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ARTICLE

Pension fund shareholding and voting right value

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Abstract
Our study investigates the influence of the Korean National Pension Fund's equity ownership on voting premiums, revealing a statistically significant reduction. In particular, we establish the liquidity pathway as the primary factor among the three channels previously suggested in the literature. Analysis of the COVID-19 era and the VKospi index underscores this predominance. These findings enrich the literature on public pension funds and capital markets, providing policymakers in emerging economies with a deeper understanding of the dynamics involved in establishing pension investment institutions.

Keywords: 5% rule; pension fund shareholding; voting premium

JEL Classifications: E52; E58; G14; G23

The United Nations (2022) notes a rise in global life expectancy from 72.8 in 2019 to an expected 77.2 by 2050, underscoring aging demographics and the need for improved pension systems. Emerging economies are boosting public pension sign-ups and considering later retirement. Effective pension fund management is crucial to counter longevity risk. Growing equity investment by nations increases direct investments, raising the profile of shareholder activism and stewardship codes. Also, as domestic stock market investments grow, pension funds' voting rights' value becomes increasingly important. This study analyzes the impact of pension funds on voting rights premiums, using South Korea's National Pension Service (NPS) data to examine economic impacts.

In this study, we examine the impact of large pension funds' shareholdings on the value of voting rights within the Korean market. Our findings indicate that significant holdings by passive pension funds decrease the voting rights' value, mainly due to liquidity constraints when these funds invest in a company's shares. This study advances the understanding of how institutional investors' increased presence affects voting premiums.

Institutional investors' influence on voting premiums is documented in the literature, with pension funds' role as institutional investors highlighted. However, Edmans and Holderness (2017) suggest that this impact varies among different investor types. Notably, public and private pension funds operate distinctively, with different governance structures and beneficiaries (shareholders versus taxpayers), and diverse performance compensation systems influence their monitoring functions (Linden and Rotenier, 1994; Murphy and Van Nuys, 1994; Gillan and Starks, 2000; Woidtke, 2002). Political factors can uniquely affect public pension funds' investment decisions (Romano, 1993; Barber, 2007; Jiao and Ye, 2012), potentially altering their impact on voting premiums. Furthermore, pension funds' investment horizons and styles, as noted by Chen *et al.* (2007) and Almazan *et al.* (2005), differ from other institutional investors, with long-term public funds and short-term profit-focused funds exerting

varying effects. This study provides new evidence that public pension funds' shareholdings can diminish a company's voting premium, suggesting they differ from typical institutional investors in their influence.

What economic pathways underpin the effect of public pension fund holdings on the voting premium? According to the existing literature, when institutions hold shares three economic pathways arise: liquidity constraints (Neumann, 2003; Ødegaard, 2007), institutional monitoring (Zingales, 1994; Chung and Kim, 1999), and takeover defense (Smith and Amoako-Adu, 1995; Nenova, 2003). First, public pension funds' long-term holdings may exert liquidity constraints, thereby depressing the voting premium. Given their predictable cash flows and passive strategy, these funds trade less frequently, which could reduce stock turnover and lower prices. This infrequent trading narrows the price gap between benchmark-included and non-included stocks, reducing the voting premium.

Second, the monitoring of public pension funds can reduce managers' private interests, consequently affecting the voting premium. Managers obtain private benefits by holding dominant voting rights (Zingales, 1994; Chung and Kim, 1999). For example, Adam Neumann, the ex-CEO of WeWork, received a loan through his company at a much lower interest rate than loans offered by commercial banks to fund a luxurious lifestyle, and in 2019 he sold the trademark 'We' to WeWork for $5.9 billion.[1] The dominant voting rights of controlling shareholders allow them to enjoy private interests such as these. As a result, investors tend to become controlling shareholders by holding voting rights, increasing the value of the voting premium. However, if a public pension fund holds voting rights, they monitor and negatively affect the private interests of controlling shareholders as institutional investors (Romano, 1993; Chung *et al.*, 2015).

Finally, if a pension fund is recognized as a white knight defending against a control contest, the takeover's potential for success is reduced, and the voting premium may decrease. Control contests, which have been noted to increase the demand for voting rights and premiums (Zingales, 1994; Smith and Amoako-Adu, 1995; Nenova, 2003), are less likely when pension funds are seen as protectors. In emerging markets, local investors may view public pension funds as safeguards against foreign takeovers (Bena *et al.*, 2017; Park *et al.*, 2019), as seen when NPS acted as a white knight in KT&G's case.[2] Such actions can lead to a perception that public pension funds lower the voting premium by protecting against wealth outflows.

Korea provides a suitable research environment to examine voting premium decreases due to public pension fund shareholding via the aforementioned three economic pathways. First, the NPS introduced its own stewardship code in 2018, which facilitates better understanding of the relationship between holdings by public pension funds and private benefits. To confirm whether an investment made by a public pension fund causes a decrease in private benefits, voting rights and monitoring should be exogenously strengthened. The introduction of the stewardship code in Korea indicates that the NPS is fulfilling its fiduciary responsibility through active shareholder activities. Using such NPS activity disclosures, it is possible to analyze investment environment before and after pension funds engage in active shareholder activities, which allows for research-based analysis of the relationship to private benefits.

Second, due to the large asset size of the NPS, many of its assets are subject to the 5%percent rule; and as a result, the NPS must disclose all transactions involving individual stocks exposed to the 5% rule. This unique disclosure allows for the tracking of daily stock transactions and positions, offering a rare insight into public pension fund operations, crucial for analyzing NPS's impact on liquidity. Furthermore, the NPS's role as a stabilizing white knight in response to foreign challenges on governance underscores its significance in control contests. With an 8–9% shareholding in the Korean

[1]See Merced (2020) https://www.nytimes.com/2021/11/09/business/dealbook/adam-neumann-wework.html

[2]In 2006, Carl Icahn and Lichtenstein acquired a 6.6% stake in KT&G, pushing for management changes and the sale of assets. They successfully appointed a nonexecutive director via a voting contest, with NPS backing KT&G's existing nonexecutive director. More details at Maidment (2006) https://www.forbes.com/2006/03/15/icahn-south-korea_cx_pm_0315notes.html?sh=3a16b9484c19

market, the NPS's substantial presence is unparalleled in emerging markets, presenting a unique case for studying the influence of large public pension funds.

In our study, liquidity constraints emerged as the most promising economic pathway, with the stewardship code's influence also suggesting the monitoring pathway's effectiveness in curtailing private benefits. Yet, governance ratings yielded inconsistent results in our robustness analysis, possibly due to ineffective control over liquidity constraints during the NPS's stewardship code implementation and its size expansion. Our analysis of the takeover defense hypothesis and its impact on voting premium, particularly regarding the shareholding ratio required by foreign investors to outvote controlling shareholders, didn't yield significant findings. However, we confirmed the explanatory power of the liquidity pathway; NPS shareholding impacts stock turnover, supporting our argument. Further, using Amihud's (2002) illiquidity measure, we observed a notable reduction effect in stocks with higher illiquidity, reinforcing the liquidity pathway's potential.

Individual stock liquidity, market liquidity, and volatility significantly influence the voting premium's value. For large entities like the NPS, the substantial transaction size and specific investment goals hinder swift market-based actions. Thus, we examined how NPS shareholdings impact the voting premium amidst market fluctuations, utilizing the VIX (Korea Volatility Index) and COVID-19 pandemic data. Our findings indicate NPS shareholdings notably affected individual stocks' voting premiums during high market volatility, corroborated by the analysis of COVID-19 case numbers. This supports Nagel (2012)'s insights on the critical role of public pension funds in market liquidity and volatility.

Our findings expand on the current body of literature, particularly by contributing to further research on the measurement of and factors influencing the voting premium. Zingales (1994) investigated the voting premium in Italy and argued that private benefits were an important factor. Nenova (2003) focused on the size and determinants of the voting premium by country; Caprio and Croci (2008) studied the determinant of the Italian voting premium; and Hong (2013) analyzed the impact of the IFRS introduction on the voting premium. Neumann (2003) showed that liquidity was an important factor, and Rydqvist (1996) found that several factors contributed to determining voting premium. Whereas most studies concerning the voting premium used liquidity as a control variable, we argue that liquidity is an important factor than other control variables and can act as an effective economic pathway.

This study is also related to literature analyzing the impact of large-scale public pension fund investments on the market. Lucas (2001) analyzed whether public pension investments could further develop the stock market; Barber (2007), Smith (1996), and Nelson (2006) investigated the relationship between the announcement of the CalPERS focus list and stock price. They argued that CalPERS's shareholder activism could lead to a higher stock price in anticipation of improved corporate governance. Hu (2012) showed that, due to the investment style of a public pension fund, the shareholdings could weaken the liquidity of the market. Our results indicate that shareholdings of large-scale public pension funds can hinder the liquidity in emerging markets, and that regulators and public pension managers in emerging countries should consider liquidity and voting premiums when the size of a public pension fund increases.

The rest of this paper is organized as follows. The next section discusses the data and basic methodology used in this study. We then present our results on public pension fund's holding effect on the voting premium, and our analyses of the monitoring, liquidity, and control contest pathways. We further focus our analysis on the robustness of the liquidity pathway using an alternative explanation, followed by a conclusion to this study.

1. Data

In this study, three types of data were combined to use company-month-based data. First, we used disclosure data from the Data Analysis, Retrieval, and Transfer System (DART) to verify the shares the NPS held in various companies and other transaction information. DART is Korea's electronic

disclosure system and it is operated by the Financial Supervisory Service. The Financial Supervisory Service recently disclosed and provided APIs (Application Programming Interface) to make it easier to utilize DART information. The problem areas in which previous studies struggled to verify the NPS positions and trading records were solved by DART's API. DART's API provides disclosure data for each company and discloses the NPS's share of each company at each transaction date, purchase price, and so on. This study collected the NPS' per-company end-of-month position data from June 2013 to June 2021 through the relevant disclosure data.

