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Do Foreign Investors Curb Stock Price Crash Risk? Evidence from Ownership Concentration in Taiwan

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Abstract

Using a specific dataset on foreign institutional ownership for firms in the Taiwan stock market during 2006-2020, this study explores robust new evidence that foreign institutional ownership concentration, a relatively small number of institutions own a large proportion of a firm's shares, is negatively related to stock price crash risk, after controlling the level of such ownership. Further evidence shows that the negative effect of foreign institutional ownership concentration on crash risk is more pronounced for firms with higher foreign institutional ownership level, as well as with higher managerial agency problems. These findings are consistent with the hypothesis that while the level of foreign institutional ownership proxies for short-termism, the concentration of such ownership proxies for external monitoring that curbs future stock price crash risk. Our extensive evidence also indicates that the monitoring mechanism of foreign institutional ownership concentration serves as a complement for financial analysts and mass media, while as a substitute for big 4 auditors in minimizing future stock price crash risk.

Keywords

Foreign Institutional Investors, Stock Price Crash Risk, Ownership Concentration, External Monitoring

1. Introduction

In an agency theory framework, the corporate finance literature has explored that due to managers' rent extraction and private benefit of control such as protecting job security, meeting a performance-threshold-based contracts, personal

reputation maintenance, or empire building, managers exhibit a willingness to take on a certain degree of limited downside risk and absorb associated losses arising from short-term poor performance by hoarding the release of negative firm-specific information. However, when negative information is accumulated to a critical threshold, managers choose to give up. Eventually, accumulated negative information is released all at once, causing stock price crashes (Jin & Myers, 2006; Kim, Li, & Zhang, 2011; Callen & Fang, 2015; Andreou, Louca, & Petrou, 2017; Li & Zhan, 2019; Hasan, Taylor, & Richardson, 2022). Building upon corporate governance theory, current literature has paid greater attention to the issue of how managerial bad-news hoarding behavior and their firm's price crash risk can be affected by various internal and external governance mechanisms, including institutional investors (An & Zhang, 2013; Callen & Fang, 2013; An, Wu, & Wu, 2016; Andreou, Antoniou, Horton, & Louca, 2016; Fan & Fu, 2020; Ni, Peng, Yin, & Zhang, 2020; Kim, Li, Luo, & Wang, 2020; Vo, 2020; Wu, Fang, & Chen, 2020; Wen, Xu, Chen, Xia, & Li, 2020; Xiang, Chen, & Wang, 2020), analyst following (Xu, Jiang, Chan, & Yi, 2013; He, Bai, & Ren, 2019; Kim, Lu, & Yu, 2019), the anti-manipulative ethos of religion (Callen & Fang, 2015), directors' and officers' liability insurance (Yuan, Sun, & Cao, 2016), extended auditor disclosure (Li, Xing, & Zhao, 2022), and other internal corporate governance attributes such as ownership structure, board structure and processes, and corporate board reforms (Andreou, Antoniou, Horton, & Louca, 2016; Chen, Chan, Dong, & Zhang, 2017; Hu, Li, Taboada, & Zhang, 2020; Wu, Fang, & Chen, 2020).

This study builds upon existing literature by examining whether companies with higher levels of ownership concentration by foreign institutional investors are more effective at monitoring and therefore less likely to experience price crashes. The study contributes to corporate governance theory, which has shown interest in the monitoring effectiveness of foreign institutional investors on corporate decision-making and stock price informativeness (Huang & Shiu, 2009; Huang & Zhu, 2015; Bena, Ferreira, Matos, & Pires, 2017; Beuselinck, Blanco, & García Lara, 2017; Luong, Moshirian, Nguyen, Tian, & Zhang, 2017; Chen, Weng, & Chien, 2018; Khalil, Ozkanc, & Yildiz, 2020; Kim, Li, Luo, & Wang, 2020; Kacperczyk, Sundaresan, & Wang, 2021; Gu, An, Chen, & Li, 2023). In more recent academic studies, the role of foreign institutional activism in interpreting the risk of stock price crashes has been explored. These researches have examined how herding activities, inattention, leading entrance, and ownership levels of foreign institutional investors contribute to this risk (Jin, Yan, Xi, & Liu, 2016; Xiang, Chen, & Wang, 2020; Vo, 2020). Nevertheless, we know little about how the concentration of foreign institutional ownership, a significant proportion of a company's shares are held by a limited number of foreign institutions, affects crash risk, especially for the sample stocks in the Taiwan market. In addition, it is a hitherto unexplored question of how the concentration of foreign institutional ownership explains crash risk conditional on the levels of such ownership. This study investigates these important research issues.

Our interest in the type of foreign institutional owners is consistent with the latest emphasis in the deregulation of qualified foreign institutional investors' ownership restrictions, especially for the Taiwan stock market (Lin & Chen, 2006; Chen, Weng, & Chien, 2018). Evidently, guided by that foreign institutional investors can be regarded as the market leaders in Taiwan, recent studies have documented foreign institutional investors' trading and holding behavior often has a significant influence on the stock markets (Chen, Wang, & Lin, 2008; Chang, Hsieh, & Lai, 2009; Huang & Shiu, 2009; Hao, Chou, Ho, & Weng, 2015; Chen, Weng, & Chien, 2018). Reinforcing the bad-news-hoarding theory of stock price crash risk, this study broadens research on the monitoring governance perspective of foreign institutions in Taiwan.

Using a comprehensive data set that includes a large number of foreign institutional ownership over a period of 2006-2020, we document extensive evidence that foreign institutional ownership concentration has negative association with future stock price crash risk. This evidence is robust to controlling for various firm characteristics that may affect price crashes, endogeneity bias, alternative proxies of stock price crash risk, sub-periods, as well as stock exchanges in Taiwan. This finding is coherent with our external monitoring hypothesis that foreign institutional ownership concentration acts as a monitoring role in alleviating managerial bad-news-hoarding activities, thereby lowering price crashes.

Several studies have suggested that the level of institutional ownership can be used to capture institutional investors' short-termism behaviors, which exacerbates the likelihood of bad-news-hoarding by managers. This suggestion implies a positive relation between institutional ownership level and stock price crash risk (Wu, Fang, & Chen, 2020; Vo, 2020). Guided by the external monitoring role of foreign institutional ownership concentration, we are interested in the issue of how the concentration of foreign institutional ownership interacts with the level of such ownership in explaining future stock price crash risk. Our regression result shows that the linkage between foreign institutional ownership concentration and stock price crash risk is stronger (more negative) for firms with higher level of such ownership. This result supports the view that institutional investors' short-termism in price crashes, driven by their ownership level, will be inhibited by such ownership concentration-linked monitoring effectiveness.

To highlight the foreign institutional ownership concentration-linked monitoring effectiveness, we also test the relationship between foreign institutional ownership concentration and stock price crash risk among firms with high versus low degree of managerial agency problems. By adopting two proxies for managerial agency problems, namely, the deviation of control rights to cash flow rights in La Porta, Lopez-de-Silanes, Shleifer, & Vishny (1999, 2002) (denoted as *DEV*) and the executives' excess control rights computed based on Cubbin and Leech (1983) (denoted as *ECR*), our findings present that the relationship between foreign institutional ownership concentration and stock price crash risk is

stronger (more negative) for firms with higher *DEV* or *ECR*. Again, these findings are supported by the view that the foreign institutional ownership concentration-linked monitoring effectiveness plays a more important role when firms with more serious principal-agent problems.

Finally, we investigate whether foreign institutional ownership concentration serves as a complement or substitute mechanism for other external monitoring mechanisms such as financial analysts, mass media, and big 4 auditors that together curbs future stock price crash risk. Our findings suggest that the negative influence of foreign institutional ownership concentration on price crashes is more evident for firms with higher analyst coverage, higher media coverage, but poorer auditor quality. This evidence indicates that the foreign institutional ownership concentration-linked monitoring role acts as a complement for financial analysts and mass media, while as a substitute for big 4 auditors in curbing future stock price crash risk.

