Effects of Foreign Investor Ownership on a Firm's Innovation Process: A Focus on Business-Group Affiliation in Korea

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Abstract

Purpose – This study investigates the effects of foreign investor ownership on firm innovation and the different stages of the firm innovation process for business group affiliation (affiliated firms) and non-affiliated firms.

Design/methodology – Research and development (R&D) intensity is used as a proxy for firm innovation. We use a sample of 7,655 firm-year observations of Korean listed firms from 2001 to 2015. To identify the distinct features of business group affiliation and how foreign investor ownership affects firm innovation, we divide the sample into affiliated and non-affiliated firms. Moreover, we classify total R&D expenditures as research and development expenditures.

Findings – This study finds a positive relationship between foreign investor ownership and innovation in non-affiliated firms. However, the foreign investor ownership's role in facilitating firm innovation does not influence business group affiliation. Moreover, the results show that foreign investor ownership encourages firms to increase research expenditures, which is the amount spent in the early stages of a firm's R&D process.

Originality/value – Existing studies have overlooked the distinct features of business group affiliation and the different characteristics of research and development expenditures. Thus, this study considers the distinct features of business group affiliation and investigates how foreign investor ownership affects different stages of R&D activities.

1. Introduction

In the current global economy, firm innovation, supported by research and development (R&D) activities, is critical for establishing and maintaining competitive advantages and sustainable growth (Chen et al., 2014; Cheng, 2004). Economists also suggest that corporate innovation is key to individual firms and economic growth (Aghion and Durlauf, 2014; Lucas, 1988; Schumpeter, 1939). One of the main ways to achieve firm innovation and sustainable growth in the global market is to engage continuously in R&D activities. However, features of R&D, such as long-term, high risk, uncertainty, and intertemporal revenue constrain a firm's R&D investments (Chan, Lakonishok, and Sougiannis, 2001; Zhang, 2015). Managers tend to avoid long-term business strategies and underinvest in R&D because they tend to seek

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private gain rather than long-term growth, as their compensation is determined by short-term performance (Ryu Sang-Lyul et al., 2021; Shin Il-Hang and Park So-Rah, 2020). Therefore, examining the factors that suppress firm innovation and promote R&D investment is essential in the global economy.

Many studies have examined the corporate governance and ownership mechanisms that affect a firm's innovative activities. They show that corporate governance and ownership structure, such as ownership concentration, CEO ownership stake, institutional investor ownership, board independence, and foreign investor ownership are significantly associated with firm innovation, as they are among the most critical factors affecting managerial behavior and business decision making (Barker and Mueller, 2002; Bushee, 1998; Lee and O'Neill, 2003; Minetti, Murro, and Paiella, 2015; Ryu Sang-Lyul et al., 2021; Shleifer and Vishny, 1986).

Among the various factors that facilitate firm innovation, foreign investor ownership has become a central issue in the capital market and has drawn significant attention from regulators and academics, as the market has been rapidly globalized over the past decades (Aguilera et al., 2017). Previous studies provide evidence that foreign investors play a significant role in promoting firm innovation through various channels, such as monitoring, threatening to sell or buy shares, knowledge spillover, and tolerance for failure (Choi, Park, and Hong, 2012; Gillan and Starks, 2003; Luong et al., 2017; Shleifer and Vishny, 1986).

However, despite the ubiquity of business group affiliation in global markets, no studies have considered the distinct business structures and characteristics of a business group affiliation (affiliated firms) when investigating the effects of foreign investor ownership (Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Garner and Kim, 2013; Luong et al., 2017). It is well-known that affiliated firms have unique business structures and characteristics. A business group affiliation can be defined as a collection of legally separate, multi-sector firms that are persistently linked by official (e.g., equity) and informal ties (e.g., family) (Chang, Chung, and Mahmood, 2006; Granovetter, 1995; Khanna and Rivkin, 2001). Specifically, the Korea Fair Trade Commission (KFTC), which designates and discloses lists of business group affiliation every year, defines affiliated firms as "a group of companies in which more than 30% of the shares are held by the same individuals or companies." These characteristics differentiate affiliated firms from other organizational forms, such as holding companies and strategic alliances, and have significant implications for the innovation of individual firms within the group. First, due to their persistent relationship, member firms within a business group affiliation generally coordinate their strategy and resources (Chang, Chung, and Mahmood, 2006; Komera, Jijo Lukose, and Sasidharan, 2018). Compared with affiliated firms, non-affiliated firms are normally self-reliant and financially independent. Second, they have a unique management system, such as group headquarters, strategic planning offices, and holding companies that can systematically monitor managers, allowing firms to effectively evaluate managers, determine optimal compensation schemes, and drive managers to act in the interests of shareholders (Chang Jin-Ho and Shin Hyun-Han, 2006). Third, a business group affiliation provides co-insurance, allowing member firms to raise external capital more easily than non-affiliated firms at lower capital costs to finance innovative activities (Ferris, Kim, and Kitsabunnarat, 2003; Khanna and Yafeh. 2007). Lastly, internal markets within affiliated firms facilitate the sharing of group-level resources, such as capital, human resources, technological knowledge, and complementary products and services (Chang, Chung, and Mahmood, 2006; Encaoua and Jacquemin, 1982; Mahmood and

Mitchell, 2004). These features of affiliated firms allow member firms to actively engage in innovative activities such as R&D investments.

These distinct and unique features of affiliated firms imply that there are limitations to explaining the effect of foreign investor ownership on firm innovation by investigating individual firm characteristics. Thus, the distinct features of affiliated firms should be considered when examining the effects of foreign investor ownership on innovation. Considering the distinct features of affiliated firms, this study extends prior literature by investigating whether the effect of foreign investor ownership on firm innovation differs between affiliated and non-affiliated firms.

This study measures firm innovation based on R&D intensity. Extant studies related to a firm innovation used the firm's R&D intensity to measure innovation (Bayersinger, Kosnik, and Turk, 1991; David, Hitt, and Gimeno, 2001; Estrada and Dong, 2019; Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Hsu, Tian, and Xu, 2014; Lee and O'Neill, 2003). However, they considered expenditures in both the early stages of research and the completion stage of development as identical expenditures. Specifically, they used total R&D expenses to measure firm innovation, although total R&D costs are classified into two stages of the innovation process: research and development (IFRS, 2022). Research and development expenditures are distinct expenditures that occur in different stages of the R&D process. Research expenditures occur in the early stages of the research process and are related to the process of obtaining new knowledge and developing new technologies and products. Development expenditures occur during the completion or final stage of R&D activities and are related to the process in which the technological and commercial feasibility of the sale or use of assets is high or guaranteed. Thus, this study extends existing literature by examining the effects of foreign investor ownership on a firm's R&D investments and how foreign investors affect each stage of corporate innovation by disaggregating total R&D costs into research and development expenditures.