Next, calculating the voting premium required data on the daily market cap and price of preferred stocks and common stocks provided by the Korea Exchange and FnGuide. The Korea Exchange discloses daily market cap, market price, closing price, high price, low price, and trading volume. By using these data, we can calculate the premium of common stock compared to preferred stock.[3] The method for calculating the voting premium in this study was the relative price method used in previous studies (Levy, 1983; Zingales, 1994; Karakaş and Mohseni, 2021). Chung and Kim (1999) previously used the relative price method for Korean data, calculated the price difference between preferred and common stocks, and then reflected dividends.

$$voting_{i,t} = \frac{(price_{common,i,t} - price_{prefer,i,t})}{price_{prefer,i,t}} \tag{1}$$

In the above formula, $price_{common,i,t}$ refers to the closing price of the common stock of Company i at the time t. $price_{prefer,i,t}$ indicates the closing price of the preferred stock of Company i at the time t. In other words, the closing price differences of the common stock and the preferred stock at the time t are proportioned based on the price of the preferred stock. After that, the average price of voting rights in month T is calculated by averaging as many as T trading days in month m. In order to analyze how shareholdings by public pension funds affect the price of voting rights, as shown in previous studies (Gurun and Karakaş, 2021; Karakaş and Mohseni, 2021), the rate of price change of voting rights is calculated, as below $\Delta VP_{i,m}$.

$$Voting_{i,m} = \frac{\sum_{t=1}^{T} voting_{i,t}}{T} \tag{2}$$

$$\Delta VP_{i,m} = \frac{Voting_{i,m}}{Voting_{i,m-1}} - 1 \tag{3}$$

However, it is assumed that the voting premium would be generated by voting rights in a situation where there was no significant difference between common stock and preferred stock, as shown in the existing literature (Levy, 1983; Lim *et al.*, 2019; Yun and Kim, 2020). In other words, there is an assumption that common stock will be priced higher than preferred stock. Although some studies have examined negative voting premium (Levit *et al.*, 2021), this study, like others before, attempted to examine the relationship between a general voting premium and pension funds, so the data were removed when the ratio was less than 0.

Finally, a set of control variables obtained through FnGuide was used to control other variables that can affect the voting premium. Control variables included: shares of the largest shareholder and affiliate persons, relative equity ratio (common stock issued equity/preferred stock issued equity), relative

[3]According to Chung and Kim (1999), there are two types of stocks in the Korean market. The first type is the common stock with voting right, and the second type is non-voting stock, which is 1% preferred stock. These two types of stocks are similar, but there is no voting right for 1% preferred stock. Such environment is appropriate for studying the voting premium. And, as the preferred stock, newly created in the 2000s, has a different structure from the existing 1% preferred stock, it is not used in this study. More details can be found in Chung and Kim (1999).

trading volume ratio (common stock trading volume/preferred stock trading volume), book to market ratio, leverage, asset, ROA, market cap, dividend rate, ratio of foreign investors' holdings, and Chaebol dummy. These three datasets (NPS ownership, voting premium, control variables) were converted based on the end of the month. After that, NPS ownership data and control variables were merged into the end-of-month voting premium data. When merging data, we use a one-month lag dataset for NPS ownership and control variables. This is because the voting premium is an average premium for one month, and it is difficult to compare it based on the end of the month. Definitions of these variables can be found in Table 1.

In Table 2's summary statistics, the voting premium was found to be 80%. This value supports findings by Zingales (1994) and contrasts the 10% level of voting premium shown in Chung and Kim (1999). However, when referring to other studies in Korea, this figure does not appear to be significantly different from the study results reported as approximately 62%.[4]

In most of the previous studies, the voting premium value is assumed to be positive. In this case, problems may arise in the assumption of linearity used in regression analysis. In addition, this study assumes the voting premium as the price of voting rights and attempts to determine how shareholdings by public pension funds affected the voting right value. Therefore, this analysis does not utilize the absolute value of the voting premium but analyzes the percent change in voting premium, which was used by Karakaş and Mohseni (2021) and Gurun and Karakaş (2021). The monthly average of percent change in voting premium was found to be 1.6%. The average level of shareholdings by the NPS was 3.49%, but that of majority shareholders was found to be 41.89%. The level NPS ownership was 3.49% on average, but 31.4% of the voting premium samples belonged to the stocks in which the NPS held more than 5% of shares. This sample indicates that a single institution holds more than 5% of the stocks for many firms. The ratio of shareholding by foreign investors was found to be 18% on average, and Chaebol companies in our sample accounted for 50%.

2. Relationship between NPS shares and voting premium

The baseline model analyzes whether the shareholdings by the NPS affect the percentage change in voting premium, even after controlling the characteristics of each company. This baseline model consists of the following.

$$\Delta VP_{i,t-1:t} = \alpha + \beta NPS_{i,t-1} + \gamma controls_{i,t-1} + \epsilon \tag{4}$$

In the above equation, the dependent variable $\Delta VP_{i,t-1:t}$ represents the percent change in the voting premium at the month t, compared to the voting premium of the previous time. $NPS_{i,t-1}$ indicates the equity ratio of NPS for Company i that was last reported one month ago. Control variables encompass the shares of the largest shareholder and affiliate persons, relative equity ratio, relative trading volume ratio, book to market ratio, leverage, asset, ROA, market cap, dividend rate, ratio of foreign investors' shareholdings, and Chaebol dummy. In addition, the above formula includes the KIC-3digit industry fixed effect and the fixed effect for each month. This analysis focuses on the value of β. If the value of β shows a statistically significant negative value, it can be assumed that the shareholdings by the NPS have an effect of lowering the voting premium on average. The estimation result of the above equation can be found in Table 3.

In all models, the coefficients of NPS ownership, the value of β are negative and are statistically significant. This means that the voting rights premium has a negative relationship with the shareholdings by the NPS. This result is consistent with Hauser and Lauterbach's (2004) findings, and pension

[4]According to previous studies, Table 2 indicated 62%, but a min value was negative (−0.99). Therefore, if only the positive value of voting premium defined in this study is used, approximately 80% is judged to be not significantly different. In addition, Chung and Kim used data from 1992 to 1993. In this sense, it is difficult to compare due to the gap in time between the data.

Table 1. Variable descriptions

Variables	Descriptions
Value of voting right	
Voting premium (%)	Difference value between common stock closed price and preferred stock closed price to prefer stock closed price
Price change of voting right	1-month change ratio of voting
NPS shareholdings	
NPS ownership (%)	End-of-month equity ratio of NPS obtained from DART
NPS 5% dummy	It takes value of 1 if the NPS hold 5% or more the voting right of the firm, and zero otherwise
Largest shareholder holdings (%)	Shares held by major shareholders and related parties
Control variables	
Equity ratio (common stock/ prefer stock)	Equity issued by commons stock/equity issued by prefer stock
Book to market	(Asset – liability – equity issued by prefer stock)/market value
Volume ratio (common stock/ prefer stock)	Monthly average value of trading volume of common stock to trading volume of prefer stock
Leverage ratio (%)	Leverage
Asset (10 billion won)	Asset
ROA	Net return on asset
Foreigners holdings ratio (%)	End-of-month equity ratio of foreign investors
Market cap (10 billion won)	End-of-month market capital
Dividend rate (%)	Dividend rate
Chaebol dummy	It takes value of 1 if the firm belong to Chaebol constituents and zero otherwise

This table presents variables used in this study, and explanations.

Table 2. Summary statistics

	Count	Mean	SD	p25	p50	p75
Value of voting right						
Voting ratio (%)	6,917	80.495	52.652	42.602	72.209	113.306
Percent change in voting premium	6,736	0.016	0.269	−0.089	−0.008	0.076
NPS shareholdings						
NPS ownership (%)	6,917	3.494	5.183	0.000	0.000	9.969
NPS 5% dummy	6,917	0.317	0.465	0.000	0.000	1.000
Majority shareholder holdings (%)	6,917	41.819	16.654	29.793	39.669	52.542
Control variables						
Equity ratio (common stock/prefer stock)	6,917	205.335	744.122	8.686	14.843	43.185
Book to market	6,917	0.180	0.337	0.028	0.067	0.149
Volume ratio (common stock/prefer stock)	6,917	0.190	0.486	0.018	0.052	0.134
Leverage ratio (%)	6,917	229.339	282.375	59.760	134.910	221.330
Asset (10 billion won)	6,917	1,890.614	4,336.877	105.266	361.857	1,686.812
ROA	6,917	4.093	3.981	1.510	3.550	5.680
Foreigners holdings ratio (%)	6,917	18.227	17.110	4.638	13.451	26.492
Market cap (10 billion won)	6,917	867.769	3,796.384	29.581	102.736	477.669
Dividend rate (%)	6,917	1.528	1.483	0.420	1.120	2.160
Chaebol dummy	6,917	0.504	0.500	0.000	1.000	1.000

This table presents summary statistics of our samples. The variables in this study are calculated and used based on the description in Table 1. The data in this study are company-month data for a total of eight years from June 2013 to June 2021. The data used in this study are winsorized values at the 1% level.

fund's shareholding is a factor in lowering the voting price. There are three possible explanations for this result.