Our research makes several notable contributions to the existing literature. Firstly, as far as we are aware, our study is the first to examine the link between foreign institutional ownership concentration and future crash risk, especially for the Taiwan stock market. Prior literature typically adopt the level of institutional ownership or the heterogeneity among different types of institutional investors to explain future stock price crash risk (An & Zhang, 2013; Callen & Fang, 2013; An, Wu, & Wu, 2016; Fan & Fu, 2020; Ni, Peng, Yin, & Zhang, 2020; Kim, Li, Luo, & Wang, 2020; Vo, 2020; Wu, Fang, & Chen, 2020; Wen, Xu, Chen, Xia, & Li, 2020; Xiang, Chen, & Wang, 2020). By focusing on ownership concentration-linked external monitoring perspective, the study presents fresh evidence pertaining to the economic outcomes of foreign institutional ownership.

Secondly, our study also supplements the work by Wu, Fang, and Chen (2020), who suggested that institutional ownership level is positively related to price crashes and concluded that Taiwanese institutional investors tend to be short-termists who exacerbates the bad news withholding by managers. Therefore, the empirical evidence that we have presented can be valuable in comprehending how diverse elements of ownership structure affect the propensity of managers to withhold negative information and, in turn, influence the possibility of future stock price crashes.

Thirdly, we extend the literature on corporate governance by showing that the inverse bond between foreign institutional ownership concentration and stock price crash risk is stronger (more negative) for firms with higher analyst coverage, higher media coverage, but poorer auditor quality. Reinforcing the monitoring perspective of institutional ownership concentration, our study helps to fill this void in the literature by suggesting that foreign institutional ownership concentration acts as a complement for financial analysts and mass media, while as a substitute for big 4 auditors in curbing future stock price crash risk.

The rest of the paper is organized as follows: Section 2 presents the literature review and hypothesis development. Section 3 describes the sample selection

procedure and the variables adopted in our empirical tests. Section 4 examines the relation between foreign institutional ownership concentration and future stock price crash risk. Section 5 conducts additional tests by investigating the relation between foreign institutional ownership concentration and future stock price crash risk for firms with high versus low degree of managerial agency problems, as well as how foreign institutional ownership concentration functions as a complement or substitute mechanism for other external monitoring mechanisms in explaining future stock price crash risk. Finally, Section 6 summarizes the main findings and concludes the paper.

2. Literature Review and Hypothesis

Acknowledging institutional investors' superior monitoring abilities versus short-termism role, most studies typically adopt the level of institutional ownership or the heterogeneity among different genres of institutional investors to explain managerial negative news hoarding activities and thus future stock price crash risk (An & Zhang, 2013; Callen & Fang, 2013; An, Wu, & Wu, 2016; Andreou, Antoniou, Horton, & Louca, 2016; Fan & Fu, 2020; Ni, Peng, Yin, & Zhang, 2020; Kim, Li, Luo, & Wang, 2020; Vo, 2020; Wu, Fang, & Chen, 2020; Wen, Xu, Chen, Xia, & Li, 2020; Xiang, Chen, & Wang, 2020). For instance, An and Zhang (2013) revealed that in contrast to transient institutional investors, dedicated institutional investors, who possess significant stakes in the firm and have a long-term investment window, exhibit a more profound motivation to monitor the company's activities and, therefore, reduce the risk of stock price crashes. In line with the institutional investors-related monitoring theory, Callen and Fang (2013) proposed that institutional ownership stability is inversely correlated with the likelihood of experiencing stock price crashes in the future. They also find that public pension funds more actively monitor management than other types of institutions (e.g., bank trusts, investment companies, and independent investment advisors) and help to reduce future stock price crash risk. Analyzing the stocks in the Taiwan market, Wu, Fang, and Chen (2020) claimed that the level of institutional ownership has a positive impact on stock price crash risk and thus classified the Taiwanese institutional investors as "short-termists". This finding is supported by Vo (2020), who documented a positive association between foreign investors' holding and future stock price crash risk in the Vietnam market.

Extending on this strand of literature, this study contributes new knowledge by investigating whether firms with greater ownership concentration of foreign institutional investors exhibit better monitoring mechanism and are thus less prone to price crashes. From the perspective of corporate governance theory, there has been considerable interest in monitoring effectiveness of foreign institutional investors on various corporate decision-making and stock price informativeness (Huang & Shiu, 2009; Huang & Zhu, 2015; Bena, Ferreira, Matos, & Pires, 2017; Beuselinck, Blanco, & García Lara, 2017; Luong, Moshirian, Nguyen, Tian, & Zhang, 2017; Chen, Weng, & Chien, 2018; Khalil, Ozkanc, & Yildiz,

2020; Kim, Li, Luo, & Wang, 2020; Kacperczyk, Sundaresan, & Wang, 2021; Gu, An, Chen, & Li, 2023). Most recently, several academic works have investigated the function of foreign institutional activism in explaining stock price crash risk, via their herding activities (Jin, Yan, Xi, & Liu, 2016), inattention (Xiang, Chen, & Wang, 2020), leading entrance (Kim, Li, Luo, & Wang, 2020), and ownership levels (Huang, Tang, & Huang, 2020; Kim, Li, Luo, & Wang, 2020; Vo, 2020). Our emphasis on the important aspect of ownership structure, ownership concentration of the foreign investors, is mainly built upon previous literature that has suggested that institutional ownership concentration appears to function as a direct, better proxy for monitoring mechanism than their ownership levels (Grinstein & Michaely, 2005; Khan, Dharwadkar, & Brandes, 2005; Burns, Demiralp, D'Mello, Schlingemann, & Subramaniam, 2011). Total ownership held by institutional investors seem to have failed in thorough consideration in capturing the level of monitoring in a firm, which may be influenced by the amount owned by each institution. Conceptually, to protect their ownership stakes, institutional investors with a higher level of total ownership are anticipated to have greater incentives for actively monitoring management. However, firms with a high level of institutional holding could be characterized as weakly monitored firms as there could be multiple institutions possessing the shares of the company, with each having only a minor stake in the ownership. As a result, these dispersed institutional investors may lack the incentive to monitor firms (Demiralp, D'Mello, Schlingemann, & Subramaniam, 2011). In support of this view, Chung, Firth, and Kim (2002) suggested that institutional investors who hold a significant proportion of the outstanding shares can enhance corporate governance by dissuading managers from engaging in opportunistic earnings management. Also, Hartzell and Starks (2003) argue that the concentration of institutional ownership, measured as the proportion of the ownership by the top five institutions in the firm or a Herfindahl Index of institutional ownership concentration, can be adequately adopted to capture institutional investor influence and presented proof that institutional investors play a supervisory function regarding executive compensation agreements. Similarly, Khan, Dharwadkar, and Brandes (2005) have suggested that greater concentration of institutional holdings enables the owners have greater voting power and shareholder activism to effectively discipline management and decrease agency costs due to their relatively higher stakes and relatively lower coordination costs. Thus, by improving monitoring effectiveness, ownership concentration of the foreign investors can help curb bad-news-hoarding activities by managers. Accordingly, this study develops the external monitoring hypothesis that stocks with higher foreign institutional ownership concentration are expected to exhibit lower price crash risk.

3. Data and Methodology

3.1. Sample Collection

Our sample consists of all common stocks listed on the Taiwan Stock Exchange

(TWSE) and the Taipei Exchange (TPEx) from 2006 through 2020.[1] The empirical data we use contain about 21,000 firm-year observations on foreign institutional ownership and firm-level measure of stock price crash risk.[2] All of the pertinent variables utilize in this study are compiled from the Taiwan Economic Journal (TEJ) database. We exclude financial institutions, utilities, and observations with non-positive total assets. **Table 2** provides a summary of the definitions of the variables.

