchange risk) adjusted Tobin's q.

In Table 7, the first row shows the results of estimation by using the risk adjusted productivity of capital, which was obtained by dividing the productivity of capital by total risk. The second and third rows show estimation results by using the exchange-risk adjusted productivity of capital, which was calculated by dividing by the absolute value of the exchange exposure index. The second row shows the results of estimation by winsorizing the dependent variable at the 1% and 99% levels, and the third row shows the results of estimation with 5% and 95% levels. Even after being adjusted with total risk, the value chain showed a significant positive relationship with the productivity. However, after the productivity was adjusted with exchange risk, it showed a significant relationship with the value chain only with a two-tailed winsorization at the 5% and 95% levels. These results suggest that the exchange risk can have an impact on the relationship between the value chain and productivity.

The results of exchange risk adjusted Tobin's q are presented in the fourth, fifth, and sixth rows. The value chain was found to maintain a positive relationship with risk-adjusted corporate value. Analysis using exchange risk adjusted Tobin's q as the dependent value showed that significant positive coefficients were estimated only when winsorized data at the 5% and 95% levels were used. The analysis of exchange risk adjusted corporate value also suggested the possible influence of the exchange risk on the relationship between value chain and corporate value.

The results presented in Table 7 show that value chain activities increase the corporate value even when an increase in the risk due to the expansion of corporate value chain activities overseas was considered. In addition, it confirms that such an increase in the corporate value is related to an increase in productivity. However, it also shows that the exchange risk can influence the performance of the value chain.

The results of this study showed that the corporate value chain improves corporate productivity, and this, in turn, increases the corporate value. Whether the increase in productivity acts as a mediation variable in the process of value chain increasing the corporate value was tested below, using the Sobel test. As suggested by Sobel (1982, 1986), it is a statistical method for analyzing the mediation effect. It is widely conducted by numerous studies such as Setiyani et al. (2019) and Chalaki, Mansourfar, and Karami (2018) to examine the mediation effects of causal relationships of multiple variables. Analysis results are presented in Table 8.

As shown in Table 8, the coefficient of value chain index in Model II was 0.674, but it decreased to 0.574 in Model III that had the productivity of capital as the control variable. Even though the significance levels were all denoted as 10%, the t-value of Model II and III were 1.948 (0.674/0.346) and 1.688 (0.574/0.340) respectively, showing that the significance level of the coefficients was decreasing. Such results appear to support that the productivity of capital variable plays the role of a mediation variable in the models. To test if the mediating effect (0.10) of the productivity of capital was significant, the z value used in the Sobel test was

Table 7. Value Chain and Risk-adjusted Corporate Value

Dependent Variable Classification	Productivity of capital			Tobin's q		
	Risk adjustment	Exchange risk adjustment (1% win.)	Exchange risk adjustment (5% win.)	Risk adjustment	Exchange risk adjustment (1% win.)	Exchange risk adjustment (5% win.)
Value chain index	5.993*** (2.676)	0.503 (1.161)	0.493** (2.394)	24.622** (2.241)	3.482 (1.273)	2.590* (1.902)
Scale	0.273 (1.494)	-0.055** (-1.986)	-0.032** (-2.163)	-0.180 (-0.172)	-0.748*** (-3.257)	-0.447*** (-3.958)
Debt ratio				-4.499 (-0.967)	-0.078 (-0.071)	0.123 (0.206)
Research and development expense ratio	-0.652 (-0.919)	0.004 (0.029)	-0.039 (-0.441)	14.956** (2.247)	1.638 (1.198)	1.475 (1.218)
Operating margin ratio	4.218*** (4.315)	0.518*** (3.487)	0.268*** (3.248)	14.745*** (2.791)	1.665 (1.356)	0.806 (1.114)
Age of corporation	-0.310 (-1.174)	0.000 (0.004)	-0.005 (-0.219)	-3.086** (-2.373)	-0.052 (-0.184)	-0.082 (-0.506)
Foreign ownership				62.100*** (4.677)	6.960*** (2.803)	3.847*** (2.985)
Net foreign currency debt ratio	-2.818* (-1.654)	0.121 (0.368)	-0.052 (-0.321)	-3.617 (-0.516)	2.085 (0.884)	0.406 (0.334)
Largest shareholder ownership	2.985** (2.505)	0.388 (1.612)	0.289** (2.514)	4.396 (0.807)	0.881 (0.625)	1.373* (1.884)
Conglomerate dummy	0.193 (0.330)	-0.056 (-0.609)	-0.053 (-1.060)	0.657 (0.230)	-0.797 (-1.266)	-0.713** (-2.241)
Export ratio	-1.347** (-2.229)	-0.270*** (-2.586)	-0.107* (-1.830)	-3.043 (-1.074)	-1.322* (-1.938)	-0.496 (-1.228)
Dividend propensity				5.574*** (3.244)	1.060* (1.850)	0.476** (2.156)
Constant	-0.270 (-0.070)	1.015 (1.638)	0.672** (2.082)	44.458** (2.299)	14.762*** (3.210)	9.003*** (4.023)
Industry, year						
Observed value	4,353	4,353	4,353	4,353	4,353	4,353
Adjusted r-squared	0.297	0.115	0.204	0.319	0.113	0.197

Notes: 1. *p<0.1, **p<0.05, ***p<0.001.
2. 1% Win. and 5% Win. mean that the dependent variable was winsorized at the 1% and 99% levels, and the 5% and 95% levels, respectively.