First, the effect of lowering the voting premium via NPS shareholding may be an effect of liquidity constraints. As of the end of 2020, NPS owned more than 5% of the shares of about 267 companies. Existing studies show that decreased liquidity in preferred stock increases transaction costs and necessitates higher returns (Chay and Mun, 2005). Investors prioritize voting rights over short-term gains, affecting liquidity for such stocks (Neumann, 2003; Kind and Poltera, 2013). With NPS's substantial

Table 3. Baseline regression result: percent change in voting premium and NPS ownership

	(1) Percent change in voting premium [t]	(2) Percent change in voting premium [t]	(3) Percent change in voting premium [t]
NPS ownership [$t-1$]	**−0.212*** (−2.663)**		
NPS 5% dummy [$t-1$]		**−0.022** (−2.581)**	
NPS 10% dummy [$t-1$]			**−0.023*** (−2.686)**
Constant	0.389** (2.305)	0.392** (2.316)	0.366** (2.215)
Controls	Yes	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes	Yes
Month fixed effect	Yes	Yes	Yes
N	6,736	6,736	6,736
adj. R^2	0.076	0.076	0.076

This table presents regression analysis outcomes on the NPS's equity ratio and voting premium changes, detailed in Table 1. Column (1) features the NPS equity ratio; column (2) introduces a dummy for ratios over 5%, set to 1 for NPS equity ratios of 5% or higher and 0 otherwise; column (3) applies the NPS 10% dummy. T-statistics, based on double-clustered standard errors by company and month, are in parentheses. The study controls for KSIC 3-digit industry and monthly effects. Significance levels are * for 10%, ** for 5%, and *** for 1%. For detailed results on control variables, refer to Internet Appendix A1.

investments across companies, its high shareholding rate impacts common stock liquidity, raising transaction costs and lowering stock prices. A notable finding is the negative significance of the volume ratio, indicating that higher trading volumes of preferred stocks lower the voting premium, aligning with Chay and Mun (2005) on liquidity's impact on voting premiums.

Next, the voting price may be lowered due to the monitoring function of the NPS. Hauser and Lauterbach (2004) reported that if institutional investors hold more stock, there may be more disturbances concerning compensation paid to majority holders. Zingales (1994) argued that there was a relationship between the private benefit of the controlling shareholder and the voting price, and that the higher the private benefit, the higher the value of the voting right. Since the NPS can monitor or check these private benefits through voting rights, it can lower the voting price. For instance, the NPS opposed increasing the remuneration limit for executives around 2020. This was to check excessive remuneration by opposing the increase in the limits, bonuses, and retirement allowances for executives. Due to this, the equity ratio of the NPS appears to serve a role in reducing the private benefits of controlling shareholders in companies, thus lowering the voting price. Furthermore, the increase in foreign investors was found to contribute to lower private benefits, and accordingly, a lower voting premium. These results appear to underpin the study and monitoring hypothesis by Hauser and Lauterbach (2004).

Finally, the voting price effect can be explained based on the possibility of mergers and acquisitions (M&A). According to Rydqvist (1996), the higher the probability of corporate governance being dispersed or hostile M&As, the higher the voting premium. In other words, when the shares of aggressive institutional investors increase, the voting premium increases (Kalay *et al.*, 2014). For example, Kalay *et al.* (2014) reported that the price of voting rights increased from 0.11 to 0.18% with the disclosure of hedge fund activism, and up to 0.22% with the disclosure of M&As. However, the NPS does not directly attempt M&A. In Korea, hostile M&A cases are rare to find, and there are cases where the NPS defended against hostile takeovers in the past for some special institutions. Because of this aspect, investors may expect the NPS to defend management rights, and as a result, the voting premium may be lowered.

3. Economic pathway analysis

The above-described relationship between the equity ratio of the NPS and the voting premium can be explained by three hypotheses. Among these three hypotheses, which pathway is the right one? To answer these questions, we conducted an analysis using the most feasible economic pathways.

3.1 Liquidity

Previous studies (Neumann, 2003; Ødegaard, 2007) argue that the value of the voting premium can change when liquidity constraints exist. Institutional investors, excluding hedge funds and focusing on long-term gains, often prioritize corporate voting rights over short-term returns. The NPS, targeting long-term investments, avoids frequent transactions for investments over 5% to prevent the burden of mandatory disclosures. This approach leads to a reduction in the number of tradable stocks, thus affecting liquidity. Such a decrease in trading volumes due to shareholding lowers liquidity, prompting investors to demand higher premiums for the associated risks, consequently depressing stock prices (O'Hara, 2003). Confirming this, studies on market microstructure and asset pricing (Chordia *et al.*, 2002; Pástor and Stambaugh, 2003; Bekaert *et al.*, 2007; Chang *et al.*, 2017) indicate that lower prices for stocks with voting rights result in a diminished voting premium.

From this point of view, we separated low float and high float stocks based on float stock, and analyzed the baseline model, to show that the shareholdings by the NPS can affect the voting premium by reducing the number of tradable stocks. Here, float stock means the number of tradable stocks in the market. In general, the number of tradable stocks in the market excludes the number of undisclosed or non-tradable stocks among the total number of stocks issued by companies. The important information is the number of stocks that cannot be traded. Non-tradable stocks include those held by major shareholders and stakeholders, the company's treasury stocks, stocks owned by the employee stock ownership association, and government stocks. Conversely, the shares of NPS are not classified as non-tradable stocks. If there are many non-tradable stocks, the voting premium will decrease as the equity of the NPS increases. This can be analyzed using the interaction term between the float rate small, the NPS 5% dummy, and the holding rate, as shown in the formula below. The low float rate dummy is set to 1 if the stock's float rate is less than the median among samples, and 0 otherwise.

$$\begin{aligned}\Delta VP_{i,t-1:t} = {} & \alpha + \beta_1 NPS_{i,t-1} + \beta_2 NPS_{i,t-1} \times low\ Float\ rate \\ & + \beta_3 low\ Float\ rate + \gamma controls_{i,t-1} + \epsilon\end{aligned} \tag{5}$$

In the above equation, β_2 is the coefficient value on which we focus; if there is a statistically significant negative value, it shows that the smaller the number of float stocks, the greater the effect of shareholding by the NPS. The results of this analysis are shown in Table 4.

In Table 4, column (1) indicates the analysis results based on the NPS holding rate, and column (2) shows the analysis results based on the NPS 5% dummy. Both columns showed statistically significant negative values. In the case of the 5% dummy, a significant result appears as −0.024. This result means that if the NPS holds stocks with low float rates, the voting premium would decrease by 2.4%.

Such results show that liquidity is an important explanatory factor, as indicated by Ødegaard (2007), who focused on Italian stocks and showed that the relative bid-ask spreads are an important factor in explaining the difference between F class stocks that foreigners can buy, and A class stocks with full voting rights. Fatemi and Krahnen (2000) also showed consistent results: the voting premium was high when liquidity was high in the common stock market. These results are confirmed even after controlling variables that have not been considered in previous studies, indicating that the ratio of tradable stocks is an important variable in explaining the change in the voting premium.

What is the transaction turnover rate of the NPS? As a result of analyzing the sample in these data, the monthly average turnover ratio of the stocks in which NPS holds more than 5% of shares of the companies corresponded to 1.1% of the total monthly average turnover ratio. In other words, among the total average monthly turnover ratio of the study sample, only 1.1% of the turnover rate of the stocks was handled. Of these, the average was 5.8% when excluding stocks without NPS's trading. In other words, turnover of NPS accounts for only a part of the monthly trading volume.[5]

[5]This is the result of analyzing the transaction turnover rate of common stock among the samples in which common stock and preferred stock exist in this study. Average turnover of stocks was produced in the average monthly turnover by

Table 4. Regression results: economic pathway (liquidity and NPS holdings)

	Percent change in voting premium (1)	Percent change in voting premium (2)
Low float rate	0.017	0.018
	(1.406)	(1.510)
NPS ownership [$t-1$]	−0.136	
	(−1.650)	
Low float rate × NPS ownership [$t-1$]	**−0.200****	
	(−2.071)	
NPS 5% dummy [$t-1$]		−0.012
		(−1.433)
Low float rate NPS 5% dummy [$t-1$]		**−0.024****
		(−2.264)
Controls	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes
Month fixed effect	Yes	Yes
N	6,736	6,736
adj. R^2	0.076	0.076

The table shows the analysis results of how the interaction term between the dummy of low float rate stock and NPS ownership affects the percent change of voting premium. Low float stock used in this study is based on the monthly median of float stocks for each stock, dividing stocks with high and low float rate stocks; a variable in which there is 1 for low stocks and 0 otherwise, and NPS ownership were used. In this analysis, the variables in Table 3 are used as control variables, and the results of controlling KIC-3digit industry fixed effects and month fixed effects are shown. In parentheses, the *t*-statistic calculated based on the standard error which was double-clustered by company and month is reported. * indicates significance at the 10% level; ** shows significance at the 5% level; *** indicates significance at the 1% level.

3.2 Monitoring and private benefit

Due to the monitoring function of the NPS, the private benefit of controlling shareholders may decrease, leading to a lower voting premium. If the reduced private benefit is the main cause, the greater the shareholder activity of the NPS, the greater an effect this will have. Therefore, we analyzed this by considering the time when the NPS declared the stewardship code on 30 July 2018.

The National Pension Fund Management Committee introduced the stewardship code on 30 July 2018, and renamed the existing guidelines for exercising voting rights to the guidelines for fiduciary duties.[6] According to the data regarding the introduction of the stewardship code published by the Ministry of Health and Welfare of South Korea, the National Pension Fund Management Committee announced that it would introduce its own stewardship code, in order to enhance the long-term profits of the fund and facilitate independence and transparency with regard to shareholder rights. It also revealed a plan to actively exercise shareholder rights against corporations that had damaged company values (Ministry of Health and Welfare, 2018).[7] Such an announcement by the National Pension Fund Management Committee may affect the private interests of controlling shareholders.