3.2. Measuring Foreign Institutional Ownership Concentration

The bulk of the literature measures the degree of institutional ownership concentration by calculating the proportion of ownership held by the top five institutional investors in the company, or by using a Herfindahl Index to measure institutional ownership (Hartzell & Starks, 2003; Velury & Enkins, 2006; Rubin, 2007; Burns, Kedia, & Lipson, 2010). Alternatively, several studies mentioned that the extent of monitoring within a company may be influenced by the amount of ownership held by each institutional investor (Khan, Dharwadkar, & Brandes, 2005; Demiralp, D'Mello, Schlingemann, & Subramaniam, 2011). To account for this effect associated with the dispersion of ownership among institutional investors, we combine the above suggestions in prior literature and measure foreign institutional ownership concentration (denoted as *FIOC*) as the equity ownership held by all foreign institutional investors, divided by the total number of foreign institutional investors. By definition, *FIOC* is designed to capture a relatively small number of foreign institutions own a large proportion of the shares. A higher value of *FIOC* represents a greater concentration of foreign institutional ownership, which reflects a perceived greater external monitoring effectiveness. In addition, the total equity ownership held by all foreign institutional investors is used to measure the foreign institutional ownership level (denoted as *FIOL*).

Table 1 presents the distribution of *FIOC* and *FIOL* over time in Taiwan. As shown, we find a general increase in foreign ownership level (*FIOL*) and the number of foreign investors (No. of QFIIs) over time in Taiwan. This represents that Taiwan's stock market gradually relaxed several limitations on foreign investors. In general, we find a general decrease in foreign ownership concentration in Taiwan (*FIOC*). The mean (median) values for the independent variable *FIOC* are 0.56% (0.09%). Moreover, *FIOC* exhibits a standard deviation value of 1.9% with a noticeably wider inter-percentile range of 0.25% (from the first quartile of 0.03% to the upper quartile of 0.28%), implying that foreign institutional ownership concentration displays cross-sectional variation across the firm-year observations. This motivates us to study whether the cross-sectional variation in foreign institutional ownership concentration can explain the Taiwan

[1]In 2006, Taiwan authorities were legislated the Company Law and Securities and Exchange Act to empower corporate governance principles, which may affect foreign institutional investors' shareholdings behavior in Taiwan area. Our sample period thus begins in 2006.

[2]Our missing data is totally ignored when conducting our empirical analysis.

Table 1. Distribution of concentration and level of foreign institutional ownership in Taiwan. This table presents the distribution of foreign institutional ownership level (*FIOL*) and foreign institutional ownership concentration (*FIOC*) in Taiwan. Foreign institutional ownership level (*FIOL*) is measured as the total fraction of shares of the stock owned by qualified foreign institutional investors (QFIIs) at the end of the year. Foreign institutional ownership concentration (*FIOC*) is the average of fraction of shares of the stock owned by per QFII, measured as the total fraction of shares of the stock owned by QFIIs divided by number of all QFIIs holding the stock. The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. All data we adopt are collected from the TEJ. This table is created by the authors.

YYYY	No. of QFIIs	Mean *FIOL* (%)	Mean	*FIOC* (%)					
				STD	Min	Q1	Median	Q3	Max
2006	37.61	7.32	0.65	1.61	0.00	0.02	0.14	0.50	17.67
2007	97.92	8.04	0.69	2.18	0.00	0.03	0.13	0.43	45.41
2008	52.18	7.83	0.57	1.89	0.00	0.04	0.11	0.35	43.95
2009	54.31	6.82	0.52	1.90	0.00	0.03	0.08	0.28	43.95
2010	62.52	7.77	0.55	2.15	0.00	0.03	0.08	0.25	43.76
2011	66.80	8.35	0.55	1.75	0.00	0.03	0.07	0.23	21.81
2012	72.90	8.97	0.53	1.69	0.00	0.03	0.07	0.21	24.00
2013	73.20	9.58	0.60	2.72	0.00	0.03	0.08	0.24	83.45
2014	78.00	10.38	0.59	2.27	0.00	0.03	0.09	0.23	44.25
2015	81.47	10.92	0.57	1.92	0.00	0.04	0.09	0.25	25.89
2016	82.16	11.40	0.57	1.82	0.00	0.04	0.09	0.25	28.79
2017	85.92	12.13	0.54	1.67	0.00	0.04	0.10	0.25	29.38
2018	91.27	12.70	0.54	1.90	0.00	0.04	0.10	0.24	43.89
2019	90.40	12.54	0.48	1.45	0.00	0.04	0.10	0.23	29.27
2020	116.00	12.02	0.47	1.65	0.00	0.04	0.09	0.21	43.89
Average	76.18	9.78	0.56	1.90	0.00	0.03	0.09	0.28	37.96

stock crash risk tendency.

3.3. Measuring Stock Price Crash Risk

To determine the level of stock price crash risk at the firm level, we adopt the methodology proposed by Callen and Fang (2015). This involves computing the negative of the third moment of firm-specific weekly residual returns for a given year, divided by the standard deviation of firm-specific weekly residual returns raised to the third power. Specifically, we begin by conducting calendar-year regressions for each firm in our sample, using the following approach:

$$r_{i,w} = \beta_{0,i} + \beta_{1,i} r_{m,w-2} + \beta_{2,i} r_{m,w-1} + \beta_{3,i} r_{m,w} + \beta_{4,i} r_{m,w+1} + \beta_{5,i} r_{m,w+2} + \varepsilon_{i,w} \quad (1)$$

where $r_{i,t}$ is stock i's weekly returns in week w over the year. $r_{m,w-2}$, $r_{m,w-1}$,

$r_{m,w}$, $r_{m,w+1}$, and $r_{m,w+2}$ are the Taiwan TAIEX value-weighted weekly market returns in week $w-2$, $w-1$, w, $w+1$, $w+2$ over the year, respectively. Then, we follow previous studies to re-measure the firm-specific weekly return for firm i in week w ($R_{i,w}$) as the natural logarithm of one plus the residual return from Equation (1). Finally, the firm-level measure of stock price crash risk for firm i in year t, $NCSKEW_{i,t}$, is computed as:

$$NCSKEW_{i,t} = \frac{-\left[n(n-1)^{\frac{3}{2}}\sum R_{i,w}^{3}\right]}{(n-1)(n-2)\left(\sum R_{i,w}^{2}\right)^{\frac{3}{2}}} \quad (2)$$

where n is the number of observations of firm-specific weekly returns over year t. $R_{i,w}$ is firm-specific weekly return as defined above. This study employs the convention that a higher value of *NCSKEW* represents a stock being more crash prone.

3.4. Descriptive Statistics

Table 2 presents a summary of the univariate descriptive statistics for the variables used in this paper. The sample includes firms cover about 21,000 firm-year observations over the period between 2006 and 2020. Recall that as shown in Table 1, the mean (median) of *FIOC* and *FIOL* are 0.56% (0.09%) and 10.4% (3.56%), respectively, suggesting that a small number of TWSE-listed firms' foreign institutional investors concentrate on holding a majority of total equity.

Table 3 further shows that *FIOC* has considerably strong correlations with *FIOL* (0.385), *NCSKEW* (−0.039), *DUVOL* (−0.038), *Analyst* (−0.099), *Media* (−0.060), *Cap* (−0.023), *MB* (0.038), *ROA Vol* (0.042), *Debt* (−0.029), *Ret* (0.027), *Amuhid* (0.043), *Sigma* (0.110), *kurtosis* (0.076), *Tenure* (−0.095), *MOR* (0.047), *BSIZE* (−0.074), *BIND* (0.097), *BOR* (0.187) and *BLOCK* (0.133). Therefore, in the following analysis, we will carefully consider the influence of these well-known factors.

4. Main Empirical Results

4.1. Panel Regressions

In this subsection we focus on the cross-sectional relation between $FIOC_{i,t}$ as the primary independent variable and $NCSKEW_{i,t+1}$ as the key dependent variable by running the following panel regressions:

$$NCSKEW_{i,t+1} = a_0 + a_1 FIOC_{i,t} + a_2 FIOL_{i,t} + a_k \sum_k Control_{i,t}^{k} + \gamma_j + \rho_t + u_{i,t+1} \quad (3)$$

where $NCSKEW_{i,t+1}$ is the degree of stock i's stock price crash risk in year $t+1$. $FIOC_{i,t}$ is stock i's foreign institutional ownership concentration in year t. $FIOL_{i,t}$ is stock i's foreign institutional ownership level in year t. $Control_{i,t}^{k}$ are a variety of control variables for firm i in year t. γ_j and ρ_t are industry- and year-fixed effects[3]. For comparison, we report the standardized estimated

[3]Our unreported results of the Hausman (1978) tests, which are adopted to differentiate between fixed effects model and random effects model in panel analysis, indicated that that the fixed effects estimates are consistent in our model specifications and suggest that the fixed-effects model should be preferred instead of a random-effects model. The authors greatly appreciate the reviewers in providing this constructive suggestion.