This study focuses on the Korean market because it has several characteristics that provide a suitable research setting. Since the Asian financial crisis in 1997, Korea has opened stock markets to foreign investments to enhance its economic and governance structures. As markets became globalized, foreign investors came to be among the largest shareholders of the Korean stock market. Equity holdings by foreign investors in the Korean stock markets have increased dramatically, reaching a peak of 42% in 2004 and 31% in 2020. Therefore, the role of foreign investors in the Korean market is influential and important, suggesting that the effect of foreign investor ownership is likely to be more apparent in the Korean market. Moreover, the KFTC annually announces a list of business group affiliations. Since 2001, the KFTC has collected and disclosed lists and data on designated business group affiliations on its website, allowing us to disaggregate samples into affiliated and non-affiliated firms and investigate the effects of affiliated firms' unique features on the relationship between foreign investor ownership and firm innovation.

Using 7,655 firm-year observations of Korean listed firms from 2001 to 2015, this study finds a positive relationship between foreign investor ownership and innovation for non-affiliated firms. Moreover, this study provides empirical evidence that foreign investor ownership promotes research rather than development activities. Although there is no significant relationship between foreign investor ownership and firm innovation for business group affiliation, additional analysis shows that foreign investor ownership facilitates a firm's R&D activities, specifically research activities, for affiliated firms with a high control owner-

ship disparity. This finding implies that foreign investors have long-term investment objectives and promote innovation through active monitoring.

This study contributes to existing literature in several ways. First, this study considers the distinct features of affiliated firms when analyzing the economic effects of foreign investors, who have become major shareholders in the Korean market. Studies show that affiliated firms have unique characteristics that affect innovation (Choi et al., 2015; Komera, Jijo Lukose, and Sasidharan, 2018; Lou et al., 2021). However, no study has considered the features of affiliated firms when examining the effects of foreign investor ownership. Second, this study demonstrates how foreign investor ownership affects firm innovation, specifically at different stages of R&D activities. Finally, this study provides practical implications for regulators and investors as foreign investors drive firms to innovate and focus on long-term performance.

The remainder of this paper is organized as follows. The following section presents a literature review and hypothesis development. Section 3 presents the study's research and model design. Section 4 presents the empirical results and Section 5 concludes the paper.

2. Literature Review and Hypotheses Development

2.1. Foreign Investor Ownership and Firm Innovation

As the role of a firm's R&D activities has become increasingly important in global markets, previous studies have examined factors that determine a firm's R&D investments. Research related to a firm's R&D investments contends that agency problems arising from conflicts of interest between shareholders and managers are the major factors suppressing a firm's R&D investments (Dong and Gou, 2010; Jensen and Meckling, 1976; Rodrigues, Samagaio, and Felicio, 2020). In addition to the classic agency problem, another strand of research shows that conflicts between controlling and minority shareholders (Type II agency problem) are significantly associated with a firm's innovation (Bebchuk and Weisbach, 2010; Di Vito, Laurin, and Bozec, 2010; Rapp and Udoieva, 2017). They contend that controlling shareholders have incentives to extract private gains, leading to misallocation of resources and suboptimal risk-taking. Thus, controlling shareholders are reluctant to engage in innovative activities such as R&D investment, which are long-term projects with high uncertainty and risks. Many studies view corporate governance as a significant determinant of firm innovation. Previous research shows that ownership structures, such as CEO ownership, institutional investor ownership, and ownership concentration, are significantly associated with firm innovation (Hu and Izumida, 2008; Lou et al., 2021; O'Connor and Rafferty, 2012; Rapp and Udoieva, 2017).

Among the various factors related to a firm's ownership structure, foreign investor ownership has drawn significant attention from regulators and academics because the Korean government has completely opened capital markets to foreign investors since the Asian financial crisis. Previous research has provided empirical evidence that foreign investors promote firm innovation through various channels. For example, when the markets are not able to efficiently monitor managerial and controlling shareholder action because of the lack of corporate governance mechanisms, such as the board of directors and audit committees, managers, or controlling shareholders may indulge in expropriation or misallocation of firms' resources for their private gain and retain less resources for innovative activities. Furthermore, moral hazard stemming from a lack of monitoring may induce them to avoid

long-term and risky innovative activities, such as R&D investment (Gillan and Starks, 2003; Luong et al., 2017; Rossi and Cebula, 2015; Shleifer and Vishny, 1986). Previous research has provided empirical evidence that foreign investors would promote a firm's innovative activities by acting as efficient corporate monitors. For example, Aggarwal et al. (2011) show that foreign investors have stronger monitoring capabilities and are more likely to monitor firms actively because of their international experience and expertise. Similarly, Gillan and Starks (2003) show that foreign investors are significantly associated with improved corporate governance. Ferreira and Matos (2008) find that firms with greater foreign investor ownership show better operating performance and higher valuations. Moreover, D'Souza, Megginson, and Nash (2005) provide evidence that foreign investor ownership is positively associated with a firm's efficiency gains, and Garner and Kim (2013) show that firms with higher foreign investor ownership demonstrate a higher pay-performance sensitivity. These findings suggest that foreign investors have better monitoring ability because they have no business ties with managers or controlling shareholders and fewer conflicts of interest.

Foreign investors also promote firm innovation by enhancing knowledge spillovers through global business networks (Choi, Park, and Hong, 2012; Luong et al., 2017). Knowledge spillover presents an exchange of ideas and resources among individual firms without a contractual relationship in the non-rival knowledge market, which has the spillover effect of stimulating other parties' technological improvement through innovation on one party (Carlino, 2001; Chang and Xu, 2008). In this context, previous research has shown that foreign investors could facilitate local firms' innovative activities through their cross-border investments, which provide business networks and exchange of opportunities and knowledge (Ferreira, Massa, and Matos, 2010; Guadalupe, Kuzmina, and Thomas, 2012).

Moreover, the literature confirms that foreign investors provide insurance to firms against failures in firm innovation because they have a greater ability to withstand the failure risk of investment in innovative activities through diversified investment portfolios worldwide (Aghion, Van Reenen, and Zingales, 2013; Luong et al., 2017). Therefore, foreign investors are more likely to encourage firms to engage in innovative activities. Based on this discussion, this study conjectures that foreign investor ownership facilitates firm innovation.

2.2. Business Group Affiliation and the Role of Foreign Investor Ownership

As mentioned earlier, it is difficult to draw conclusions on the effect of foreign investor ownership on firm innovation by investigating an individual firm's governance structure because there are distinct differences between affiliated and non-affiliated firms. Therefore, this study divides samples into affiliated and non-affiliated firms to consider the distinct features of affiliated firms to investigate the effects of foreign ownership on firm innovation and the different stages of the innovation process.