Controlling shareholders have financial and non-financial interests. In terms of financial interests, people can serve as executives or enjoy pecuniary benefits through dividends; as for non-pecuniary benefits, the controlling shareholder may use a company's private car or have a spacious office. For example, Daewoo E&C leased the 23rd floor of the Namsan Hilton Hotel for 25 years at a low

calculating daily turnover. The average turnover of the sample in this study is 0.67%, which means that 0.67% of the total number of issued shares per day is traded on average. On the other hand, the turnover of the NPS is 0.006% per day, which is a low level among the total number of issued shares. This result indicates a low level (0.02%) compared to the total turnover, considering that even if there is a transaction of the NPS.

[6]The history of NPS trustee activities can be found online on the organization's website. See Natioanl Pension Service Investment Management (2022a) https://fund.nps.or.kr/jsppage/fund/mcs/mcs_06_03.jsp

[7]These data disclose the matters decided by the National Pension Fund Management Committee, and detailed information can be found at the following link of the Ministry of Health and Welfare. http://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&page=1&CONT_SEQ=345546&SEARCHKEY=TITLE&SEARCHVALUE=%EC%8A%A4%ED%8A%9C%EC%96%B4%EB%93%9C

price, with no rational reason.[8] As shown in this case, if the controlling shareholder defrauds financial or non-financial private interests, minority shareholders may suffer losses; however, the NPS announcement can directly reduce such private interests through its shareholder activities.

In this analysis, we construct a *Stewardship code* indicator that takes the value of one if the calendar time of data after 30 July 2018, when the stewardship code was introduced, and zero otherwise. With the help of the stewardship code variable, we make a model that is a little bit different from the baseline model. This model is composed as follows.

$$\begin{aligned}\Delta VP_{i,t-1:t} = \alpha + \beta_1 NPS_{i,t-1} + \beta_2 NPS_{i,t-1} \times Stewardship\ code \\ + \beta_3 Stewardship\ code + \gamma controls_{i,t-1} + \epsilon\end{aligned} \tag{6}$$

The above model focuses on the term of β_2. Here, the term of β_2 indicates the differences in the value of voting rights of company shares held by the NPS, compared to those not held by the NPS, after the stewardship code introduction. If the value of β_2 is statistically significant negative, it means that the voting premium was further lowered after the NPS's announcement of introducing the stewardship code. In other words, the stewardship code introduction can reduce the exploitation of private benefits, leading to a lower voting premium. The analysis results of this model are shown in Table 5.

Table 5 shows the lower voting premium of stocks held by the NPS, after the announcement of introducing the stewardship code. The coefficient of *Stewardship code* × *NPS ownership*, which is the result of Difference in difference, is −0.353, which is statistically significant within 5%. This result is the same even if the 5% NPS dummy variable is used. This result shows that, like the liquidity pathway, the pathway to fewer private benefits is an economic pathway that can explain the relationship between the shareholding by the NPS and the lower voting premium.

3.3 Takeover defense

The final factor that can explain the NPS voting premium is the possibility of hostile M&As. The value of voting premium increases when management disputes arise (Shleifer and Vishny, 1986; Zingales, 1994; Rydqvist, 1996). In case of a dispute over management rights, more voting rights are required to take control of the company. In short, the demand for voting rights increases, leading to the higher price of voting rights, and as a result, an increase in the voting premium. Damodaran (2012) also argued that the value of the voting premium rose, as the likelihood of a firm's control changing increased.

Such hypotheses have also been verified through empirical analysis. In Canada, the higher the acquisition risks, the higher the voting stock price (Smith and Amoako-Adu, 1995). This also has been studied in other countries; Nenova (2003) showed that the value of the voting premium decreased when there were more laws related to acquisition regulations and investor protection. These results show that the voting premium is closely related to M&As.

However, in terms of the relationship between NPS shareholding and control contests in the Korean market, there is a structural inappropriateness due to several reasons. First, it is rare to find cases of control contests in the Korean market. According to the Korea Capital Market Institute, the number of M&As in Korea is lower than that of the United States and other countries; among them, the cases in which listed companies are subject to an acquisition reach only around 11% (Choi and Kim, 2017). Furthermore, it is rare to find hostile Korean M&As, and the voting rights market is known to be vulnerable compared to other countries (Park *et al.*, 2017). As such, in a market in which control contests rarely take place, there is difficulty in increasing the voting premium due to

[8]Daewoo Chairman Kim Woo-joong leased the 23rd floor of the Millennium Hilton Hotel owned by Daewoo E&C, and then CDL Hotel Korea, which took over the hotel, filed a civil lawsuit for unfair trade practices. In this case, the court ruled in favor of CDL Hotel Korea and reached a verdict that there was preferential treatment for property regardless of the position of chairman. See Kim (2008) https://www.koreatimes.co.kr/www/nation/2022/02/113_25899.html?KK

Table 5. Regression results: economic pathway (monitoring; the stewardship code effect)

	(1) Change rate of voting ratio [t]	(2) Change rate of voting ratio [t]
Stewardship code	0.015	0.016
	(0.338)	(0.354)
NPS ownership [$t-1$]	−0.138	
	(−1.252)	
Stewardship code × NPS ownership [$t-1$]	**−0.353****	
	(−2.117)	
NPS 5% dummy [$t-1$]		−0.012
		(−1.009)
Stewardship code × NPS 5% dummy [$t-1$]		**−0.041****
		(−2.211)
Controls	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes
Month fixed effect	Yes	Yes
N	6,736	6,736
adj. R^2	0.076	0.076

This table shows the difference analysis results before and after the announcement of the stewardship code of the NPS. The stewardship code was decided by the National Pension Fund Management Committee on 30 July 2018. In this study, the analysis was performed using a dummy variable that sets 1 for the case after the announcement of the stewardship code, and to 0 otherwise. As for column (1), we used the equity ratio of the NPS, and for column (2), we used the 5% dummy of the NPS. Each column is controlled by using control variables in Table 2, as well as additional control over the KSIC 3-digit industry and monthly fixed effects. In parentheses, the t-statistic calculated based on the standard error which was double-clustered by company and month is reported. * indicates significance at the 10% level; ** shows significance at the 5% level; *** indicates significance at the 1% level.

concerns about M&As. Second, the voting premium is known to be highly related to concerns about the change in management rights. On the other hand, the NPS shareholding aims for long-term investment, not the change of management rights.[9] Recently, as the importance of its fiduciary duties has been emphasized, the NPS has been exercising its voting rights, but it does not directly operate companies after taking over. In this respect, NPS shareholding does not increase the probability of triggering a control contest. For this reason, it is also difficult to generate a voting premium.

Although the Korean market and the NPS shareholding are not generally compatible with the control contest pathway, there are some situations in which this pathway becomes relevant: for example, when foreign investors attempt hostile takeovers, or when the NPS act as white knight for companies facing control contests. In addition, most hostile M&A cases or cases challenging management rights in the Korean market were brought about by foreign investors: management disputes between Sovereign Fund and SK Group, between Carl Icahn and KT&G, and between Samsung and Elliott.[10] In this sense, as Korean investors may perceive foreign investors as relatively activist funds or activist investors, there may be effects similar to those in control contests. In addition, existing controlling shareholders may be more likely to lose their management rights to foreign investors. If so, when foreign investors' ownership is high and controlling shareholder's equity ratio is low, the effect can be examined based on the level of shareholding by the NPS. Therefore, in this analysis, the threshold probability value used in Park *et al.* (2012) was employed. The threshold probability value is a methodology that analyzes what percentage of the remaining shareholders must agree to win the voting competition when foreign investors compete with the controlling shareholder for voting rights, and its equation can be found as follows.

$$Critical\ Ratio_{i,t} = \frac{(0.5 - Foreign_{i,t})}{(1 - Foreign_{i,t} - Major\ Shareholder_{i,t})} \tag{7}$$

[9]According to the NPS Investment Management Principles, the NPS is oriented toward long-term investment. See Natioanl Pension Service Investment Management (2022b).

[10]According to Park *et al.* (2017), there is also the view that the Carl Icahn Fund and KT&G showed the behavior of shareholder participation.

In the above equation (7), the 'Critical Ratio' is the threshold probability value. In other words, what percentage of the remaining shareholders must agree for foreign investors to successfully exercise their voting rights? 'Foreign' refers to the equity ratio of foreign investors, and 'Major shareholder' refers to the shares of the controlling shareholder and affiliated persons.

In this analysis, the calculated critical ratio can be divided into low and high based on the monthly median. Then, by categorizing the samples with low and high critical ratios, we conduct subsample analysis. The analysis results can be found in Table 6.

In Table 6, the first column is a sample with a critical ratio smaller than the median value. In other words, they are the samples in which foreign investors can have a greater effect when a small percentage of the remaining shareholders agree. As a result, the proportion of shareholding by the NPS does not have a statistically significant effect on the voting premium. On the other hand, in the second column there are the samples with high critical ratios, indicating that there is a negative significant relationship between the proportion of shareholding by the NPS and the voting premium. In the samples with a relatively low probability of takeover by foreign investors, the proportion of shareholding by the NPS affects the voting premium. This means that the proportion of shareholding by the NPS does not occur where the probability of triggering a control contest is high.

4. Robust analysis

In this study, we investigated the economic pathways that explain the relationship between the shareholding by the NPS and the lower voting premium. Among them, liquidity constraints and the reduction of private benefits through monitoring were found to be the most highly feasible pathways. We analyzed which pathway had more explanatory power through additional robustness analysis.