Table 2. Summary Statistics. The table presents summary statistics for the TWSE and the TPEx sample firm-year observations (N) between 2006 and 2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. *FIOC* and *FIOL* are foreign institutional ownership concentration and level, respectively, defined as in Table 1. *NCSKEW* and *DUVOL* are two measures of stock price crash risk defined as in Equations (2) and (3), respectively. *DEV* is deviation of control rights to cash flow rights in a given firm, as measured in La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999, 2002). *ECR* is executives' excess control rights in a given firm, computed based on Cubbin and Leech (1983). *Analyst* is the number of analysts following a stock in a given year. *Media* is the number of mass media articles about a stock in a given year, in which we focus on five influential daily mass media in Taiwan, namely, the Commercial Times, Economic Daily News, DigiTimes, Wealth Magazine, and MoneyDJ. *Big*4 is an indicator variable that equals 1 when the auditor is a Big 4 accounting firm (including affiliated firms) and 0 otherwise. *Cap* is the year-end market capitalization. *MB* the total market value of equity divided by the total net assets at the end of the fiscal year. *ROA* is return on assets. *ROA Vol* is standard deviation of a firm's ROAs over the preceding five-year period, including the current year. *Debt* is the ratio of total debt to total assets. *Ret* is average of stock weekly returns over the year. *Sigma* (*kurtosis*) is volatility (kurtosis) of firm-specific weekly returns, measured as the standard deviation (kurtosis coefficient) of firm-specific weekly returns residuals estimated from Equation (1). *Tenure* is the average of all top management teams' tenures for each firm in a given year. *MOR* is total fraction of shares of the stock owned by top management teams. *BSIZE* is the number of board members. *BIND* is the proportion of independent directors. *BOR* is total fraction of shares of the stock owned by the board of director. *Bduality* is the percentage of directors who also occupies the top manager positions. *BLOCK* is total fraction of shares of the stock owned by the top 10 largest shareholders. *HI* is the Herfindahl-Hirschman index for industry concentration based on sales. All data we adopt are collected from the TEJ. This table is created by the authors.

Variables	N	Mean	Median	STD	Q1	Q3
A. Foreign institutional ownership						
FIOC (%)	21,092	0.56	0.09	1.92	0.03	0.27
FIOL (%)	21,089	10.04	3.56	15.39	0.45	12.10
B. Stock price crash risk						
NCSKEW	21,228	−0.42	−0.36	0.79	−0.83	0.06
DUVOL	21,228	−0.32	−0.30	0.52	−0.65	0.02
C. Agency problem						
DEV	21,078	3.24	1.08	34.19	1.01	1.41
ECR (%)	21,237	16.98	15.59	14.84	5.53	26.80
D. Other external monitoring						
Analyst	21,237	5.40	4.00	4.88	2.00	8.00
Media	21,237	33.03	24.00	37.30	17.00	36.00
*Big*4	21,100	0.52	1.00	0.50	0.00	1.00
E. Other controls						
Cap (NT$ b)	21,192	16.65	2.80	151.67	1.20	7.58
MB	21,232	1.92	1.39	3.51	0.94	2.15

Continued

ROA (%)	21,134	6.59	6.65	9.20	2.63	11.21
ROA Vol (%)	21,232	10.35	5.92	30.10	3.32	10.98
Debt (%)	21,232	41.21	41.20	18.25	27.38	54.03
Ret (%)	21,237	0.30	0.19	1.05	−0.24	0.73
Amihud	21,237	7.06	0.20	53.52	0.05	0.99
Sigma (%)	21,237	5.42	5.00	2.91	3.49	6.75
kurtosis (%)	21,235	3.15	1.95	4.05	0.79	3.98
Tenure (%)	21,237	8.91	8.12	4.62	5.63	11.29
MOR (%)	21,078	1.57	0.54	2.64	0.08	1.93
BSIZE	21,078	9.21	9.00	2.18	7.83	10.00
BIND	21,078	0.21	0.22	0.15	0.06	0.31
BOR (%)	21,078	24.13	20.38	15.18	12.94	31.53
Bduality (%)	21,078	22.91	20.00	15.26	14.29	30.09
BLOCK (%)	21,078	22.09	19.83	12.18	13.47	28.26
HI	21,230	0.19	0.12	0.19	0.06	0.21

coefficients on each explanation variable in Equation (3). The outcomes of our primary regression in Equation (3) are presented in Table 4. All reported *t*-values for the estimated coefficients throughout the paper are based on heteroscedasticity-robust standard errors clustered by years. It should be noted that since we employ the model specifications with one-year-ahead *NCSKEW* ($NCSKEW_{i,t+1}$) as the dependent variable, our sample size reduces from about 21,000 in Table 2 to 19,400 in Table 4 (the missing data has been totally ignored in the regressions).

As shown in Table 4, we find that the coefficient on *FIOC* exerts a significantly and negatively related to *NCSKEW* in model (1) (−0.038, $t = -5.34$). This reveals that stocks owned to a high degree concentration by foreign institutional investors in the Taiwan market strongly inverse influence on stock price crash risk. Furthermore, as shown in model (2), the coefficient on *FIOL* exerts a significantly and positively related to *NCSKEW* in model (2) (0.063, $t = 8.75$). This finding is consistent with Wu, Fang, and Chen (2020), who documented that institutional ownership level is positively associated with price crashes and concluded that the Taiwanese institutional investors tend to be short-termists who exacerbates the bad news withholding by managers. Model (3) runs a horse race regression by considering both $FIOC_{i,t}$ and $FIOL_{i,t}$ as the main independent variables and shows that after controlling for *FIOL*, the coefficient on *FIOC* still exerts a significantly (even) negatively related to *NCSKEW* (−0.073, $t = -9.42$). When incorporating other controls in model (4), we continue to find that the coefficient on *FIOC* remains negatively related to *NCSKEW* (−0.036, $t = -4.16$).

Overall, the findings in Table 3 suggest that there is strong evidence that

Table 3. Correlation matrix. This table presents the Pearson correlation coefficients among variables used in this study. The definitions for all of the variables are detailed in Table 2. This table is created by the authors.

		FIOC	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
FIOL	(1)	0.385																								
		(<0.01)																								
NCSKEW	(2)	−0.039	0.061																							
		(<0.01)	(<0.01)																							
DUVOL	(3)	−0.038	0.068	0.876																						
		(<0.01)	(<0.01)	(<0.01)																						
DEV	(4)	−0.011	0.007	0.002	0.005																					
		(0.12)	(0.32)	(0.76)	(0.50)																					
XCR	(5)	−0.009	−0.039	−0.016	0.001	−0.007																				
		(0.21)	(<0.01)	(0.02)	(0.96)	(0.31)																				
Analyst	(6)	−0.099	0.395	0.146	0.147	0.055	−0.068																			
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)																			
Media	(7)	−0.060	0.270	0.110	0.109	0.008	−0.012	0.486																		
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.22)	(0.07)	(<0.01)																		
Big4	(8)	0.001	0.045	−0.002	0.001	−0.011	−0.036	0.060	0.047																	
		(1.00)	(<0.01)	(0.74)	(0.92)	(0.12)	(<0.01)	(<0.01)	(<0.01)																	
Cap	(9)	−0.023	0.188	0.035	0.036	0.007	0.012	0.236	0.365	0.002																
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.32)	(0.08)	(<0.01)	(<0.01)	(0.81)																
MB	(10)	0.038	0.079	0.055	0.054	0.025	−0.026	0.089	0.030	−0.002	0.034															
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.80)	(<0.01)															
ROA	(11)	0.007	0.163	0.061	0.072	0.025	0.069	0.261	0.156	0.020	0.094	−0.023														
		(0.28)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)														
ROAVol	(12)	0.042	0.005	0.006	−0.001	−0.003	−0.013	−0.013	0.034	0.002	−0.012	0.152	−0.107													
		(<0.01)	(0.43)	(0.38)	(0.94)	(0.70)	(0.05)	(0.18)	(<0.01)	(0.83)	(0.09)	(<0.01)	(<0.01)													
Debt	(13)	−0.029	0.025	0.016	0.010	−0.003	0.092	0.021	0.094	0.023	−0.004	0.025	−0.156	0.089												
		(<0.01)	(<0.01)	(0.02)	(0.14)	(0.67)	(<0.01)	(0.03)	(<0.01)	(<0.01)	(0.58)	(<0.01)	(<0.01)	(<0.01)												