Extant research related to business group affiliation provides evidence suggesting that foreign investors' role in facilitating firm innovation may not influence affiliated firms because they already have business structures that facilitate firm innovation. The organization-focused approach suggests that firms require financial and human resources to engage in innovative activities (Belenzon and Berkovitz, 2010; Chang, Chung, and Mahmood, 2006; Xiang, 2021). In this context, extant research investigating the role of business group affiliation shows that affiliated firms support each other in financing innovative activities through internal capital markets such as intra-group loans and dividends (Gopalan and

Gormely, 2012; Gopalan, Nanda, and Seru, 2007; Komera, Jijo Lukose, and Sasidharan, 2018, Lou et al., 2021). Based on the institutional void theory, they argue that because of the low level of information asymmetry within the group, affiliated firms can obtain internal funds at lower costs and can raise external capital more easily as business groups provide co-insurance. Business group affiliation can also use their internal labor markets to promote sharing of human resources, which facilitates knowledge spillover (Chang, Chung, and Mahmood, 2006; Chang Sea-Jin and Hong Jae-Bum, 2000; Filatotchev, Piga, and Dyomina, 2003).

Furthermore, Chang Jin-Ho and Shin Hyun-Han (2006) and Chae Joon et al. (2020) argue that affiliated firms' strategic business structures, such as group headquarters, strategic planning offices, and holding companies allow controlling shareholders to monitor member firms' managers effectively and critically influence their decision-making. These business structures encourage managers to take risks and engage in innovative activities by lowering information asymmetry.

Overall, literature on the effects of foreign investor ownership suggests that foreign investors positively affect a firm's innovation. However, the literature on business group affiliation implies that such effects on foreign investors may not be important or influential for affiliated firms because they already have business structures that promote innovative activities, leading to our first hypothesis.

> H1a: Foreign investor ownership positively affects non-affiliated firms' innovation (R&D intensity).
> H1b: Foreign investor ownership does not positively affect affiliated firms' innovation (R&D intensity).

2.3. Research and Development Expenditures

In most prior studies, R&D intensity (i.e., the ratio of total R&D expenditures to total assets or sales) was used to measure firm innovation. (Bayersinger, Kosnik, and Turk, 1991; David, Hitt, and Gimeno, 2001; Estrada and Dong, 2019; Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Hsu, Tian, and Xu, 2014; Lee and O'Neill, 2003). However, according to the International Financial Reporting Standards (IFRS) of the International Accounting Standards Board (IASB), R&D expenditures can be classified into two stages: research and development. The research stage includes the costs of basic research to obtain new knowledge and technologies in the early stages of corporate innovation. The development stage includes the costs for development activities in the completion stage of corporate innovation, which presents the design, construction, testing, and operation of pre-production or pre-use prototypes and models involving new technologies.

Specifically, according to IFRS IAS 38, activities in the research stage include costs for activities to: (1) obtain new knowledge; (2) search, evaluate, select, and apply research findings or other knowledge; (3) search for alternatives for materials, devices, products, processes, systems, or services; and (4) formulate, design, evaluate, and select possible alternatives for new or improved materials, devices, products, processes, systems, or services. The development stage includes costs for activities to: (1) design, construct, and test pre-production or pre-use prototypes and models; (2) design tools, jigs, molds, and dies involving new technology; (3) design, construct, and operate a pilot plant that is not of a scale economically feasible for commercial production; and (4) design, construct, and test selected alternatives for new or improved materials, devices, products, processes, systems, or services. The costs

incurred during the research stage are fully recognized as expenses. In contrast, costs incurred during the development stage can be capitalized and recognized as intangible assets for economically feasible parts; otherwise, they are expensed. Because R&D capitalization involves managers' judgment, it is subject to managerial discretion. Collectively, IAS 38 explicitly states that each research and development activity represents a different stage of a firm's innovation process.

Given that each research and development expenditures represent different stages of the R&D process, previous research shows that each research and development expenditures have different effects. For example, Cazavan-Jeny, Jeanjean, and Joos (2011) show that research expenditures are more significantly associated with a firm's future performance. They also show that firms with higher development expenditures spend less on R&D. Similarly, Cazavan-Keny and Jeanjean (2006) argue that the value relevance of development expenditure is lower than that of research expenditures by showing a negative association between capitalized R&D and stock prices and returns. Moreover, Oswald and Zarowin (2007) argue that development expenditures or capitalized R&D may not be informative because they can be used as a tool for earnings management. Similarly, Dinh, Kang, and Schultze (2016) demonstrate that the discretion involved in development expenditures and R&D capitalization can be used to manipulate earnings, resulting in a negative association between capitalized R&D and a firm's market value.

Collectively, the literature suggests that research expenditures are more value-relevant and play a more critical role in improving a firm's long-term value than development expenditures, given that development expenditures are prone to managerial discretion and can be used to manage earnings. Thus, given that foreign investors have long-term perspectives and promote a firm's R&D investments through active monitoring, they encourage firms to invest in research activities rather than development activities, leading to the second hypothesis.

H2a: Foreign investor ownership positively affects non-affiliated firms' research expenditures.
H2b: Foreign investor ownership does not positively affect non-affiliated firms' development expenditures.

3. Research Design

3.1. Research Model

This study examines the effect of foreign investor ownership on firm innovation by disaggregating the sample into business-group affiliations and non-affiliated firms. Specifically, this study uses R&D intensity as a proxy for a firm innovation, which is widely used in the literature (Bayersinger, Kosnik, and Turk, 1991; David, Hitt, and Gimeno, 2001; Estrada and Dong, 2019; Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Hsu, Tian, and Xu, 2014; Lee and O'Neill, 2003). Pakes and Griliches (1980) also show a strong contemporaneous positive relationship between R&D intensity and the number of successful patent applications. Moreover, to identify the effect of foreign investor ownership on a firm's innovation process, we classify R&D expenditures into research and development expenditures. We extend previous studies on a firm's R&D investments (Choi et al., 2015; Lou et al., 2021; Shin Il-Hang and Park So-Rah, 2020) and estimate the following regression model.

$$RD\_TOT(RD\_RES, RD\_DEV) = \beta_0 + \beta_1 FOR_{it-1} + \beta_2 PPE_{it-1} + \beta_3 SIZE_{it-1} +$$
$$\beta_4 ROA_{it-1} + \beta_5 LEV_{it-1} + \beta_6 HERF_{it-1} + \beta_7 CAPEX_{it-1} + \beta_8 LNAGE_{it-1} +$$
$$\beta_9 BTM_{it-1} + \beta_{10} VOL\_Sales_{it-1} + \beta_{11} DIV_{it-1} + \sum IND + \sum YEAR + \varepsilon_t \qquad (1)$$

where *RD_TOT* represents the total R&D expenditures scaled by the firm's initial total assets and captures the firm's innovation (Choi et al., 2015; Lou et al., 2021; Ryu Sang-Lyul et al., 2021). *RD_EXP* and *RD_DEV* indicate the costs incurred during research and development activities, respectively. *FOR* is the variable of interest, which captures the ratio of foreign investor ownership to total market value at the end of fiscal year *t*. Following the literature, we control for various firm characteristics that affect a firm's R&D investments, such as its property plant and equipment (*PPE*), size (*SIZE*), return on assets (*ROA*), leverage (*LEV*), capital expenditures (*CAPEX*), age (*LNAGE*), book-to-market ratio (*BTM*), sales volatility (*VOL_Sales*), and dividend yield ratio (*DIV*). To control for industry characteristics, we include the degree of market competition, measured by the Herfindahl index based on annual sales (*HERF*). Table 1 presents the details of these variables. We also control for industry and year fixed effects, and the standard errors are adjusted to confirm the robustness of within-firm cluster correlations (Petersons, 2009). To mitigate endogeneity issues related to omitted variables and reverse causality, this study adopted a lead-lag test model by including lagged independent and control variables.