4.1 NPS effect with governance rating

There may be some opinion differences on how to explain the monitoring pathway of the NPS concerning the stewardship code. As the scale of the NPS continues to increase, impacts on market liquidity cannot be neglected. Figure 1 shows the stock investment scale of the NPS in Korea and the market capitalization of the stock market per year.

The stock investment scale of the NPS has grown continuously since 2013, accounting for approximately 9% of the entire stock market in 2020. This scale has been growing since 2018, and consequently it is difficult to exclude all the effects on liquidity compared to the market size.

In order to solve this problem, we conducted a subsample analysis using the corporate governance rating provided by the Korea Corporate Governance Service (KCGS) and analyzed whether NPS equity affected the voting premium as a pathway to reduce private profits.

Accurate analysis requires information on the governance rating used by the NPS. However, the NPS does not publish a governance rating. If there are nationally used governance ratings, these can be used as a proxy variable for NPS's governance rating, and in Korea, this problem can be solved by using the KCGS rating.

According to Jang (2021), KCGS is a non-profit corporation relying on donation income in which Korea Exchange accounts for 60%, Korea Securities Depository for 21%, Korea Securities Finance Corporation for 10%, and Korea Financial Investment Association for 5%. Since most donor institutions of KCGS are on the public side, it was possible to judge based on representative ratings for investors. In addition, KCGS has announced plans to evaluate governance and its ratings across the longest period in the Korean market. KCSG evaluations dominate in the market, and it is generally viewed as a practical public evaluation agency (Jang, 2021).[11] If KCGS data are used, it is possible to analyze using representative ratings.

[11]According to Jang (2021), KCGS has dominated in the Korean market as it was difficult for companies with new ESG and governance evaluation to enter the market. In addition, since most donor institutions are on the public side, it was

Table 6. Subsample regression: economic pathway (takeover defense; critical probability)

Dependent variable: percent change in voting premium	(1) Low critical probability	(2) High critical probability
NPS ownership [$t-1$]	**−0.161**	**−0.276****
	(−1.385)	**(−2.545)**
Largest shareholder's holding [$t-1$]	**0.002****	**0.002**
	(2.529)	**(1.042)**
Constant	0.144	−0.027
	(0.721)	(−0.118)
Controls	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes
Month fixed effect	Yes	Yes
N	2,402	2,346
adj. R^2	0.118	0.080

This table shows the subsample analysis results based on the critical probability of the baseline model in Table 3. Low critical probability is calculated with (0.5–foreigner shareholders)/(1–foreigners shareholders–largest shareholder's holding) to consider foreign investors while using the threshold probability value used in Park *et al.* (2012). This value means how many percent of the remaining shareholders must agree to win the voting right competition when foreign investors compete for voting rights with the controlling shareholder. In other words, it shows that the lower the critical probability has, the higher possibility that the competition for voting rights will intensify. The control variables in this table are the same as those of the existing baseline model, and KIC-3digit industry fixed effects and month fixed effects are reflected. The parentheses in this table indicate the *t*-statistic, and this value indicates the value calculated by Petersen's two-way clustering standard error. * indicates statistical significance at the 10% level, ** shows statistical significance at the 5% level, and *** refers to statistically significant at the less than 1% level. For detailed results on control variables, see Internet Appendix A2.

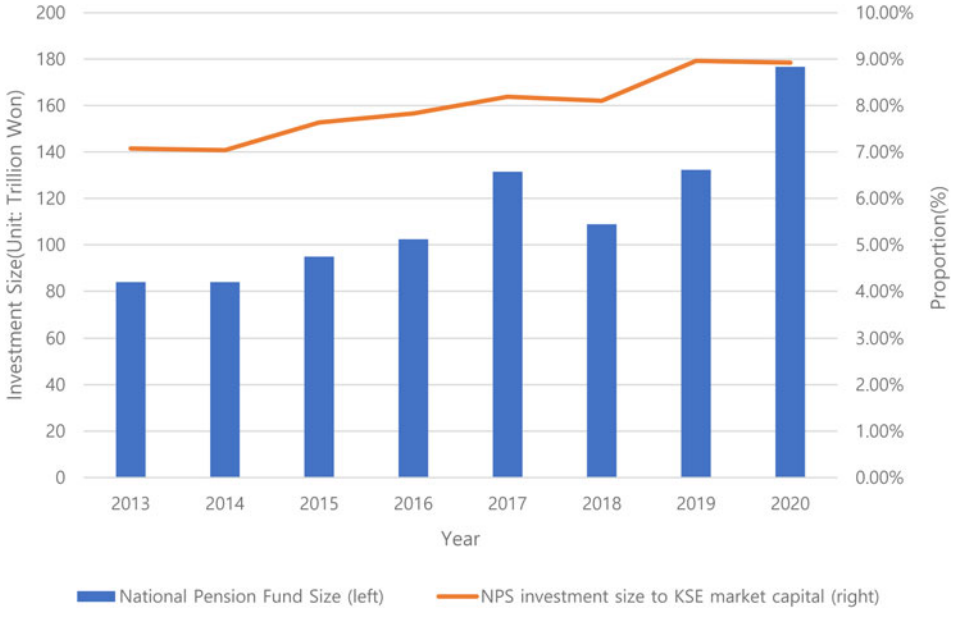

Figure 1. NPS size to Korea total market capital. This figure illustrates the scale of the NPS at the end of the year and the equity ratio of the NPS in the Korean stock market.

We conducted our analysis while assuming that corporations with lower governance ratings would have higher private interests, and there would subsequently be a stronger monitoring function by the NPS. If the investment by the NPS reduces the private interests of controlling shareholders, the effect

possible to judge based on representative ratings for investors. For this reason, the rating of KCGS has a high influence on the rating and structure of other investment institutions.

of NPS ownership will be more evident in companies with poor governance. Accordingly, a subsample analysis based on the governance structure was performed, as shown in the table below.

Table 7 is an analyzed model dividing the baseline model implemented in Table 3, based on the corporate governance ratings obtained through KCGS. KCGS classifies the corporate governance structure of the evaluation target companies into ratings of A+, A, B+, B, C, and D, and evaluates companies with higher than a B+ rating as having good governance structure. By setting the rating higher than B+ as a good governance structure in our analysis, panel A of Table 7 shows that there were statistically significant negative results in columns (2) and (4). The result indicates that the investment by the NPS can lower the voting premium for companies with better governance. In addition, in panel B we classified and analyzed the existing diff-in-diff method based on the governance structure. As a result, identical to the previous result, the equity ratio of the NPS following the stewardship code lowered the voting premium under good governance. According to the private benefit hypothesis, there should have been a greater negative effect due to the holding of the NPS in companies with low governance ratings. However, our results showed negative effects for companies with good governance ratings. Both results are difficult to explain with the lower voting premium through the above-described fewer private benefits.

What is the relationship between the NPS and voting premium for each governance rating? To answer this, we conducted a subsample regression analysis based on each governance rating, as shown in the table below.

According to Table 8, the significant results at the 1 and 10% were found in B+ and B ratings. However, it is difficult to explain the relationship with the voting premium based on the governance rating, as the results show that the effect and statistical significance decrease in the B rating. In other words, the shareholding by the NPS does not further reduce the voting premium of companies with poor governance, and the results indicate that this effect is not caused by reduced private benefits.

We further utilized dividends to analyze the relationship between the NPS's shareholding and the voting premium to dissect the pathway of private benefits. Our analysis found no significant results between the voting premium and NPS's shareholding within the group expected to have relatively larger private benefits. For a detailed explanation of the related analysis, please refer to Internet Appendices A3 and Table A3-1.

4.2 Stock illiquidity and pension fund shareholding

From the previous analysis results, liquidity seems to have the most explanatory power among the pathways in which NPS shareholding affects the voting premium. If the liquidity pathway can explain a decrease in the voting premium, then stocks with relatively insufficient liquidity can lead to further decrease in the voting premium. Considering that, we conducted an additional analysis on the relationship between public pension fund shareholding and the voting premium according to the illiquidity of individual stocks.

We calculated the monthly average of amihud illiquidity of each stock, and the calculation method is as follows.

$$Amihud_{i,t} = \frac{|r_{i,t}|}{DVol_{i,t}} \tag{8}$$

First, $Amihud_{i,t}$ refers to the amihud illiquidity of i stock at the time t. The numerator, $|r_{i,t}|$, refers to the absolute return of the i stock on the day of t. The denominator, $DVol_{i,t}$, refers to the dollar volume of the i stock at the time t. Won Volume is used for Korean currency (won). After calculating the monthly average of $Amihud_{i,t}$, the amihud illiquidity of a monthly basis is used.

Based on the calculated amihud illiquidity, the sample was divided into three groups.[12] We classified the group with low amihud illiquidity as 'Low', the high group as 'High', and the rest as 'Mid'.

[12]The criteria of third division were divided by 33% based on the monthly percentile.