Continued

Ret	(14)	0.027	−0.011	0.083	0.075	0.007	0.003	0.005	0.012	0.001	0.016	0.187	0.192	0.023	−0.023																	
		(<0.01)	(0.10)	(<0.01)	(<0.01)	(0.30)	(0.68)	(0.58)	(0.08)	(0.94)	(0.02)	(<0.01)	(<0.01)	(<0.01)	(<0.01)																	
Amuhid	(15)	0.043	−0.033	0.019	0.003	0.001	−0.045	−0.082	−0.050	−0.038	−0.014	0.126	−0.168	0.150	0.118	0.030																
		(<0.01)	(<0.01)	(0.01)	(0.69)	(0.97)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.05)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)																
Sigma	(16)	0.110	−0.048	0.050	0.011	0.012	−0.131	−0.007	0.037	0.006	−0.048	0.163	−0.110	0.174	0.042	0.358	0.230															
		(<0.01)	(<0.01)	(<0.01)	(0.10)	(0.08)	(<0.01)	(0.44)	(<0.01)	(0.39)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)															
kurtosis	(17)	0.076	−0.058	−0.061	−0.061	−0.010	0.042	−0.151	−0.131	−0.002	−0.040	0.005	−0.049	0.017	−0.016	0.157	−0.032	0.210														
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.13)	(<0.01)	(<0.01)	(<0.01)	(0.81)	(<0.01)	(0.51)	(<0.01)	(0.01)	(0.02)	(<0.01)	(<0.01)	(<0.01)														
Tenure	(18)	−0.095	−0.055	−0.029	−0.016	−0.024	0.033	−0.007	−0.089	−0.015	0.033	−0.073	0.046	−0.101	−0.049	−0.006	−0.060	−0.204	0.003													
		(<0.01)	(<0.01)	(<0.01)	(0.02)	(<0.01)	(<0.01)	(0.44)	(<0.01)	(0.03)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.40)	(<0.01)	(<0.01)	(0.63)													
MOR	(19)	0.047	−0.062	−0.004	−0.004	0.010	−0.059	−0.009	−0.022	0.013	−0.030	0.038	0.086	0.079	−0.057	0.040	−0.007	0.082	0.034	−0.003												
		(<0.01)	(<0.01)	(0.56)	(0.57)	(0.14)	(<0.01)	(0.34)	(<0.01)	(0.06)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.32)	(<0.01)	(<0.01)	(0.63)												
BSIZE	(20)	−0.074	0.013	0.034	0.038	−0.005	−0.032	0.073	0.128	0.004	0.072	0.001	0.058	−0.038	−0.006	−0.015	−0.050	−0.111	−0.042	0.006	−0.009											
		(<0.01)	(0.07)	(<0.01)	(<0.01)	(0.48)	(<0.01)	(<0.01)	(<0.01)	(0.52)	(<0.01)	(0.90)	(<0.01)	(<0.01)	(0.37)	(0.03)	(<0.01)	(<0.01)	(<0.01)	(0.41)	(0.18)											
BIND	(21)	0.097	0.182	−0.050	−0.043	0.035	−0.047	0.054	−0.057	0.043	0.049	0.064	0.059	−0.012	−0.056	0.010	−0.058	0.008	0.095	−0.041	0.038	−0.225										
		(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.08)	(<0.01)	(0.13)	(<0.01)	(0.27)	(<0.01)	(<0.01)	(<0.01)	(<0.01)										
BOR	(22)	0.187	0.019	−0.047	−0.041	0.061	0.394	−0.104	−0.099	−0.023	−0.026	0.054	0.077	0.048	−0.024	0.038	0.047	0.033	0.104	−0.131	0.025	0.080	0.010									
		(<0.01)	(0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.16)									
Bduality	(23)	−0.006	−0.003	0.037	0.030	−0.023	0.028	0.071	0.089	0.009	0.001	−0.029	0.045	0.007	0.003	0.009	0.003	0.018	−0.061	0.180	0.176	−0.118	−0.224	−0.124								
		(0.36)	(0.69)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.18)	(0.98)	(<0.01)	(<0.01)	(0.31)	(0.67)	(0.20)	(0.68)	(0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)								
BLOCK	(24)	0.133	0.142	−0.026	−0.018	−0.038	0.312	−0.048	−0.080	−0.031	0.007	0.054	−0.024	0.044	0.067	0.025	0.080	−0.021	0.096	−0.018	−0.090	−0.183	0.085	−0.198	−0.031							
		(<0.01)	(<0.01)	(<0.01)	(0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.30)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)							
HI	(25)	0.001	0.025	−0.010	−0.009	0.009	0.037	−0.011	−0.018	0.011	0.018	−0.004	0.005	0.001	−0.024	0.009	−0.009	−0.004	0.034	−0.014	0.025	−0.015	0.090	0.022	−0.036	0.028						
		(0.96)	(<0.01)	(0.14)	(0.18)	(0.20)	(<0.01)	(0.24)	(0.01)	(0.11)	(0.01)	(0.53)	(0.48)	(0.90)	(<0.01)	(0.20)	(0.19)	(0.54)	(<0.01)	(0.04)	(<0.01)	(0.03)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)						

Table 4. *FIOC* determining future stock price crash risk. This table presents the results of regressions of $NCSKEW_{i,t+1}$ against $FIOC_{i,t}$ based upon the following model: $NCSKEW_{i,t+1} = a_0 + a_1 FIOC_{i,t} + a_2 FIOL_{i,t} + a_k \sum_k Control_{i,t}^k + \gamma_j + \rho_t + u_{i,t+1}$. where $NCSKEW_{i,t+1}$ is the degree of stock *i*'s stock price crash risk in year $t + 1$. $FIOC_{i,t}$ is stock *i*'s foreign institutional ownership concentration in year *t*. $FIOL_{i,t}$ is stock *i*'s foreign institutional ownership level in year *t*. $Control_{i,t}^k$ are a variety of control variables for firm *i* in year *t*. γ_j and ρ_t are industry- and year-fixed effects. The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. The *t*-statistics are reported in square brackets. N is the number of firm-year observations. Superscripts *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. All data we adopt are collected from the TEJ. This table is created by the authors.

	(1)	(2)	(3)	(4)
Constant	−0.397	−0.438	−0.435	−1.052
	[−67.35]	[−64.95]***	[−64.69]***	[−14.09]***
FIOC	**−0.038**		**−0.073**	**−0.036**
	[−5.34]* **		**[−9.42]*** **	**[−4.16]*** **
FIOL		0.063	0.090	0.030
		[8.75]***	[11.73]***	[3.07]***
NCSKEW				0.019
				[2.31]**
ln*Cap*				0.102
				[6.85]***
MB				0.021
				[2.90]***
ROA				−0.024
				[−2.79]***
ROAVol				−0.001
				[−0.11]
Debt				0.007
				[0.89]
Ret				0.086
				[8.12]***
ln*Amihud*				0.047
				[4.58]***
Sigma				−0.012
				[−1.79]*
kurtosis				−0.028

Continued

				[−3.67]***
Tenure				0.002
				[0.27]
MOR				−0.005
				[−0.69]
BSIZE				−0.005
				[−0.58]
BIND				−0.007
				[−0.78]
BOR				−0.027
				[−2.85]***
Bduality				−0.001
				[−0.08]
BLOCK				−0.010
				[−1.12]
HI				−0.002
				[−0.27]
DEV				−0.005
				[−0.70]
ECR				−0.004
				[−0.40]
ln*Analyst*				0.069
				[6.55]***
ln*Media*				0.010
				[0.88]
*Big*4				−0.014
				[−2.01]**
Industry-Fixed Effects	No	No	No	Yes
Year-Fixed Effects	No	No	No	Yes
N	19,433	19,433	19,433	19,319
Adjusted R^2	0.14%	0.39%	0.84%	7.87%

foreign institutional ownership concentration has a significantly negative relation to future stock price crash risk, and this relation is robust to controlling for foreign institutional ownership level and various determinants of crash risk.