Table 1. Variable Definitions

Variable	Description
RD_TOT	Firm innovation measures with research and development expenditures divided by the beginning total assets (R&D intensity).
RD_RES	Research expenditures, divided by the beginning total assets.
RD_DEV	Development expenditures, divided by the beginning total assets.
FOR	The ratio of foreign investor ownerships' market value to total market value at the end of fiscal year t.
PPE	Ratio of net property, plant, and equipment to the beginning total assets
SIZE	The natural logarithm of the total sales.
ROA	Return-on-assets ratio, calculated as the income before extraordinary items divided by the beginning total assets.
LEV	Leverage ratio, calculated as the sum of long-term and short-term debts divided by total assets.
HERF	Herfindahl index of three-digit SIC industry *j* to which firm *i* belongs, measured at the end of fiscal year *t*.
CAPEX	Capital expenditures scaled by book value of total assets at the end of fiscal year *t*.
LNAGE	Natural logarithm of one plus firm's age.
BTM	Book-to-market ratio, measured as book value of equity to market value of equity at the beginning of year *t*
Vol_Sales	Volatility of sales using rolling five-year windows at the beginning of year *t*
DIV	Dividend yield ratio, measured as the amount of dividend payment to stock price at the beginning of year *t*

3.2. Sample Selection and Descriptive Statistics

This study uses data on public firms listed on the Korean stock exchange from 2001 to 2015. To identify business group affiliations and non-affiliated firms, following Kang et al. (2017) and Kim and Yi (2006), this study collects data on business group affiliation from the KFTC disclosure on the list of business group affiliations. The KFTC has disclosed data on business group affiliations on its website since 2000. The KFTC defines affiliated firms as "a group of companies in which more than 30% of the shares are held by the same individuals or companies." From the list of business group affiliates designated by the KFTC, we exclude government-governed firms to ensure sample homogeneity. Data on firms' foreign investor ownership and financial information were collected from the TS2000 and FnGuide databases (equivalent to Compustat in the U.S.). This study excludes financial institutions because of their unique industrial characteristics. Firms with fiscal year-ends other than December and those with impaired capital are also excluded. Finally, delisted firms and firms without the data necessary for measuring the variables are removed to ensure sample homogeneity, producing a sample of 1,400 affiliated firms from the total sample of 7,655 firms.

Table 2. Descriptive Statistics

Variable	Affiliated firms			Non-affiliated firms			Mean Diff. p-value	
	N	Mean	Median	N	Mean	Median		
RD_TOT	1,400	1.3250	0.3410	6,255	1.1439	0.2576	0.0043	**
RD_RES	1,400	1.1719	0.3042	6,255	1.0045	0.2067	0.0042	**
RD_DEV	1,400	0.1466	0.0000	6,255	0.1161	0.0000	0.0146	*
FOR	1,400	0.1826	0.1415	6,255	0.0780	0.0178	<.0001	***
PPE	1,400	0.3591	0.3625	6,255	0.3494	0.3378	0.1245	
SIZE	1,400	28.4346	28.5217	6,255	26.0765	25.9975	<.0001	***
ROA	1,400	0.0414	0.0431	6,255	0.0291	0.0331	<.0001	***
LEV	1,400	0.5139	0.5412	6,255	0.4378	0.4326	<.0001	***
HERF	1,400	0.1835	0.1483	6,255	0.1140	0.0661	<.0001	***
CAPEX	1,400	0.1940	0.1164	6,255	0.2233	0.1283	<.0001	***
LNAGE	1,400	3.4663	3.6109	6,255	3.5285	3.6376	0.0001	***
BTM	1,400	1.3382	0.9636	6,255	1.9525	1.4630	<.0001	***
VOL_Sales	1,400	0.2517	0.1411	6,255	0.2170	0.1390	0.1621	
DIV	1,400	0.7857	1.0000	6,255	0.6994	1.0000	<.0001	***

Notes: 1. All variables are defined in the Table 1.

2. All *p*-values are based on two-tailed t-tests.

3. All continuous variables are winsorized at the top and bottom 1%.

4. *p<0.1, **p<0.05, ***p<0.001.

Table 2 provides the descriptive statistics for each variable used in the analyses. The mean values for total R&D expenditures for affiliated and non-affiliated firms are 1.3250 and 1.1439, respectively, which are significantly different (p-value = 0.0043). This shows that affiliated firms spend more on innovation than non-affiliated firms. On average, the research expenditures for affiliated and non-affiliated firms are 1.1719 and 1.0045, respectively. They

show that both affiliated and non-affiliated firms spend more on research expenditures than on development expenditures, as the mean values of development expenditures for both groups are 0.1466 and 0.1161, respectively. Foreign investors account for 18.26% and 7.8% of the equity shares of affiliated and non-affiliated firms, respectively. This result indicates that foreign investors tend to invest more in affiliated firms. Moreover, affiliated firms have an average size of 28.4346, ROA of 0.0414, leverage of 0.5139, and book-to-market ratio of 1.3382, whereas non-affiliated firms have averages of 26.0765, 0.0291, 0.4378, and 1.9525, respectively.

4. Empirical Results

4.1. Correlations

Table 2 presents the Pearson correlations among the variables used in this study, indicating that *RD_TOT* is positively correlated with foreign investor ownership (*FOR*). Further, foreign investor ownership is significantly correlated with research expenditures (*RD_RES*) but not significantly correlated with development expenditures (*RD_DEV*). *RD_TOT* is significantly

Table 3. Correlations Matrix

Variable	(2)	(3)	(4)	(5)	(6)	(7)
RD_TOT (1)	0.9597	0.4272	0.1922	(0.1379)	0.0840	0.1016
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
RD_RES (2)		0.1848	0.2078	(0.1342)	0.0948	0.1263
		<.0001	<.0001	<.0001	<.0001	<.0001
RD_DEV (3)			0.0056	(0.0477)	0.0163	(0.0397)
			0.6220	<.0001	0.1549	0.0005
FOR (4)				(0.0282)	0.4713	0.2538
				0.0135	<.0001	<.0001
PPE (5)					0.1134	0.0272
					<.0001	0.0174
SIZE (6)						0.1545
						<.0001
ROA (7)						
LEV (8)						
HERF (9)						
CAPEX (10)						
LNAGE (11)						
BTM (12)						
VOL_Sales (13)						
DIV (14)						

Table 3. (Continued)