Table 7. Robust analysis: regression by governance rating

Panel A. Subsample regression for good governance and bad governance

	Bad governance (1) Change rate of voting ratio [t]	Good governance (2) Change rate of voting ratio [t]	Bad governance (3) Change rate of voting ratio [t]	Good governance (4) Change rate of voting ratio [t]
NPS 5% dummy [$t-1$]	**−0.020**	**−0.029****		
	(−1.451)	**(−2.283)**		
NPS ownership [$t-1$]			**−0.197**	**−0.299****
			(−1.609)	**(−2.455)**
Controls	Yes	**Yes**	Yes	**Yes**
KSIC-3digit fixed effect	Yes	**Yes**	Yes	**Yes**
Month fixed effect	Yes	**Yes**	Yes	**Yes**
N	3,506	**2,875**	3,506	**2,875**
adj. R^2	0.080	**0.079**	0.080	**0.079**

Panel B. Subsample diff-in-diff analysis

	Bad governance (1)	Good governance (2)	Bad governance (3)	Good governance (4)
Stewardship code	−0.009	0.033	−0.009	0.032
	(−0.168)	(0.876)	(−0.160)	(0.866)
NPS ownership [$t-1$]	−0.164	−0.261*		
	(−1.211)	(−1.957)		
Stewardship code × NPS ownership [$t-1$]	**−0.111**	**−0.360****		
	(−0.777)	**(−2.077)**		
NPS 5% dummy [$t-1$]			−0.015	−0.025*
			(−1.057)	(−1.805)
Stewardship code × NPS 5% dummy [$t-1$]			−0.014	−0.040**
			(−0.861)	(−2.155)
Controls	Yes	Yes	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
N	3,506	2,875	3,506	2,875
adj. R^2	0.017	0.012	0.016	0.012

The table below shows the results of the analysis of Table 5 according to the governance rating. In Table A below, the analysis was performed using each governance rating; B+ or higher was classified as good governance, otherwise, it was classified as bad governance. Panel B shows the results of the stewardship code diff-in-diff conducted in Table 5, between good governance and bad governance.

Subsample regression analysis was performed for each classified sample. The regression model was as follows, with similarities to the main model.

$$\Delta VP_{i,t-1:t} = \alpha + \beta_1 NPS_{i,t-1} + \beta_2 NPS_{i,t-1} \times Float\ Rate_{i,t-1} + \beta_3 Float\ Rate_{i,t-1} + \gamma controls_{i,t-1} \quad (9)$$

In the above equation, our focus was β_2 of $\beta_2 NPS_{i,t-1} \times Float\ Rate_{i,t-1}$. In other words, if the coefficient value of the interaction term between NPS shareholding and the ratio of stocks with circulation possibility is statistically significantly positive, it means that the voting premium decreases as the ratio of stocks with untradable. In particular, if the effect increases at High among the subsamples divided by the monthly amihud illiquidity, the higher illiquidity of individual stocks indicates a greater influence exerted by the NPS and the float rate on the lower voting premium. Table 9 shows the results of the subsample regression analysis.

In Table 9's third column, the stocks with High amihud illiquidity had significantly positive results. This result shows that the lower the float rate, the greater effect the shareholding by the NPS has on the voting premium; it can be clearly found in the stocks with high illiquidity. In other words, it provides clear evidence of the relationship between the NPS and the voting premium due to illiquidity.

Table 8. Robust analysis: which rating affected by NPS holdings

Governance rating	(1) A+	(2) A	(3) B+	(4) B	(5) C
NPS ownership [$t-1$]	67.868	−0.378*	**−0.427*** **	**−0.320***	−0.006
	(1.678)	(−1.720)	**(−3.161)**	**(−1.947)**	(−0.037)
Controls	Yes	Yes	Yes	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes	Yes	Yes	Yes
Month fixed effect	Yes	Yes	Yes	Yes	Yes
N	170	871	1,763	2,235	1,181
adj. R^2	0.116	0.052	0.087	0.097	0.064

This table shows the results of subsample regression according to the governance rating announced by KCGS. The model used in the analysis below is the same model as the main model in Table 3. The control variables used in this table are the same as those of the existing baseline model, and the KIC-3digit industry fixed effect and month fixed effect are reflected. The parentheses in this table indicate the *t* statistic, and this value indicates the value calculated by Petersen's two-way clustering standard error. * indicates statistical significance at the 10% level; ** means statistical significance at the 5% level; *** shows statistical significance at the less than 1% level.

Table 9. Robust analysis: subsample regression (float rate and amihud illiquidity)

Dependent variable: percent change of voting premium	(1) Low amihud illiquidity	(2) Mid amihud illiquidity	(3) High amihud illiquidity
NPS 5% dummy [$t-1$]	**−0.081**	**−0.102****	**−0.333****
	(−0.852)	**(−2.190)**	**(−2.456)**
Float rate [$t-1$]	0.001	−0.001	−0.001
	(1.168)	(−0.409)	(−0.585)
NPS 5% dummy [$t-1$] × float rate [$t-1$]	**0.001**	**0.001**	**0.006****
	(0.867)	**(1.325)**	**(2.150)**
Controls	Yes	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes	Yes
Month fixed effect	Yes	Yes	Yes
N	2,291	2,239	2,200
adj. R^2	0.213	0.109	0.089

This table shows the subsample analysis results based on the amihud illiquidity. The control variables in this table are the same as those of the existing baseline model, and the KIC-3digit industry fixed effect and month fixed effect are reflected. The parentheses in this table indicate the *t* statistic, and this value indicates the value calculated by Petersen's two-way clustering standard error. * means statistical significance at the 10% level; ** shows statistical significance at the 5% level; *** indicates statistical significance at the less than 1% level.

In our analysis, we explored whether stocks held by the NPS are characterized by lower liquidity. To examine the liquidity constraint pathway further, we analyzed the relationship between NPS's shareholding and stock turnover. Our findings reveal a statistically significant negative relationship between turnover and NPS shareholdings, suggesting that stocks owned by the NPS exhibit lower turnover rates. This supports Hu's (2012) examination of the Asian pension market, which argued that the expansion of the pension market can contribute to lower stock market turnover. For a detailed exposition of this analysis, please refer to Internet Appendix A4 and Table A4-1.

4.3 VKOSPI and COVID-19 analysis

Through previous analysis, we have shown that shareholding by the NPS affects the lower voting premium, and that the liquidity pathway has the most explanatory power. The factors that can affect stock prices and transactions include not only the liquidity of individual stocks, but also the liquidity of the market. In particular, the volatility of emerging markets is high, and the sensitivity to liquidity is also high. Considering these characteristics of emerging countries, we must examine how public pension fund shareholdings exert influences on stock prices and voting premiums when the demand for market liquidity increases. How does NPS ownership affect the voting premium at a time when the market instability increases and the liquidity demand rises? To answer the question, we used Korea's VIX index, the VKOSPI index.

VIX is a volatility index, also called the fear index. Whaley (2009) showed that such an index can illustrate the anxiety level of investors on the market, and the expectation of volatility. According to Nagel (2012), when VIX rises, liquidity demanders are willing to pay more. Nagel (2012) also found that VIX can be the variable that explains the demand for liquidity. Based on this argument, when the VIX index is higher the demand for liquidity increases, resulting in a lower voting premium due to NPS shareholding. To analyze this, we added VKOSPI to the baseline model below to compose the model as follows.

$$\begin{aligned}\Delta VP_{i,t-1:t} = \alpha + \beta_1 NPS_{i,t-1} + \beta_2 NPS_{i,t-1} \times VKOSPI_{i,t-1} \\ + \beta_3 VKOSPI_{i,t-1} + \gamma controls_{i,t-1}\end{aligned} \tag{10}$$

The above model indicates that the VKOSPI level at the $t-1$ month was reflected as an interaction term in the baseline model. Since VKOSPI shows the monthly market level, the analysis was performed except for the monthly fixed effect. The value of β_2 is the value we want to analyze. According to previous studies, if there is a lower voting premium when VKOSPI is higher, the value of β_2 will be negative with significance. Table 10 is the result of analyzing the model reflecting the VKOSPI index.

As shown in Table 10, the value of coefficient of *NPS* 5% $dummy_{i,t-1} \times VKOSPI_{i,t-1}$, which is β_2, was −0.003, shows significance at 1%. This result implies that when VKOSPI increases, the voting premium of the shares owned by the NPS can decrease significantly. This result is consistent with the outcomes of Nagel (2012), and Bams and Honarvar (2021).

Then, what happens when the market suddenly feels anxious? We recently experienced great volatility in the market due to COVID-19. COVID-19 started in China and its impact quickly spread not only in the Korean market, but also across Asia, America, Europe, and other parts of the world, providing a huge shock to the global financial market.[13] The official announcement of COVID-19 and the number of deaths and confirmed cases are reported to have exerted impacts on the financial market like the VIX (Albulescu, 2020; Just and Echaust, 2020; Onali, 2020). Most studies argued that VIX and COVID-19 had a positive relationship, and these exogenous shocks in the market will appear greater where liquidity is reduced. This effect will also provide an environment in which NPS shareholding can further reduce the voting premium, as shown in Table 10. Therefore, the number of confirmed cases in Korea and the COVID-19 period were used to show how NPS shareholding affected the voting premium when an exogenous market shock occurred.

$$\begin{aligned}\Delta VP_{i,t-1:t} = \alpha + \beta_1 NPS_{i,t-1} + \beta_2 NPS_{i,t-1} \times Log\ covid\ confirm_{i,t-1} \\ + \beta_3 Log\ covid\ confirm_{i,t-1} + \gamma controls_{i,t-1}\end{aligned} \tag{11}$$

By utilizing the baseline model, the above model shows the relationship between the sum of the number of confirmed cases converted to log at the $t-1$ month, and the NPS shareholding at the $t-1$ month. If β_2 is negatively significant in the above model, it can be interpreted that shareholding by the NPS contributes to a lower voting premium. Table 11 is the result of analyzing the above model.

Columns 1 and 2 in Table 11 are analyses using a dummy variable in which the shareholding by the NPS was set to 1 in the case of equity ratio of 5% or higher, and to 0 otherwise. According to column 1, the interaction term between the log-converted number of confirmed COVID-19 cases and the equity ratio of 5% or higher of the NPS was −0.008, indicating a significant result at 1%. Thus, as the number of COVID-19 confirmed cases increased, the voting premium of companies owned by the NPS decreased. Next, in column 2, the *COVID-Dummy* indicator takes the value of one if the number of confirmed COVID-19 cases is bigger than 0, and zero otherwise. As a result, the coefficient

[13] According to WHO (2020), the coronavirus was named COVID-19 in March 2020, along with the announcement of the pandemic.