Consistent with the external monitoring hypothesis, the foreign institutional ownership concentration appears to play a critical monitoring role in curbing future stock price crash risk.

4.2. Addressing Concern for Endogeneity

In this subsection, we examine the robustness of our results to endogeneity by estimating the two-stage least squares instrumental variable (2SLS) regressions. Specifically, in the first-stage regression, we follow Gounopoulos, Loukopoulos, and Loukopoulos (2021) to adopt the location-industry *FOIC* (denoted as $FIOC\_IV_{i,t}$) as our instrumental variable that is used to explain $FIOC_{i,t}$. Our instrumental variable, $FIOC\_IV_{i,t}$, is calculated as the average values of $FIOC_{i,t}$ in the same industry and location as the sample firm, excluding the sample firm. In the second-stage regression, we further use instrumental predicted value of $FIOC_{i,t}$ from the first-stage regression as an explanatory variable to explain $NCSKEW_{i,t+1}$. Table 5 reports the results of the 2SLS regressions.

As shown in model (1) of Table 5, the instrumental variable ($FIOC\_IV_{i,t}$) has a highly significant positive relation with $FIOC_{i,t}$ ($t = 27.09$). More importantly, model (2) shows that the coefficient on instrumental $FIOC_{i,t}$ is significantly negatively related to $NCSKEW_{i,t+1}$. The results show robustness in the relation between *FOIC* and stock price crash risk to this endogeneity adjustment.

4.3. Other Robustness Analyses

This subsection presents several robustness analyses aimed at validating the connection between the concentration of foreign institutional ownership and the risk of stock price crashes. First, we consider alternative measures of stock price crash risk. Specifically, models (1), (2), and (3) of Table 5 consider $DUVOL_{i,t+1}$, $NCSKEW2_{i,t+1}$, and $NCSKEW3_{i,t+1}$ as the key dependent variable, respectively, by re-estimating regressions in Equation (3). In model (1),

$DUVOL_{i,t} = Ln\left[\dfrac{(n_u - 1)\sum_d R_{i,w}^2}{(n_d - 1)\sum_u R_{i,w}^2}\right]$ is an alternative firm-specific crash risk, down-to-up volatility, where n_u and n_d are the number of up and down weeks during the fiscal year *t*, respectively. For each firm *i* over a fiscal-year period *t*, firm-specific weekly returns are separated into two groups: "Down" ("Up") weeks when the returns are below (above) the annual mean. Standard deviation of firm-specific weekly returns is calculated separately for each of these two groups, and *DUVOL* is the natural logarithm of the ratio of the standard deviation in the "Down" weeks to the standard deviation in the "Up" weeks. Model (2) employ $NCSKEW2_{i,t+1}$ as the dependent variable, in which we re-estimate firm-specific weekly return residuals by adding value-weighted industry contemporaneous, one- and two-week leading, as well as one- and two-week lagged weekly returns into Equation (1). Model (3) employs $NCSKEW3_{i,t+1}$ as the dependent variable, in which we re-estimate firm-specific weekly return residuals by employing Fama-French five factors as main explanatory variables in

Table 5. Addressing endogeneity: instrumental variable approach. This table presents the results of a two-stage least squares (2SLS) regressions with the instrumental variable. The first-stage regression uses $FIOC_{i,t}$ as the dependent variable and the industry-location *FIOC* (denoted as $FIOC_{i,t}^{IV}$) as the main explanatory variable. Our instrumental variable, $FIOC_{i,t}^{IV}$, is calculated as the average values of *FIOC* in the same industry and location as the sample firm, excluding the sample firm. The second-stage regression uses $NCSKEW_{i,t+1}$ as the dependent variable and the instrumented $FIOC_{i,t}$ as the main explanatory variable. Control variables in both stages are identical to those in Table 4. The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. The *t*-statistics are reported in square brackets. N is the number of firm-year observations. Superscripts *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. All data we adopt are collected from the TEJ. This table is created by the authors.

	First Stage: Dep. variable = $FIOC_{i,t}$	Second Stage: Dep. variable = $NCSKEW_{i,t+1}$
Constant	−0.002	−0.090
	[−0.07]	[−2.51]**
Instrumented *FIOC*		**−0.035**
		[−4.19]* **
$FIOC^{IV}$	0.171	
	[27.09]***	
FIOL	0.501	0.033
	[67.78]***	[3.35]***
NCSKEW	−0.033	0.015
	[−6.51]***	[2.00]**
ln*Cap*	−0.335	0.117
	[−27.11]***	[7.87]***
MB	0.010	0.029
	[1.57]	[3.86]***
ROA	−0.003	−0.008
	[−0.44]	[−0.95]
ROAVol	0.002	−0.002
	[0.27]	[−0.23]
Debt	−0.015	0.020
	[−2.35]**	[2.66]***
Ret	0.064	0.051
	[6.91]***	[4.68]***
ln*Amihud*	0.117	0.082
	[13.16]***	[7.80]***

Continued

Sigma	0.017	−0.017
	[1.88]*	[−1.89]*
kurtosis	0.016	−0.019
	[2.51]**	[−2.55]**
Tenure	−0.021	0.006
	[−3.23]***	[0.83]
MOR	0.029	−0.007
	[4.70]***	[−1.00]
BSIZE	0.002	0.002
	[0.29]	[0.32]
BIND	0.005	−0.008
	[0.61]	[−0.95]
BOR	0.165	−0.007
	[20.34]***	[−0.69]
Bduality	0.022	−0.001
	[1.27]	[−0.18]
BLOCK	0.098	0.004
	[12.55]***	[0.42]
HI	−0.002	0.018
	[−0.28]	[2.39]**
DEV	−0.007	−0.012
	[−1.14]	[−1.67]*
ECR	−0.034	−0.020
	[−4.23]***	[−2.10]**
ln*Analyst*	−0.075	0.059
	[−8.38]***	[5.55]***
ln*Media*	0.003	0.011
	[0.34]	[0.96]
*Big*4	−0.001	−0.009
	[−0.17]	[−1.80]*
Industry-Fixed Effects	Yes	Yes
Year-Fixed Effects	Yes	Yes
N	19,319	19,319
Adjusted R^2	33.21%	6.59%

Equation (1). As shown in models (1), (2), and (3), we find that all the coefficients on *FIOC* are significantly and negatively related to three alternative measures of stock price crash risk. For example, the coefficient on *FIOC* is significantly and negative at −0.028 with a *t*-value of −3.44 when considering $DUVOL_{i,t+1}$ as the key dependent variable. Those similar results confirm that our main results are not sensitive to various measures of crash risk.

Second, we re-estimate regressions in Equation (3) for two alternative sub-periods, namely, 2006-2013 and 2014-2020. As shown in models (4) and (5) of Table 6, both coefficients on *FIOC* are significantly and negatively related to *NCSKEW* for sample periods of 2006-2013 and 2014-2020. Therefore, our main findings are not sensitive to different sample period choices.