Source: Authors' calculation using TS2000 data.

calculated and found to be 2.009, which was significant at the 5% level. The results presented in Table 8. It shows that productivity plays the role of a mediation variable in the influential relationship in which the corporate value chain influences the corporate value. The formula for Sobel test is as follows below (4). c_A, c_B are regression coefficients, and s_A, s_B are the standard errors of regression coefficient.

$$z = \frac{c_A c_B}{\sqrt{c_B^2 s_A^2 + c_A^2 s_B^2}} \quad (4)$$

Table 8. Test of Mediation Effects of Productivity

Dependent variable Classification	Productivity (Model I)	Corporate value (Model II)	Corporate value (Model III)
Value chain index	0.135***$[c_A]$ (0.042)$[s_A]$	0.674* (0.346)	0.574* (0.340)
Productivity of capital			0.744**$[c_B]$ (0.289)$[s_B]$
Scale	0.00489 (0.003)	-0.003 (0.027)	-0.007 (0.027)
Research and development expense ratio	-0.0145 (0.015)	0.593*** (0.184)	0.604*** (0.184)
Operating margin ratio	0.117*** (0.024)	0.210 (0.180)	0.123 (0.186)
Age of corporation	-0.00763 (0.005)	-0.116*** (0.040)	-0.110*** (0.040)
Net foreign currency debt ratio	-0.0755** (0.034)	-0.144 (0.211)	-0.088 (0.209)
Largest shareholder ownership	0.0311 (0.023)	-0.431** (0.177)	-0.454** (0.178)
Conglomerate dummy	-0.000514 (0.011)	-0.024 (0.090)	-0.023 (0.090)
Export ratio	-0.0148 (0.012)	-0.159* (0.089)	-0.148* (0.087)
Constant	0.0663 (0.074)	1.676*** (0.534)	1.627*** (0.541)
Industry, Year dummy			
Observed value	4,353	4,353	4,353
Adjusted r-squared	0.301	0.179	0.187
Mediating effect $c_A \times c_B$	0.100		
Sobel Test (z-value)	2.009**		

Notes: 1. *p<0.1, **p<0.05, ***p<0.001.
Source: Authors' calculation using TS2000 data.

5. Conclusion

This study has analyzed the relationship between the corporate value chain and corporate performance of a non-financial business in the South Korean stock market. The value chain index is based on the transaction data with related companies, and corporate chain variable analyzed the relationship among the value chain, productivity, and corporate value. The results of this study support the phenomenon that corporate productivity and value increase when the corporation expands its value chain established with domestic related companies to

overseas companies. Such a positive effect is statistically significant even after the possible risk factors that accompany the expansion of value chain were considered, and productivity played the role as a mediation variable in the effect of the value chain on the corporation values. These research findings can be considered to be on the same extension line as the research findings of Kim Chang-Bong, Kyong-Chol Yol, and Sang-An Park (2020) who reported that global corporations are moving their business assets to the market in the Philippines through FDI and GVC. In addition, Baldwin and Yan(2014), Kim In-Chul, Young-Min Kim, and Yang-Shin Park (2016), Hur Jung, Hae-Yeon Yoon, and Yong-Dae Lee (2018) all reported a positive impact of GVC participation on the firms' overall productivity.

This study also confirms the previous findings but through an empirical analysis, it confirms that South Korean corporations' expansion of their value chain (centered on related companies) overseas helps them in terms of the maximization of their productivity and corporate value. Theoretically, this is what clearly differentiates this study from others because it reflects the reality of internal transaction or activities of Korean companies that actively expand their functions from domestic to overseas. In particular, from productivity standpoint, Korean companies are highly encouraged to expand their activities outside Korean market by building various networks with related companies to gain overall enhanced productivity. Expansion of domestic to an international value chain has been tested positive for Korean companies which clearly justifies global business activities. Practically, in order to support the industry, changes in the government's policy towards the GVC is necessary for strengthening the global competitiveness of domestic SMEs through their active participation in the GVC. Further, while domestic SMEs need to understand internationalization deeply, they also need to strategically promote globalization to expand their participation in the GVC.

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