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Making honest men of them: Institutional investors, financial reporting, and the appointment of female directors to all-male boards

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ABSTRACT

In this paper, we theorize that dedicated institutional investors are more likely than transient institutional investors to appoint female directors to investee firms with all-male boards, particularly those with high opacity. We conjecture that dedicated investors appoint female directors as a governance mechanism to improve the financial reporting quality of these investee firms. Specifically, we find that through the appointment of female directors, dedicated institutional investors trigger the release of stockpiled negative accounting information, thereby increasing the likelihood of a stock price crash risk. We also show that dedicated investors, through the appointment of female directors, improve investee firms' corporate disclosure environment by decreasing earnings management. Finally, we find that through continued service on investee firms' boards, female directors reduce the future likelihood of a stock price crash.

> "Women held 18.8% of the board seats of companies in the Fortune 1000 in 2016. Frustrated by the slow pace of change, the world's largest institutional investors are now taking the campaign directly to their investees, arguing that gender diversity at the board level is material to a company's financial performance."
> —Russel Reynolds Associate Board and CEO Advisory Group[1]

1. Introduction

Institutional investors have fast become central stakeholders in global capital markets, managing financial assets of around $100 trillion in 2015 (World Bank, 2015). It is acknowledged that these professional investors play an important governance role in their

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[1] Goodman and O'Kelley (2017). Institutional investors lead the push for more gender-diverse boards. In *Russell Reynolds Associates Board and CEO Advisory Group.*

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investee firms (e.g., Chen et al., 2007). As the opening quote exemplifies, one such governance mechanism that seeks to impose the appointment of female directors to male-dominated boards is the institutional investor. Indeed, the push for board gender diversity is a moral obligation that institutional investors are actively campaigning for among their investees. The New York State Common Retirement Fund, for example, recently voted against all corporate boards of directors standing for re-election at companies with no female board members.[2] Despite this anecdotal evidence, no research has examined whether institutional investors induce the appointment of female directors to all-male boards and whether their appointment has any effect on investee firms' financial performance. In this paper, we address this gap by positing that dedicated institutional investors seek to induce the appointment of female directors to investee firms with all-male boards in order to improve their financial reporting quality.

Institutional investors are generally classified into two divergent types based on their investment behavior and assumed monitoring role, namely *dedicated* and *transient* (Bushee, 1998, 2001). *Dedicated investors* invariably hold a high level of firm ownership, have a focused portfolio, and low portfolio turnover. They traditionally have long investment horizons and trade on a firm's growth potential. As such, they have incentives to invest in monitoring and rely on information beyond current earnings to assess a firm's performance (Gaspar et al., 2005; Chen et al., 2007; Callen and Fang, 2013). Dedicated investors, therefore, tend to be able to influence the operations of portfolio firms and have advantages in obtaining insider information, including financial reporting practices (e.g., Bushee and Noe, 2000; Bushee, 2004; Cheng et al., 2020). In contrast, *transient investors* hold a low level of firm ownership and have high portfolio turnover. These investors are more likely to be myopic traders interested in short-term gains. Consequently, transient investors have less incentive to monitor management and are unlikely to materially influence a firm's operations.

Given these differences, dedicated investors are naturally more motivated than transient investors to identify and be alert to investee firms with perceived agency risks. We conjecture that high opacity investees with all-male boards are likely to emerge as acute "red-flag" candidates to dedicated investors due to: (1) the lack of gender diversity; and (2) the associated risks of an all-male board on financial reporting quality—given males are known to be more risk-prone and aggressive than females in their accounting practices (e.g., Srinidhi et al., 2011). Since dedicated investors initially benefit from information advantages in opaque settings (Maffett, 2012), but then seek to intervene over the long-term to improve investees' financial reporting quality when there are perceived agency risks (Lai et al., 2017), high opacity investees with all-male boards are logical candidates to examine whether dedicated investors use female directors as a governance mechanism. Prior research has shown that the appointment of female directors can reduce agency costs and maximize shareholder value (e.g., Adams and Ferreira, 2009; Srinidhi et al., 2011; Lai et al., 2017), as females are less likely to lie and make unethical decisions (Gupta et al., 2020; Arnaboldi et al., 2021). From an agency theory perspective, therefore, dedicated investors may push for female director presence on all-male boards to reduce perceived agency costs and improve investees' financial reporting quality, particularly in relation to corporate disclosures and opacity (Gul et al., 2011).

In line with these assertions, we first predict that the likelihood of appointing a female director to investee firms with all-male boards is likely to increase as a function of dedicated investor ownership but not as a function of transient investor ownership, particularly for high opacity firms. Second, we predict that the appointment of female directors will lead to improvements in the financial reporting quality of high opacity investees. This is mainly because females speak in different moral voices to males (Walker, 2006) and act more ethically (Gupta et al., 2020), leading to improvements in reporting quality. Thus, we expect that financial reporting quality is likely to improve through the mechanism of female ethicality on corporate boards. Improving investees' reporting quality is a top priority for dedicated investors, as it is necessary for realizing price improvements over the long-term and supports their value trading strategy (Bushee et al., 2019). While dedicated investors possess an information advantage and have access to management via private meetings through which they can directly lobby for improvements in financial reporting quality (Becht et al., 2021), inducing the appointment of female directors is a more efficient (indirect) monitoring mechanism as it reduces the transactions costs associated with direct monitoring.