Finally, we re-estimating regressions in Equation (3) separately for the TWSE and the TPEx stock exchanges in models (6) and (7). As shown, both coefficients on *FIOC* are significantly and negatively associated with *NCSKEW* for sample stocks listed on the TWSE or the TPEx. Thus, the *FIOC* impact is not due to any

Table 6. Robustness checks. This table presents various results of robustness checks. Model (1) employ $DUVOL_{i,t+1}$ as the dependent variable. $DUVOL = Ln\left[\frac{(n_u-1)\sum_{Down} W_{i,t}^2}{(n_d-1)\sum_{Up} W_{i,t}^2}\right]$ is an alternative firm-specific crash risk, down-to-up volatility, where n_u and n_d are the number of up and down weeks during the fiscal year *t*, respectively. For each firm *i* over a fiscal-year period *t*, firm-specific weekly returns are separated into two groups: "Down" ("Up") weeks when the returns are below (above) the annual mean. Standard deviation of firm-specific weekly returns is calculated separately for each of these two groups, and *DUVOL* is the natural logarithm of the ratio of the standard deviation in the "Down" weeks to the standard deviation in the "Up" weeks. Model (2) employ $NCSKEW2_{i,t+1}$ as the dependent variable, in which we re-estimate firm-specific weekly return residuals by adding value-weighted industry contemporaneous, one- and two-week leading, as well as one- and two-week lagged weekly returns into Equation (1). Model (3) employ $NCSKEW3_{i,t+1}$ as the dependent variable, in which we re-estimate firm-specific weekly return residuals by employing Fama-French five factors as main explanatory variables in Equation (1). Models (4) and (5) re-estimate Model (4) of Table 4 for sub-periods during 2006-2013 and 2014-2020, respectively. Models (6) and (7) re-estimate Model (4) of Table 4 for the sample firms listed on the TWSE and the TPEx, respectively. The sample consists of the TWSE and the TPEx stocks during 2006−2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. To save space, only the coefficients on $FIOC_{i,t}$ are presented. N is the number of firm-year observations. Superscript *** represents significance levels of 1%. All data we adopt are collected from the TEJ. This table is created by the authors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$DUVOL_{i,t+1}$	$NCSKEW2_{i,t+1}$	$NCSKEW3_{i,t+1}$	2006-2013	2014-2020	TWSE	TPEx
FIOC	−0.028	−0.036	−0.033	−0.032	−0.037	−0.029	−0.048
	[−3.44]***	[−4.31]***	[−4.01]***	[−2.85]***	[−3.01]***	[−2.79]***	[−3.44]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	19,319	19,319	19,319	9,972	9,347	10,820	8,499
Adjusted R^2	9.03%	6.52%	7.39%	10.33%	5.24%	9.23%	6.63%

particular stock exchanges in Taiwan.

4.4. Moderation Effect of Foreign Institutional Ownership Level

Several works of literature have provided empirical evidence that the level of institutional ownership exerts a significantly positive effect on price crash risk and thus concluded that those institutional investors tend to be "short-termist" in managerial bad-news-hoarding activities (Wu, Fang, & Chen, 2020; Vo, 2020). Guided by our main result suggesting that *FIOC* functions as a monitoring governance in mitigating opportunistic managerial bad-news-hoarding behavior, it is reasonable to expect that *FIOC*-driven monitoring plays a more important role in curbing stock price crash risk for firms with higher level of institutional ownership. These considerations lead to our following hypothesis: the negative effect of *FIOC* on price crash risk is stronger (more negative) when the firm's foreign institutional ownership level is higher.

To test this hypothesis, we re-estimate the panel regressions model (4) of Table 4 where $FIOC_{i,t}$ is the main explanatory variable and $CrashRisk_{i,t+1}$ is the dependent variable, separately for two subsamples of above- and below-median value (denoted as High and Low) of foreign institutional ownership level (*FIOL*).

The findings presented in Table 7 indicate that the FIOC coefficients are

Table 7. The effect of *FIOC* on crash risk for subsamples sorted by foreign institutional ownership level (*FIOL*). This table presents the regression result of the effect of *FIOC* on crash risk, by estimating panel regressions model (4) of Table 4 where $FIOC_{i,t}$ is the main explanatory variable and $CrashRisk_{i,t+1}$ is the dependent variable, separately for two subsamples of above- and below-median value (denoted as High and Low) of foreign institutional ownership level (*FIOL*). The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. To save space, only the coefficients on $FIOC_{i,t}$ are presented. The *F*-tests are used to compare the coefficients on $FIOC_{i,t}$ across the subsamples. N is the number of firm-year observations. Superscript *** represents significance levels of 1%. All data we adopt are collected from the TEJ. This table is created by the authors.

	Sorted by *FIOL*	
	High	**Low**
FIOC	−0.040	−0.015
	[−3.31]***	[−1.33]
Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	9746	9573
Adjusted R^2	9.05%	6.44%
Difference in *FIOC* coefficient	−0.025	
p-value of the *F*-test	(<0.01)***	

negative in both subsets, but only statistically significant for firms possessing a high FIOL score (above the median value). (coefficient = −0.040, t-statistics = −3.31). Furthermore, the F-test shows that the coefficient on *FIOC* is much larger for the subsample with the above-median (high) *FIOL* than for the subsample with the below-median (low) *FIOL* (difference in coefficient = −0.025, *p*-value < 0.01).

Overall, the results in Table 7 suggest that the negative effect of *FIOC* on price crash risk is more concentrated (negative) for firms with higher foreign institutional ownership level. This is consistent with our hypothesis that *FIOC*-driven monitoring plays a more important role in curbing stock price crash risk when firms have a greater likelihood of institutional ownership level-driven short-termism in managerial bad-news-hoarding activities.

5. Further Evidence

5.1. Moderation Effect of Managerial Agency Problem

Given the fact that monitoring of bad-news-hoarding activities is facilitated by foreign institutions with concentrated holdings, we further investigate whether the degree of managerial agency problem of the firm has an impact on the relation between *FIOC* and future stock price crash risk. Empirically, we adopt two well-known proxies for the managerial agency problem of the firm, namely, the deviation of control rights to cash flow rights in a given firm (*DEV*), as measured in La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999, 2002), as well as the executives' excess control rights in a given firm (*ECR*), computed based on Cubbin and Leech (1983).

The first part of Table 8, known as Panel A, utilizes regression model (4) from Table 4, and applies it separately to subgroups with high and low levels of DEV. It was discovered that while FIOC coefficients were negative in both subgroups, they were only significant for firms with high levels of DEV that exceeded the median value (coefficient = −0.051, t-statistics = −4.26). An F-test was conducted to compare the differences in the estimated FIOC coefficients across the subgroups, revealing that the coefficient for the high DEV subgroup was significantly greater than the coefficient for the low DEV subgroup (difference in coefficient = −0.039, *p*-value < 0.01). The second part of Table 8, or Panel B, applied regression model (4) from Table 4 to subgroups with high and low levels of ECR. Results showed that the negative FIOC coefficient was significantly greater for the high ECR subgroup than the low ECR subgroup, with a difference of −0.049 and a p-value of less than 0.01.

Taken together, the results in Table 8 suggest that the influence of *FIOC* on future crash risk is more concentrated (negative) among firms with more severe degree of managerial agency problem, confirming again the importance of *FIOC*-driven monitoring governance in curbing price crash risk.

5.2. The Substitutionary or Complementary Effect of Other External Monitoring

Recent research studies have suggested that price crash risk driven by managerial

Table 8. The effect of *FIOC* on crash risk for subsamples sorted by the degree of managerial agency problem. This table presents the regression result of the effect of *FIOC* on crash risk, by estimating panel regressions model (4) of Table 4 where $FIOC_{i,t}$ is the main explanatory variable and $CrashRisk_{i,t+1}$ is the dependent variable, separately for two subsamples of above- and below-median value (denoted as High and Low) of agency problem. Panels A and B employ *DEV* and *ECR* as proxies for the degree of managerial agency problem, respectively. The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. To save space, only the coefficients on $FIOC_{i,t}$ are presented. The *F*-tests are used to compare the coefficients on $FIOC_{i,t}$ across the subsamples. N is the number of firm-year observations. Superscript *** represents significance levels of 1%. All data we adopt are collected from the TEJ. This table is created by the authors.