Table 10. Robust analysis: liquidity (VKOSPI)

	(1) Percent change of voting premium	(2) Percent change of voting premium
NPS 5% dummy [$t-1$]	0.039*	
	(1.862)	
VKOSPI [$t-1$]	0.004***	0.004***
	(2.691)	(2.670)
NPS 5% dummy [$t-1$] × VKOSPI [$t-1$]	**−0.003*** **	
	(−2.880)	
NPS ownership [$t-1$]		0.342*
		(1.818)
NPS ownership [$t-1$] × VKOSPI [$t-1$]		**−0.031*** **
		(−2.886)
Controls	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes
Month fixed effect	No	No
N	6,736	6,736
adj. R^2	0.025	0.025

This table shows the relationship between the VKOSPI index and the level of shareholding by the NPS. The dependent variable is the change in voting premium. The control variables in this table are the same as those of the existing baseline model, and the KIC-3digit industry fixed effect is reflected. The parentheses in this table indicate the *t* statistic, and this value indicates the value calculated by Petersen's two-way clustering standard error. * means statistical significance at the 10% level; ** shows statistical significance at the 5% level; *** indicates statistical significance at the less than 1% level.

Table 11. Robust analysis: market shock (COVID-19 event)

	(1) Percent change of voting premium	(2) Percent change of voting premium	(3) Percent change of voting premium	(4) Percent change of voting premium
NPS 5% dummy [$t-1$]	−0.008	−0.006		
	(−0.943)	(−0.722)		
Log covid confirms [$t-1$]	0.008**		0.008**	
	(2.484)		(2.504)	
NPS 5% dummy [$t-1$] # log covid confirms [$t-1$]	**−0.008*** **			
	(−2.983)			
Covid dummy [$t-1$]		0.059*		0.059*
		(1.958)		(1.984)
NPS 5% dummy [$t-1$] # covid dummy [$t-1$]		**−0.063*** **		
		(−2.975)		
NPS ownership [$t-1$]			−0.087	−0.071
			(−1.119)	(−0.898)
NPS ownership [$t-1$] # log covid confirms [$t-1$]			**−0.069*** **	
			(−2.987)	
NPS ownership [$t-1$] # covid dummy [$t-1$]				**−0.578*** **
				(−3.048)
Controls	Yes	Yes	Yes	Yes
KSIC-3digit fixed effect	Yes	Yes	Yes	Yes
Month fixed effect	No	No	No	No
N	6,736	6,736	6,736	6,736
adj. R^2	0.025	0.024	0.025	0.024

This table indicates the relationship between the level of shareholding by the NPS and the COVID-19 event. The dependent variable is the percent change of voting premium. Log covid confirms [$t-1$] is the log conversion of the sum of confirmed COVID-19 cases in the past month. Covid dummy is a value expressed as 1 for the month in which COVID-19 occurred, and 0 for the month without the occurrence. The control variables in this table are the same as those of the existing baseline model, and the KIC-3digit industry fixed effect is reflected. The parentheses in this table indicate the *t* statistic, and this value indicates the value calculated by Petersen's two-way clustering standard error. * means statistical significance at the 10% level; ** shows statistical significance at the 5% level; *** indicates statistical significance at the less than 1% level.

value of the interaction term was −0.063, which was significant at 1%. This result means that the voting premium of the shares owned by the NPS (more than 5%) relatively decreased by 0.063 during COVID-19. Additionally, in columns 3 and 4, the analysis was conducted using the NPS shareholding ratio. As a result, the same negative statistical values as in columns 1 and 2 appeared.

Interestingly, these results bear similarity to the analysis results on the VKOSPI level. The results also underpin previous studies (Albulescu, 2020; Onali, 2020) arguing that there was a positive relationship between COVID-19 and the VIX.

5. Conclusion

Using the Korean context, this study provides evidence that shareholding by a national pension fund can affect a company's voting premium. Unlike past studies, we performed analyses that satisfied the linearity by using the rate of change in the voting premium. As a result, we found that NPS shareholding reduced the voting premium. To analyze the economic pathway of the decrease in voting premium, we combined unique market circumstances in Korea and three potential economic pathways. As a result, a shortage of tradable stocks was found after the passive NPS held shares of companies.

We investigated the liquidity pathway, monitoring pathway, and equity ratio competition pathway using Korea's NPS data. As for the effect of the shareholding by the NPS on the voting premium of companies, the liquidity pathway was the most feasible. Furthermore, its feasibility was confirmed to be greater when the illiquidity of individual stocks increased. On the other hand, while the monitoring pathway could explain the voting premium to some extent when analyzing by using the cases before and after the introduction of the stewardship code by the NPS, it was ultimately difficult to support it once we analyzed the governance rating. It was confirmed that these results were identical when analyzed using dividends or corporate governance ratings.

By using the VIX index, VKOSPI, and COVID-19 related data, we also analyzed the effect of the NPS on the voting premium when market volatility or liquidity demand increases. When the VIX index increased, the voting premium of the stocks owned by the NPS decreased; the same result could be obtained in the analysis using the number of confirmed COVID-19 cases.

In this study, the case of the NPS exerting a high influence on the Korean stock market provides valuable insight into the impact of public pension fund investments, not only in Korea but also with implications beyond. The NPS of Korea serves as a successful example of a state-led public pension introduction, transitioning adeptly from traditional bonds to a diversified equity asset approach. This makes the NPS a potential model for emerging economies aiming to stabilize their pension funds through equity asset returns. As similar public pensions in emerging markets become more active and invest in their national capital markets, they will face considerations surrounding shareholders' rights, much like the challenges faced by the NPS. Using the publicly disclosed data of the NPS, we found evidence that domestic investment leads to liquidity constraints and a subsequent decrease in the voting premium. The liquidity constraint effect by the NPS was identified as the primary cause for the decrease in the voting premium. Given the NPS's subpar shareholder activities performance (Lee *et al.*, 2018) and the rarity of M&A cases in Korea, other pathways seemed less plausible. We also highlighted the significance of the NPS's investment behavior, noting that the effect on voting premiums is contingent on market conditions. These findings raise questions for policymakers and companies in emerging markets looking to expand their national pension funds and investments. How should the price of voting rights be managed as public pension funds grow their investments? While there's no straightforward answer, it's evident that this dynamic can profoundly influence the protection of companies' voting rights and liquidity-based pricing in emerging markets. Our research provides insights into the potential ramifications on voting rights' value and market reactions as large-scale pensions, akin to public pensions, venture into investments.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S1474747224000027.

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References

Albulescu C (2020) Coronavirus and financial volatility: 40 days of fasting and fear. *arXiv preprint* arXiv:2003.04005, 1–7. https://doi.org/10.48550/arXiv.2003.04005

Almazan A, Hartzell JC and Starks LT (2005) Active institutional shareholders and costs of monitoring: evidence from executive compensation. *Financial Management* **34**, 5–34. https://doi.org/10.1111/j.1755-053X.2005.tb00116.x

Amihud Y (2002) Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets* **5**, 31–56. https://doi.org/10.1016/S1386-4181(01)00024-6

Bams D and Honarvar I (2021) VIX and liquidity premium. *International Review of Financial Analysis* **74**, 101655. https://doi.org/10.1016/j.irfa.2020.101655

Barber BM (2007) Monitoring the monitor: evaluating CalPERS' activism. *Journal of Investing* **16**, 66–80. https://doi.org/10.3905/joi.2007.698965

Bekaert G, Harvey CR and Lundblad C (2007) Liquidity and expected returns: lessons from emerging markets. *Review of Financial Studies* **20**, 1783–1831. https://doi.org/10.1093/rfs/hhm030

Bena J, Ferreira MA, Matos P and Pires P (2017) Are foreign investors locusts? The long-term effects of foreign institutional ownership. *Journal of Financial Economics* **126**, 122–146. https://doi.org/10.1016/j.jfineco.2017.07.005

Caprio L and Croci E (2008) The determinants of the voting premium in Italy: the evidence from 1974 to 2003. *Journal of Banking & Finance* **32**, 2433–2443. https://doi.org/10.1016/j.jbankfin.2008.04.001

Chang X, Chen Y and Zolotoy L (2017) Stock liquidity and stock price crash risk. *Journal of Financial and Quantitative Analysis* **52**, 1605–1637. https://doi.org/10.1017/S0022109017000473

Chay JB and Mun PS (2005) Discount pricing of preferred stocks to common stocks: the role of liquidity premiums. *Asian Review of Financial Research* **18**, 263–287. UCI: G704-000234.2005.18.2.010

Chen X, Harford J and Li K (2007) Monitoring: which institutions matter? *Journal of Financial Economics* **86**, 279–305. https://doi.org/10.1016/j.jfineco.2006.09.005

Choi SY and Kim GL (2017) Characteristics of Korea's MA market and analysis of the determinant of MA performance. *Korea Capital Market Institute Research Papers*, 17-07. Available at https://www.kcmi.re.kr/en/report/report_view?report_no=720

Chordia T, Roll R and Subrahmanyam A (2002) Order imbalance, liquidity, and market returns. *Journal of Financial Economics* **65**, 111–130. https://doi.org/10.1016/S0304-405X(02)00136-8

Chung KH and Kim JK (1999) Corporate ownership and the value of a vote in an emerging market. *Journal of Corporate Finance* **5**, 35–54. https://doi.org/10.1016/S0929-1199(98)00014-5