Variable	(8)	(9)	(10)	(11)	(12)	(13)	(14)
RD_TOT (1)	(0.0978)	0.0139	0.0302	(0.0935)	(0.0294)	(0.0111)	(0.0313)
	<.0001	0.2246	0.0082	<.0001	0.0102	0.3329	0.0061
RD_RES (2)	(0.1068)	(0.0048)	0.0211	(0.0922)	(0.0344)	(0.0123)	(0.0199)
	<.0001	0.6727	0.0649	<.0001	0.0026	0.2822	0.0821
RD_DEV (3)	0.0128	0.0654	0.0345	(0.0135)	0.0151	(0.0011)	(0.0470)
	0.2614	<.0001	0.0025	0.2361	0.1855	0.9211	<.0001
FOR (4)	(0.1464)	0.1565	0.0450	(0.0571)	(0.0488)	(0.0194)	(0.0366)
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0906	0.0014
PPE (5)	0.1803	0.0569	(0.0174)	0.0625	0.0464	(0.0825)	0.0340
	<.0001	<.0001	0.1283	<.0001	<.0001	<.0001	0.0030
SIZE (6)	0.1432	0.2797	(0.0547)	0.0541	(0.0122)	(0.0194)	(0.1359)
	<.0001	<.0001	<.0001	<.0001	0.2851	0.0904	<.0001
ROA (7)	(0.3543)	0.0136	0.0972	(0.0911)	0.0189	(0.0012)	0.1172
	<.0001	0.2334	<.0001	<.0001	0.0983	0.9201	<.0001
LEV (8)		0.1037	(0.0732)	(0.0026)	(0.0346)	0.0746	(0.0651)
		<.0001	<.0001	0.8175	0.0024	<.0001	<.0001
HERF (9)			0.0064	(0.0108)	(0.0196)	0.0725	(0.0755)
			0.5765	0.3449	0.0857	<.0001	<.0001
CAPEX (10)				(0.0935)	(0.0135)	0.0367	0.0211
				<.0001	0.2373	0.0013	0.0649
LNAGE (11)					0.0408	(0.0341)	(0.0069)
					0.0004	0.0028	0.5486
BTM (12)						(0.0264)	0.0291
						0.0208	0.0110
VOL_Sales (13)							(0.0157)
							0.1705
DIV (14)							

Notes: 1. All variables are defined in Table 1.
2. All *p*-values are based on two-tailed tests.
3. All continuous variables are winsorized at the top and bottom 1%.
4. The VIF for each variable was lower than 10, showing there are no serious concerns with multicollinearity.

correlated with a firm's PPE (*PPE*), size (*SIZE*), return on assets (*ROA*), leverage (*LEV*), capital expenditure (*CAPEX*), firm age (*LNAGE*), book-to-market ratio (*BTM*), and dividend yield (*DIV*). However, it is difficult to draw precise conclusions regarding the effect of foreign investor ownership on firm innovation based on Pearson's correlation coefficient. The regression results are presented in the next section, considering all the control variables employed in our analysis.

4.2. Empirical Results

4.2.1. Effect of Foreign Investor Ownership on a Firm's R&D Investments for Affiliated and Non-Affiliated Firms

Table 4 shows the empirical results for Hypotheses 1a and 1b, regressing R&D intensity on foreign investor ownership for affiliated and non-affiliated firms. As Table 4 shows, the coefficient of *FOR* (2.2599) is positive and significant at the 1% level (p-value < 0.01) for nonaffiliated firms. However, the coefficient of *FOR* (0.4356) is not statistically significant (p-value = 0.7028) for affiliated firms. This result suggests that foreign investors promote innovation in non-affiliated firms, supporting our hypothesis. Furthermore, the results also support our argument that foreign investors' role in facilitating firm innovation is not influential in affiliated firms.

Table 4. The Relationship between Foreign Investor Ownership and a Firm's R&D Investments for Affiliated and Non-affiliated Firms

Variable	Dependent Variable = *RD_TOT*			
	Affiliated firms		Non-affiliated firms	
	Coef.	p-value	Coef.	p-value
Intercept	-6.0293	0.0900	2.6412	0.0647
FOR it-1	0.4356	0.7028	2.2599	<0.01 ***
PPE it-1	-0.8695	0.1344	-1.5236	<0.01 ***
SIZE it-1	0.3288	0.0202 **	0.0070	0.9067
ROA it-1	0.1701	0.9220	1.1061	0.0924 *
LEV it-1	-1.5419	0.1404	-0.1366	0.6612
HERF it-1	2.2549	0.1548	-1.1271	0.0379 **
CAPEX it-1	0.3442	0.3258	-0.0154	0.9217
LNAGE it-1	-0.2698	0.3308	-0.3025	0.0394 **
BTM it-1	-0.1378	0.0758 *	-0.0035	0.3589
VOL_Sales it-1	-0.1299	0.0487 **	-0.0286	0.1943
DIV it-1	-0.3711	0.2206	0.0570	0.7276
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R^2	0.1399		0.09404	
N	1,400		6,255	

Notes: 1. All variables are defined in Table 1.
2. All *p*-values are based on two-tailed tests.
3. All continuous variables are winsorized at the top and bottom 1%.
4. *$p<0.1$, **$p<0.05$, ***$p<0.001$.
5. The VIF for each variable was lower than 10, showing there are no serious concerns with multicollinearity.

4.2.2. Effect of Foreign Investor Ownership on a Firm's R&D Process for Affiliated and Non-Affiliated Firms

For Hypotheses H2a and H2b, we divide R&D expenditures into research and development expenditures to identify the effects of foreign investor ownership on different stages of firm innovation. Given that research expenditures are more value-relevant and significantly associated with a firm's future performance and that foreign investors have long-term perspectives, we conjecture that foreign investors promote research activities rather than development activities for non-affiliated firms. Panels A and B of Table 5 report the empirical results for hypotheses H2a and H2b, and the relationship between foreign investor ownership and each research and development expenditure, respectively.

Panel A of Table 5 shows the relationship between foreign investor ownership and research expenditures on affiliated and non-affiliated firms. The results show that the coefficient of *FOR* (2.2103) is significantly positive (p-value < 0.01) for non-affiliated firms, whereas the coefficient of *FOR* (0.6499) for affiliated firms is not statistically significant. Panel B of Table 5 reports the effect of foreign investor ownership on a firm's development expenditure, which captures a firm's development activities in the completion stage of the corporate innovation process. The results show that foreign investor ownership (*FOR*) is not significantly related to a firm's development expenditure for either affiliated (-0.2374, p-value = 0.1424) or non-affiliated firms (-.0246, p-value = 0.7745).