Panel A: Sorted by *DEV*		
	High	**Low**
FIOC	−0.051	−0.012
	[−4.26]***	[−1.05]
Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	9578	9741
Adjusted R^2	7.36%	8.66%
Difference in *FIOC* coefficient	−0.039	
p-value of the *F*-test	(<0.01)***	
Panel B: Sorted by *ECR*		
	High	Low
FIOC	−0.061	−0.012
	[−4.78]***	[−1.07]
Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	8599	10,720
Adjusted R^2	7.39%	8.24%
Difference in *FIOC* coefficient	−0.049	
p-value of the *F*-test	(<0.01)***	

bad-news-hoarding behavior will be mitigated by various external monitoring mechanisms, including financial analysts (He, Bai, & Ren, 2019), mass media (An, Chen, Naiker, & Wang, 2020), and external auditors (Lim, Kang, & Kim, 2016). Following this line of literature, we are interested in an issue of whether

FIOC, as an effective external monitor of management, functions as a complement or substitute mechanism for other external monitors, such as financial analysts, mass media, and external auditors in curbing managerial bad-news-hoarding behavior.

To conduct the analysis, Table 9 reports the results by re-estimating regression model (4) of Table 4 separately for subsamples with above- (high) and below-median (low) analyst coverage (*Analyst*) in Panel A, media coverage (*Media*) in Panel B, as well as big 4 auditors versus non-big 4 auditors in Panel C. Panel A shows that the coefficients on *FIOC* are significantly negative for both subsamples (coefficient = −0.035 with a *t*-statistics = −2.91 for high-*Analyst* firms; while coefficient = −0.026 with a *t*-statistics = −2.01 for low-*Analyst* firms). In addition, the coefficient on *FIOC* is significantly larger in absolute value for high-*Analyst* subsample firms than for low-*Analyst* subsample firms (difference in coefficient = −0.009, *p*-value = 0.09). These findings suggest that the negative effect of *FIOC* on future stock price crash risk is stronger when the firms are coverage more by financial analysts, implying that *FIOC* serves as a complement for financial analysts in reducing price crash risk.

In a similar pattern, Panel B of Table 9 partitions the sample by above- and below-median *Media*, and estimates regression model (4) of Table 4 for each subsample separately. We explore that the coefficients on *FIOC* are significantly negative for both subsamples (coefficient = −0.038 with a *t*-statistics = −3.68 for high-*Media* firms, while coefficient = −0.025 with a *t*-statistics = −1.75 for low-*Media* firms). More important, the *F*-test shows that the coefficient on *FIOC* is significantly greater in absolute value for high-*Media* subsample firms than for low-*Media* subsample firms (difference in coefficient = −0.013, *p*-value = 0.06). These results suggest that *FIOC* acts as a complement mechanism for media external monitoring in deterring bad-news-hoarding behavior.

Interestingly, when we re-estimate regression model (4) of Table 9 separately for subsamples of big 4 auditors versus non-big 4 auditors, as shown in Panel C, we find that the coefficients on *FIOC* are significantly negative for both subsamples (coefficient = −0.021 with a *t*-statistics = −1.69 for firms with big 4 auditors; while coefficient = −0.046 with a *t*-statistics = −3.92 for firms with non-big 4 auditors). The *F*-test reveals that the coefficient on *FIOC* is significantly larger in absolute value for non-big 4 auditors subsample firms than for big 4 auditors subsample firms (difference in coefficient = 0.015, *p*-value = 0.02). These findings suggest that the impact of *FIOC* on future stock price crash risk is more evident for firms with poorer auditor quality, which implies that *FIOC* operates as a replacement mechanism for the external monitoring carried out by big 4 auditors in limiting the practice of managerial bad-news-hoarding.

The overall results in Table 9 explore that the monitoring effectiveness stemming from foreign institutional ownership concentration serves as a complement for security analysts and mass media, while as a substitute for big 4 auditors in minimizing future stock price crash risk.

Table 9. The effect of *FIOC* on crash risk for subsamples sorted by other external monitoring. This table presents the regression result of the effect of *FIOC* on crash risk, by estimating panel regressions model (4) of Table 4 where $FIOC_{i,t}$ is the main explanatory variable and $CrashRisk_{i,t+1}$ is the dependent variable, separately for two subsamples sorted by other external monitoring. In Panels A, B, and C, we consider three external monitoring mechanisms, namely, *Analyst*, *Media*, and *Big*4, respectively. Panels A and B partition the overall sample into two subsamples of above- and below-median value (denoted as High and Low) according to *Analyst* and *Media*, respectively. Panel C classifies the overall sample into two subsamples as Big4 and non-Big4. The sample consists of the TWSE and the TPEx stocks during 2006-2020. Sample stocks in financial industries (two-digit industrial codes 28, 58, and 60) are excluded. To save space, only the coefficients on $FIOC_{i,t}$ are presented. The *F*-tests are used to compare the coefficients on $FIOC_{i,t}$ across the subsamples. N is the number of firm-year observations. Superscript ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. All data we adopt are collected from the TEJ. This table is created by the authors.

Panel A: Sorted by *Analyst*		
	High	**Low**
FIOC	−0.035	−0.026
	[−2.91]***	[−2.01]**
Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	9797	9522
Adjusted R^2	9.25%	5.51%
Difference in *FIOC* coefficient	−0.009	
p-value of the *F*-test	(0.09)*	
Panel B: Sorted by *Media*		
	High	**Low**
FIOC	−0.038	−0.025
	[−3.68]***	[−1.75]*
Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	11,582	7737
Adjusted R^2	8.83%	5.40%
Difference in *FIOC* coefficient	−0.013	
p-value of the *F*-test	(0.06)*	
Panel C: Sorted by *Big*4		
	Big4	**Non-Big4**
FIOC	−0.021	−0.046
	[−1.69]*	[−3.92]***

Continued

Controls	Yes	Yes
Industry-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
N	9,957	9,362
Adjusted R^2	8.14%	7.84%
Difference in *FIOC* coefficient	−0.015	
p-value of the *F*-test	(0.02)**	

6. Conclusion

The foreign institutional ownership concentration performs the important function of monitoring management. Prior studies have investigated the monitoring role of foreign institutional ownership concentration and its effects on various corporate decision-making and stock price informativeness. Analyzing the sample stocks in the Taiwan market, our study attempts to fill this gap by assessing the potential effect of foreign institutional ownership concentration on future stock price crash risk.

We explore a strong negative relation between foreign institutional ownership concentration and future stock price crash risk, after controlling for the level of foreign institutional ownership. This finding is supported by the external monitoring hypothesis that the monitoring effectiveness of foreign institutional ownership concentration curbs managerial bad-news-hoarding activities and thus, reduces stock price crashes. In addition, our further evidence shows that the negative effect of foreign institutional ownership concentration on crash risk is more pronounced for firms with higher foreign institutional ownership level, as well as with higher managerial agency problems. These findings suggest that the monitoring role of foreign institutional ownership concentration is more important when firms experience more serious agency problems driven by institutional short-termism and self-interested managerial behaviors. Finally, we provide extensive evidence suggesting that the monitoring mechanism of foreign institutional ownership concentration serves as a complement for financial analysts and mass media, while as a substitute for big 4 auditors in reducing future stock price crash risk.

Overall, there is clear evidence that foreign institutional ownership concentration has a significantly negative relation to a stock price crash risk. More importantly, our study provides direct evidence to identify that while the level of foreign institutional ownership proxies for short-termism, the concentration of such ownership proxies for external monitoring that curbs future stock price crash risk. Thus, our study contributes to the literature by offering a new perspective on the monitoring role of foreign institutional ownership concentration in capital markets.

It is worth noting that this study's conclusion may not be generalized to other nations, as it was only conducted on the Taiwan-listed firms. Future research with similar variables conducted in other nations is thus encouraged. Given our main finding that foreign institutional ownership concentration functions as a strongly external monitoring mechanism, the policy-makers in Taiwan Area should devise strategies and offer incentives to attract the foreign institutional long-term investment in the Taiwan stock market, which could improve corporate governance and information disclosure within the capital markets of Taiwan.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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