Chung CY, Liu C, Wang K and Zykaj BB (2015) Institutional monitoring: evidence from the F-score. *Journal of Business Finance & Accounting* **42**, 885–914. https://doi.org/10.1111/jbfa.12123

Damodaran A (2012) The value of control. In Damodaran A (ed.), *Damodaran on Valuation*, 2nd Edn. Hoboken, NJ, USA: John Wiley & Sons, Inc., pp. 457–496. https://doi.org/10.1002/9781119201786.ch13

Edmans A and Holderness CG (2017) Blockholders: a survey of theory and evidence. *The Handbook of the Economics of Corporate Governance* **1**, 541–636. https://doi.org/10.1016/bs.hecg.2017.11.002

Fatemi A and Krahnen JP (2000) On the valuation of common and preferred shares in Germany: new evidence on the value of voting rights. *Managerial Finance* **26**, 42–54. https://doi.org/10.1108/03074350010766927

Gillan SL and Starks LT (2000) Corporate governance proposals and shareholder activism: the role of institutional investors. *Journal of Financial Economics* **57**, 275–305. https://doi.org/10.1016/S0304-405X(00)00058-1

Gurun UG and Karakaş O (2021) Earnings and the value of voting rights. *Available at SSRN 2793545*. SSRN Working paper. http://doi.org/10.2139/ssrn.2793545

Hauser S and Lauterbach B (2004) The value of voting rights to majority shareholders: evidence from dual-class stock unifications. *Review of Financial Studies* **17**, 1167–1184. https://doi.org/10.1093/rfs/hhg061

Hong HA (2013) Does mandatory adoption of international financial reporting standards decrease the voting premium for dual-class shares? *Accounting Review* **88**, 1289–1325. https://doi.org/10.2308/accr-50442

Hu Y (2012) Growth of Asian pension assets: implications for financial and capital markets. ADBI Working Papers, 360. Available at http://hdl.handle.net/11540/1123

Jang YJ (2021) Status and problems of Korean ESG rating agencies and regulatory direction. *Commercial Cases Review* **34**, 423–471. https://doi.org/10.36894/kcca.2021.34.3.423

Jiao Y and Ye P (2012) Public pension fund ownership and firm performance. *Review of Quantitative Finance and Accounting* **40**, 571–590. https://doi.org/10.1007/s11156-012-0288-x

Just M and Echaust K (2020) Stock market returns, volatility, correlation and liquidity during the COVID-19 crisis: evidence from the Markov switching approach. *Finance Research Letters* **37**, 101775. https://doi.org/10.1016/j.frl.2020.101775

Kalay A, Karakaş O and Pant S (2014) The market value of corporate votes: theory and evidence from option prices. *Journal of Finance* **69**, 1235–1271. https://doi.org/10.1111/jofi.12132

Karakaş O and Mohseni M (2021) Staggered boards and the value of voting rights. *Review of Corporate Finance Studies* **10**, 513–550. https://doi.org/10.1093/rcfs/cfab004

Kim R (2008, Jun. 15) Kim Woo-choong ordered to leave Hilton Penthouse, *Koeran Times*. Available at https://www.koreatimes.co.kr/www/nation/2022/02/113_25899.html?KK

Kind A and Poltera M (2013) The value of corporate voting rights embedded in option prices. *Journal of Corporate Finance* **22**, 16–34. https://doi.org/10.1016/j.jcorpfin.2013.03.004

Lee J, In F, Khil J, Park YS and Wee KW (2018) Determinants of shareholder activism of the NPS of Korea. *Asia-Pacific Journal of Financial Studies* **47**, 805–823. https://doi.org/10.1111/ajfs.12238

Levit D, Malenko N and Maug EG (2021) The Voting Premium. European Corporate Governance Institute – *Finance Working Paper No. 720/2021*. SSRN Working paper. Available at https://papers.ssrn.com/bstract_id=3783944

Levy H (1983) Economic evaluation of voting power of common stock. *Journal of Finance* **38**, 79–93. https://doi.org/10.1111/j.1540-6261.1983.tb03627.x

Lim B, Yoon PS and Choi H (2019) The effect of controlling shareholders' ownership on voting premium. *Korean Management Review* **48**, 1515–1544. https://10.17287/kmr.2019.48.6.1515

Linden DW and Rotenier N (1994) Good-bye to Berle & Means. *Forbes* **153**, 100–105.

Lucas D (2001) Investing public pensions in the stock market: implications for risk sharing, capital formation and public policy in the developed and developing world. *International Review of Finance* **2**, 179–202. https://doi.org/10.1111/1468-2443.00024

Maidment P (2006, Mar. 15) Icahn's Asian Assault, Forbes. Available at https://www.forbes.com/2006/03/15/icahn-southkorea_cx_pm_0315notes.html?sh=3a16b9484c19

Merced MJ (2020, Nov. 9) 'It went to my head': Adam Neumann has regrets about his time at WeWork. *New York Times*. Available at https://www.nytimes.com/2021/11/09/business/dealbook/adam-neumann-wework.html

Ministry of Health and Welfare (2018) Press release. Declaration on Introduction of Principles of Trustee Liability of National Pension Fund (Stewardship Code). Available at http://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&page=1&CONT_SEQ=345546&SEARCHKEY=TITLE&SEARCHVALUE=%EC%8A%A4%ED%8A%9C%EC%96%B4%EB%93%9C

Murphy K and Van Nuys K (1994) *State Pension Funds and Shareholder Inactivism. working paper*. Harvard University.

Nagel S (2012) Evaporating liquidity. *Review of Financial Studies* **25**, 2005–2039.

National Pension Service Investment Management (2022*a*) Milestone of stewardship activities. Available at https://fund.nps.or.kr/jsppage/fund/mcs/mcs_06_03.jsp

National Pension Service Investment Management (2022*b*) Investment Principal. Available at https://fund.nps.or.kr/jsppage/fund/mpc_e/mpc_e_02.jsp

Nelson JM (2006) The 'CalPERS effect' revisited again. *Journal of Corporate Finance* **12**, 187–213. https://doi.org/10.1016/j.jcorpfin.2005.07.002

Nenova T (2003) The value of corporate voting rights and control: a cross-country analysis. *Journal of Financial Economics* **68**, 325–351. https://doi.org/10.1016/S0304-405X(03)00069-2

Neumann R (2003) Price differentials between dual-class stocks: voting premium or liquidity discount? *European Financial Management* **9**, 315–332. https://doi.org/10.1111/1468-036X.00223

Ødegaard BA (2007) Price differences between equity classes. Corporate control, foreign ownership or liquidity? *Journal of Banking & Finance* **31**, 3621–3645. https://doi.org/10.1016/j.jbankfin.2007.01.013

O'Hara M (2003) Presidential address: liquidity and price discovery. *Journal of Finance* **58**, 1335–1354. https://doi.org/10.1111/1540-6261.00569

Onali E (2020) COVID-19 and stock market volatility. SSRN Electronic Journal. *Available at SSRN 3571453*. https://doi.org/10.2139/ssrn.3571453

Park YS, Shin JY, Wee KW, Lee JH and Chung JM (2012) Proxy voting policy and strategy for national pension service. *Korean Journal of Financial Studies* **41**, 93–124. UCI: G704-SER000000670.2012.41.1.004

Park KS, Jung C and Kim SM (2017) Policy measures for M&A laws and regulations in Korea: focused on reinforcement of minority shareholder rights. *Korean Journal of Financial Studies* **46**, 1–33. https://doi.org/10.26845/KJFS.2017.02.46.1.1

Park KW, Jeong SH and Oh JYJ (2019) Foreigners at the gate? Foreign investor trading and the disposition effect of domestic individual investors. *North American Journal of Economics and Finance* **49**, 165–180. https://doi.org/10.1016/j.najef.2019.04.009

Pástor Ľ and Stambaugh RF (2003) Liquidity risk and expected stock returns. *Journal of Political Economy* **111**, 642–685. https://doi.org/10.1086/374184

Romano R (1993) Public pension fund activism in corporate governance reconsidered. *Columbia Law Review* **93**, 795–853. https://doi.org/10.2307/1122989

Rydqvist K (1996) Takeover bids and the relative prices of shares that differ in their voting rights. *Journal of Banking & Finance* **20**, 1407–1425. https://doi.org/10.1016/0378-4266(95)00042-9

Shleifer A and Vishny R (1986) Large shareholders and corporate control. *Journal of Political Economy* **94**, 461–488. https://doi.org/10.1086/261385

Smith MP (1996) Shareholder activism by institutional investors: evidence from CalPERS. *Journal of Finance* **51**, 227–252. https://doi.org/10.2307/2329308

Smith BF and Amoako-Adu B (1995) Relative prices of dual class shares. *Journal of Financial and Quantitative Analysis* **30**, 223–239. https://doi.org/10.2307/2331118

United Nations (2022) World Population Prospects 2022: Summary of Results July 2022. Available at https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf

Whaley RE (2009) Understanding the VIX. *Journal of Portfolio Management* **35**, 98–105. https://doi.org/10.3905/JPM.2009.35.3.098

WHO (2020) WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020. Available at https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Woidtke T (2002) Agents watching agents?: evidence from pension fund ownership and firm value. *Journal of Financial economics* **63**, 99–131. https://doi.org/10.1016/S0304-405X(01)00091-5

Yun J and Kim JS (2020) The effect of the audit committee on voting premium. *Korean Management Consulting Review* **20**, 39–56.

Zingales L (1994) The value of the voting right: a study of the Milan stock exchange experience. *Review of Financial Studies* **7**, 125–148. https://doi.org/10.1093/rfs/7.1.125

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