Table 5. The Effect of Foreign Investor Ownership on a Firm's Innovation Process for Affiliated and Non-affiliated Firms

Panel A: Dependent Variable = *RD_RES*

Variable	Dependent Variable = *RD_RES*			
	Affiliated firms		**Non-affiliated firms**	
	Coef.	**p-value**	**Coef.**	**p-value**
Intercept	-4.1195	0.2079	1.7526	0.1677
FOR $_{it-1}$	0.6499	0.5458	2.2103	<0.01 ***
PPE $_{it-1}$	-0.8637	0.1009	-1.3283	<0.01 ***
SIZE $_{it-1}$	0.2588	0.0500 **	0.0239	0.6517
ROA $_{it-1}$	0.0613	0.9694	1.3746	0.0174 *
LEV $_{it-1}$	-1.4189	0.1541	-0.0386	0.8876
HERF $_{it-1}$	2.1439	0.1515	-1.3758	<0.01 ***
CAPEX $_{it-1}$	0.3032	0.3209	-0.0767	0.5971
LNAGE $_{it-1}$	-0.3231	0.1965	-0.2509	0.0548 *
BTM $_{it-1}$	-0.0982	0.1779	-0.0043	0.1389
VOL_Sales $_{it-1}$	-0.1115	0.0608 *	-0.0224	0.2402
DIVI $_{it-1}$	-0.3441	0.2229	0.1403	0.3171
Firm Clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R^2	0.1317		0.1076	
N	1,400		6,255	

Table 5. (Continued)

Panel B: Dependent Variable = *RD_DEV*

Variable	Dependent Variable = *RD DEV*			
	Affiliated firms		Non-affiliated firms	
	Coef.	p-value	Coef.	p-value
Intercept	-1.7423	0.0126 **	0.4898	0.0930 *
FOR $_{it-1}$	-0.2374	0.1424	-0.0246	0.7745
PPE $_{it-1}$	-0.0155	0.8404	-0.1373	<0.01 ***
SIZE $_{it-1}$	0.0622	<0.01 ***	-0.0082	0.4923
ROA $_{it-1}$	0.0721	0.8227	-0.1448	0.2465
LEV $_{it-1}$	-0.0661	0.6090	-0.0429	0.4458
HERF $_{it-1}$	0.0605	0.7560	0.1770	0.2573
CAPEX $_{it-1}$	0.0405	0.5418	0.0418	0.2814
LNAGE $_{it-1}$	0.0633	0.2165	-0.0241	0.3394
BTM $_{it-1}$	-0.0355	0.0114 **	0.0010	0.2405
VOL_Sales $_{it-1}$	-0.0186	0.0322 **	-0.0044	0.2679
DIV $_{it-1}$	-0.0261	0.6174	-0.0491	0.0995 *
Firm Clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.06831		0.02175	
N	1,400		6,255	

Notes: 1. All variables are defined in Table 1.

2. All *p*-values are based on two-tailed tests.

3. All continuous variables are winsorized at the top and bottom 1%.

4. **p*<0.1, ***p*<0.05, ****p*<0.001.

5. The VIF for each variable was lower than 10, showing there are no serious concerns with multicollinearity.

These results suggest that foreign investors encourage non-affiliated firms to invest in research activities, which represents the early stages of corporate innovation. This result also implies that foreign investors have a long-term perspective, driving non-affiliated firms to focus on long-term value. Furthermore, the results indicate that foreign investor ownership does not significantly influence affiliated firms.

4.3. Robustness Test

To enhance the robustness of our results, we conduct a two-stage least squares (2SLS) regression analysis to address endogeneity issues related to reverse causality. Foreign investor ownership is not an exogenous factor because investors make investment decisions based on their preferences and experience. Thus, one might argue that foreign investors do not drive firms to invest in R&D; instead, they prefer firms to engage in innovative activities. Thus, we use a 2SLS regression analysis with an instrumental variable to mitigate endogeneity concerns

related to reverse causality.

According to prior studies (Cremers et al., 2016; Ferreira and Matos, 2008; Shin Il-Hang and Park So-Rah, 2020), foreign investors tend to invest in companies cross-listed on the U.S. stock market and the MSCI all-country world index (MSCI ACWI). This implies that the MSCI ACWI is significantly associated with foreign investor ownership but not significantly associated with a firm's R&D investments, because the MSCI ACWI listing is determined by a mechanical rule based on market capitalization (Bena et al., 2017). Therefore, we use historical listing on the MSCI ACWI (*MSCI*) as an instrumental variable for foreign investor ownership. We set the *MSCI* equal to one if the firm is listed on the MSCI ACWI for year *t*.

Panel A of Table 6 shows the results of the first-stage 2SLS regression analysis. The results show that the instrumental variable *MSCI* (0.1106, p-value < 0.01) is positively associated with foreign investor ownership (*FOR*), the dependent variable. In the second stage, we re-estimate our main regression using the predicted value of foreign investor ownership, estimated from the first-stage regression analysis, as an independent variable. As Panel B of Table 6 shows, the coefficient of predicted *FOR* (7.4518, p-value = 0.0208) for non-affiliated firms is significantly positive, which is qualitatively consistent with our main analysis. Furthermore, Panels C and D of Table 6 indicate that the coefficient of predicted *FOR* (6.9941, p-value = 0.0179) is positive and statistically significant only for non-affiliated firms when research expenditure *(RD_RES)* is the dependent variable, whereas when the dependent variable is development expenditure (*RD_DEV*) for both affiliated and non-affiliated firms, it is not statistically significant. These results support our argument that foreign investor ownership promotes innovation for non-affiliated firms and drives them to invest in the early stages of a firm's innovation process.

Table 6. Robustness Test: 2SLS Regression Analysis

Panel A: First-Stage Regression

Variable	Dependent Variable = *FOR*	
	Coef.	p-value
Intercept	-0.6069	<0.01 ***
MSCI$_{it-1}$ [Instrument]	0.1106	<0.01 ***
PPE$_{it-1}$	-0.0365	0.0436 **
SIZE$_{it-1}$	0.0285	<0.01 ***
ROA$_{it-1}$	0.1705	<0.01 ***
LEV$_{it-1}$	-0.0897	<0.01 ***
HERF$_{it-1}$	0.0460	0.1684
CAPEX$_{it-1}$	0.0185	0.0323 **
LNAGE$_{it-1}$	-0.0118	0.1061
BTM$_{it-1}$	-0.0005	0.0235 **
VOL_Sales$_{it-1}$	-0.0026	0.0191 **
DIV$_{it-1}$	0.0113	0.1590
Firm Clustering	YES	
Industry fixed effect	YES	
Year fixed effect	YES	
Adj. R²	0.3443	
N	7,655	

Table 6. (Continued)

Panel B: Second-Stage Regression when Dependent Variable = RD_TOT

Variable	Affiliated firms		Non-affiliated firms	
	Coef.	**p-value**	**Coef.**	**p-value**
Intercept	-3.5381	0.5989	6.9505	0.0170 **
FOR$_{it-1}$[Predicted]	2.5789	0.4872	7.4518	0.0208 *
PPE$_{it-1}$	-0.7694	0.1963	-1.3223	<0.01 ***
SIZE$_{it-1}$	0.2162	0.4424	-0.1868	0.1185
ROA$_{it-1}$	0.4155	0.8108	1.2913	0.0514 **
LEV$_{it-1}$	-1.3230	0.3142	0.4582	0.2508
HERF$_{it-1}$	2.1818	0.1635	-1.3392	0.0207 **
CAPEX$_{it-1}$	0.3661	0.2915	-0.1091	0.4345
LNAGE$_{it-1}$	-0.2029	0.4745	-0.2415	0.0946 *
BTM$_{it-1}$	-0.1269	0.0757 *	-0.0032	0.5805
VOL_Sales$_{it-1}$	-0.1173	0.0634 *	-0.0085	0.7253
DIV$_{it-1}$	-0.4356	0.1285	-0.0300	0.8751
Firm Clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.1411		0.08726	
N	1,400		6,255	

Panel C: Second-Stage Regression when Dependent Variable = RD_RES

Variable	Affiliated firms		Non-affiliated firms	
	Coef.	**p-value**	**Coef.**	**p-value**
Intercept	-2.1985	0.7353	5.6858	0.0274 **
FOR$_{it-1}$[Predicted]	2.3220	0.5203	6.9941	0.0179 **
PPE$_{it-1}$	-0.7752	0.1527	-1.1493	<0.01 ***
SIZE$_{it-1}$	0.1719	0.5290	-0.1528	0.1451
ROA$_{it-1}$	0.3420	0.8310	1.5615	<0.01 ***
LEV$_{it-1}$	-1.2779	0.3095	0.4966	0.1545
HERF$_{it-1}$	2.0577	0.1635	-1.5703	<0.01 ***
CAPEX$_{it-1}$	0.3271	0.2775	-0.1601	0.2107
LNAGE$_{it-1}$	-0.2678	0.2952	-0.1962	0.1293
BTM$_{it-1}$	-0.0959	0.1497	-0.0043	0.3449
VOL_Sales$_{it-1}$	-0.1010	0.0762 *	-0.0036	0.8636
DIV$_{it-1}$	-0.3961	0.1336	0.0558	0.7441
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.1311		0.09908	
N	1,400		6,255	

Table 6. (Continued)

Panel D: Second-Stage Regression when Dependent Variable = *RD_DEV*

Variable	Dependent Variable = *RD_DEV*			
	Affiliated firms		**Non-affiliated firms**	
	Coef.	**p-value**	**Coef.**	**p-value**
Intercept	-1.0245	0.1462	0.6409	0.1773
FOR$_{it-1}$[Predicted]	0.3590	0.4305	0.1315	0.7015
PPE$_{it-1}$	-0.0023	0.9777	-0.1283	<0.01 ***
SIZE$_{it-1}$	0.0300	0.2578	-0.0149	0.4889
ROA$_{it-1}$	0.0234	0.9433	-0.1411	0.2623
LEV$_{it-1}$	0.0306	0.8145	-0.0200	0.7986
HERF$_{it-1}$	0.0826	0.6790	0.1681	0.2891
CAPEX$_{it-1}$	0.0377	0.5789	0.0363	0.3731
LNAGE$_{it-1}$	0.0756	0.2099	-0.0223	0.4683
BTM$_{it-1}$	-0.0250	0.0465 **	0.0012	0.3224
VOL_Sales$_{it-1}$	-0.0161	0.0627 *	-0.0038	0.3764
DIV$_{it-1}$	-0.0400	0.4738	-0.0525	0.0710 *
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.06552		0.02177	
N	1,400		6,255	

Notes: 1. All variables are defined in Table 1.

2. All *p*-values are based on two-tailed tests.

3. All continuous variables are winsorized at the top and bottom 1%.

4. *p<0.1, **p<0.05, ***p<0.001.

5. The VIF for each variable was lower than 10, showing there are no serious concerns with multicollinearity.

4.4. Additional Analysis

The governance structures of Korean affiliated firms, such as pyramidal ownership structures and circular shareholdings, allow controlling shareholders who have a small fraction of ownership to exercise significant influence on the firm's business operation, which leads to the control-ownership disparity. Specifically, control-ownership disparity refers to the divergence of cash flow rights and control rights (voting rights) (Belkhir, Boubaker, and Deriyuche, 2014; Choi Hyang-Mi, Cho Young-Gon, and Sul Won-Sik, 2014; Kang Min-Jung et al., 2014; Kang Min-Jung, Kim Sang-Il, and Cho Moon-Kyung, 2019: Kim and Yi, 2006).

Previous studies show that affiliated firms' high control-ownership disparity provides controlling shareholders with substantial control rights over cash flow rights incentives to expropriate private benefits from minority shareholders, causing agency problems. For

example, Claessens, Djankov, and Lang (2002), Lemmon and Lins (2003), and Lins (2003) show that firm value, return, and performance are lower for firms with high control-ownership disparity. Kang Min-Jung et al. (2014) provide evidence that control-ownership disparity is positively associated with a firm's related party transactions (RPTs) and find that the RPTs of Korean-affiliated firms reduce firm value. They argue that RPTs increase when agency problems are severe and are used as tools for tunneling. Moreover, Jiang, Kim, and Pang (2011) find a negative association between control-ownership disparity and investment-q sensitivity.

In summary, the literature suggests that high control-ownership disparity results in increased agency problems (Type II agency problem) and inefficient allocation of resources because controlling shareholders in affiliated firms with high control-ownership disparity are more likely to transfer resources and profits for their private benefits, reducing firm innovation. This implies that although affiliated firms have business structures that foster firm innovation, they may invest less in innovative activities, depending on their ownership structure. Moreover, Di Vito, Laurin, and Bozec (2010) and Park Hyun-Young, Chae Soo-Joon, and Cho Moon-Kyung (2016) show that the effect of foreign investor ownership on firms' R&D activity and investment behavior differs according to the level of firms' control–ownership disparity. Thus, the role of foreign investors in fostering firm innovation by curbing the self-serving behavior of controlling shareholders through monitoring may become important and influential when the control-ownership disparity is high.

Thus, examining the effect of foreign investor ownership on affiliated firms' innovation based on control-ownership disparity allows us to confirm the positive effect of foreign investor ownership on firm innovation. Moreover, it verifies whether foreign investors promote innovation for companies with less incentive to engage in innovative activities through active monitoring. For analysis, we divide samples of affiliated firms based on the sample median of control-ownership disparity and conduct an analysis using predicted *FOR* estimated from the 2SLS regression analysis. Consistent with our prediction, the results in Panel A of Table 7 show that the coefficient of predicted *FOR* (9.1034, p-value<0.01) for affiliated firms with high control-ownership disparity is positively significant. In contrast, that of affiliated firms with low control-ownership disparity is not statistically significant. Furthermore, Panels B and C of Table 7 suggest that foreign investors encourage firms to invest in research activities by showing a positive relationship between foreign investor ownership and research expenditure for affiliated firms with high control-ownership disparity. These results support our primary argument that foreign investors drive firms to focus on long-term value and engage in innovation through active monitoring. Furthermore, the results confirm the positive effect of foreign investor ownership on firm innovation, especially when firms have less incentive to engage in innovative activities.

Table 7. Relationship between Foreign Investor Ownership and Affiliated Firms Innovation based on the Control-Ownership Disparity

Panel A: Dependent Variable = RD_TOT

Variable	Dependent Variable = RD_TOT			
	Affiliated Firms with high control-ownership disparity		Affiliated Firms with low control-ownership disparity	
	Coef.	p-value	Coef.	p-value
Intercept	5.2953	0.2464	-10.0207	0.3103
$FOR_{it1}[Predicted]$	9.1034	<0.01 ***	-0.7982	0.8816
PPE_{it-1}	-0.9864	0.1993	-0.2421	0.7597
$SIZE_{it-1}$	-0.1743	0.3556	0.4290	0.2914
ROA_{it-1}	1.6163	0.4280	-0.6491	0.7527
LEV_{it-1}	2.0978	0.0585 *	-4.0183	0.0269 **
$HERF_{it-1}$	1.8851	0.3285	2.1603	0.2935
$CAPEX_{it-1}$	-0.3326	0.4628	0.9366	0.0955 *
$LNAGE_{it-1}$	-0.3087	0.4462	0.3563	0.1473
BTM_{it-1}	-0.0246	0.7519	-0.2591	0.0295 **
VOL_Sales_{it-1}	-0.0642	0.6639	-0.1006	0.1613
DIV_{it-1}	-0.0294	0.9244	-0.7883	0.0555 *
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.182		0.257	
N	700		700	

Panel B: Dependent Variable = RD_RES

Variable	Dependent Variable = RD_RES			
	Affiliated Firms with high control-ownership disparity		Affiliated Firms with low control-ownership disparity	
	Coef.	p-value	Coef.	p-value
Intercept	7.1437	0.1087	-8.6694	0.3592
$FOR_{it1}[Predicted]$	8.2518	<0.01 ***	-0.8341	0.8724
PPE_{it-1}	-1.0291	0.1457	-0.2039	0.7795
$SIZE_{it-1}$	-0.2211	0.2512	0.3777	0.3322
ROA_{it-1}	1.4358	0.4205	-0.5070	0.7978
LEV_{it-1}	1.9212	0.0597 *	-3.7906	0.0297 **
$HERF_{it-1}$	1.8411	0.2931	2.0010	0.3116
$CAPEX_{it-1}$	-0.2225	0.5539	0.7606	0.1212
$LNAGE_{it-1}$	-0.4627	0.1875	0.3361	0.1363
BTM_{it-1}	0.0203	0.7537	-0.2425	0.0374 **
VOL_Sales_{it-1}	-0.0344	0.7875	-0.0893	0.1890
DIV_{it-1}	-0.0293	0.9166	-0.7375	0.0508 *
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R²	0.1815		0.2412	
N	700		700	

Table 7. (Continued)

Panel C: Dependent Variable = *RD_DEV*

	Dependent Variable = *RD_DEV*			
Variable	Affiliated Firms with high control-ownership disparity		Affiliated Firms with low control-ownership disparity	
	Coef.	p-value	Coef.	p-value
Intercept	-1.7925	0.1120	-0.8447	0.3707
FOR_{it1}[Predicted]	0.8572	0.3050	0.2236	0.5571
PPE_{it-1}	0.0226	0.8208	-0.0303	0.7605
$SIZE_{it-1}$	0.0422	0.2423	0.0307	0.3930
ROA_{it-1}	0.1408	0.7470	-0.2311	0.5205
LEV_{it-1}	0.2154	0.3113	-0.1408	0.2205
$HERF_{it-1}$	0.0501	0.8743	0.0716	0.6370
$CAPEX_{it-1}$	-0.1086	0.3420	0.1734	0.0746 *
$LNAGE_{it-1}$	0.1693	0.1405	0.0224	0.5089
BTM_{it-1}	-0.0406	0.0690 *	-0.0090	0.5093
VOL_Sales_{it-1}	-0.0247	0.3647	-0.0097	0.2850
DIV_{it-1}	-0.0100	0.9033	-0.0385	0.4758
Firm clustering	YES		YES	
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R^2	0.1446		0.07879	
N	700		700	

Notes: 1. All variables are defined in Table 1.

2. All *p*-values are based on two-tailed tests.

3. All continuous variables are winsorized at the top and bottom 1%.

4. *$p<0.1$, **$p<0.05$, ***$p<0.001$.

5. The VIF for each variable was lower than 10, showing there are no serious concerns with multicollinearity.

5. Conclusion

This study examines the effects of foreign investor ownership on firm innovation. In a global economy, firm innovation is a key factor in establishing a competitive advantage that helps firms survive in competitive global markets. Therefore, it is crucial to investigate the determinants of firm innovation. It is well-established that agency problems (both Type I and Type II agency problems) suppress firms' investment in innovative activities because innovative activities, such as R&D investments, are long-term investment projects that entail high uncertainty and risks. The literature demonstrates that corporate governance structures are significantly associated with firm innovation.

Over the past decades, as markets became globalized, the importance of foreign investor ownership has dramatically increased among various corporate governance factors. Academics have investigated the effects of foreign investors on firm innovation in response to an increase in the importance of foreign investors. The literature demonstrates that foreign investors promote firm innovation through various channels, such as monitoring, knowledge spillovers, and insurance. However, previous studies overlooked the distinct business structure characteristics of business group affiliations (Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Di Vito, Laurin, and Bozec, 2010; Lee and O'Neill, 2003;

Luong et al., 2017) and the distinct features of each research and development expenditure (Bayersinger, Kosnik, and Turk, 1991; David, Hitt, and Gimeno, 2001; Estrada and Dong, 2019; Gang Kwang-Wook, Choi Byung-Chul, and Park Min-Seok, 2021; Hsu, Tian, and Xu, 2014; Lee and O'Neill, 2003) when analyzing the effect of foreign investor ownership on firm innovation. Therefore, this study classifies the sample firms into affiliated and non-affiliated firms to identify the different features of business group affiliation. Moreover, R&D expenditures are classified into research and development expenditures to analyze how foreign investors affect each stage of the innovation process.

This study finds that foreign investor ownership positively affects innovation in non-affiliated firms. However, foreign investor ownership does not influence the affiliated firms. Furthermore, the results show that foreign investors encourage firms to invest in research activities, which represent the early stages of innovation. These results hold after addressing endogeneity concerns regarding reverse causality. Additional analysis shows that the role of foreign investors in promoting firm innovation becomes influential for affiliated firms when the control-ownership disparity is high. These results verify that foreign investors have a long-term perspective and facilitate firms' innovation activities.

This study provides practical implications for investors and regulators in that foreign investor ownership can play an important role in improving economic and firms' long-term growth. Nevertheless, this study has limitation. Although this study proves that foreign investor ownership has a significant effect on firm innovation, it does not provide further economic consequences for this positive relationship between foreign investor ownership and firm innovation. Thus, future research should examine whether increased firm innovation resulting from foreign investor ownership affects the value relevance of each R&D activity stage.

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