To test our ideas, we begin by investigating the association between institutional investor ownership (dedicated and transient) and the appointment of female directors to investee firms with all-male boards. We classify institutional investors as dedicated or transient based on portfolio turnover and holdings concentration. We then examine the effect of financial reporting opacity using 3-year moving sums of the absolute value of discretionary accruals (Hutton et al., 2009) to identify potential differences in female director appointments between high and low opacity investees. Our empirical tests are based on a sample of 9062 firm-year observations spanning 2001–2018. We find that increases in dedicated investor ownership are associated with a significant and positive increase in the likelihood of appointing a female director in all-male boards. Further, this effect is pronounced for high opacity firms. We find no such effect in the case of transient investors. This finding gives credence to our conjecture that dedicated institutional investors trigger the appointment of female directors in investee firms with all-male boards, especially for high opacity firms.

Next, we examine whether the appointment of female directors to all-male boards of high opacity firms is associated with ~~a~~ stock price crash risk, which we use as a proxy for financial reporting transparency. A stock price crash is defined as a large negative drop in the firm's distribution of returns induced by the sudden release of stockpiled negative accounting information to the market (Jin and Myers, 2006; Bleck and Liu, 2007; Kim et al., 2011a). While our earlier evidence suggests that the likelihood of appointing a female director to high opacity investee firms with all-male boards increases as a function of dedicated investor ownership, it remains unclear what effect—beyond inducing board-level gender diversity—this has on financial performance. We hypothesize that, through the appointment of female directors, dedicated institutional investors will improve the financial reporting quality of investees by: (1) increasing the likelihood of an immediate stock price crash; and (2) reducing the future likelihood of a stock price crash. This is

[2] https://www.pionline.com/article/20180321/ONLINE/180329971/n-y-state-common-to-oppose-all-board-directors-at-companies-without-women-members'

because, as pointed out earlier, female directors, given their heightened ethical orientation and monitoring responsibility (Lai et al., 2017; Arnaboldi et al., 2021), are more likely to induce the sudden release of stockpiled bad news and then subsequently prevent the firm from engaging in future bad news hoarding if they are continuously appointed.

Consistent with our conjecture, we find a positive and significant indirect effect between dedicated institutional investors and financial reporting quality, as proxied by three different crash risk measures, through female directors. This implies that dedicated institutional investors indirectly increase the likelihood of disclosing stockpiled negative accounting information in the interest of higher transparency. We also find that through female director appointments, dedicated investors also improve investee firms' corporate disclosure environment by decreasing earnings management. These results provide further support for our conjecture that, through the appointment of female directors to all-male boards, dedicated institutional investors indirectly improve the financial reporting quality of high opacity investees. To mitigate potential endogeneity concerns of omitted variable bias, we conduct a propensity-score matching procedure and a difference-in-differences analysis. To address the concern of sample selection bias, we perform a Heckman procedure. Further, we perform Granger causality tests to address the issue of reverse causality and confirm that there is no significant relation between the appointment of female directors to investee firms with all-male boards in the previous year and dedicated institutional investor ownership. All tests collectively attest to the robustness of our main findings.

As a logical extension, we also explore the potential reasons why dedicated investors appoint female directors to increase the financial reporting quality of investee firms. Drawing on the notion of the "glass ceiling" (Adams and Funk, 2012), we argue that female directors may have higher levels of expertise than male directors since they typically have to be more capable than male directors to be considered for a board position. Not surprisingly, we find that female directors possess higher average levels of expertise in terms of their qualifications, experience, and education than their male counterparts. This may explain why dedicated institutional investors are more likely to appoint female directors. Further, we explore what effect continued female director service has on the future likelihood of a stock price crash and find that continued female director service is negatively related, thereby suggesting that female directors maintain high levels of financial reporting quality.

Our study not only contributes to the extant literature but also deepens our understanding of the governance role that institutional investors, dedicated versus transient, play within investee firms with all-male boards through inducing the appointment of female directors. First, the findings explain why dedicated institutional investors push for female presence on investee firms' boards and serve as activists for improving gender balance. Despite the ongoing debate regarding the sub-optimal level of monitoring by institutional investors (e.g., Coffee, 1991; Manconi et al., 2012), we find that dedicated investors use female directors as a monitoring mechanism, particularly among high opacity investees. This is not the case for transient investors. These findings run counter to the belief that institutional investors put short-term pressure on firms—focusing on share-price movements (e.g., Karpoff et al., 1996; Smith, 1996). Therefore, boards and their executives should cautiously interpret prior research findings when attempting to improve corporate governance in the evolving environment.

Second, and different from prior studies that examine the association between institutional investors and crash risk from the perspective of investor stability (e.g., An and Zhang, 2013; Callen and Fang, 2013), we provide support for a novel mechanism—the appointment of female directors to all-male boards—that dedicated institutional investors use to indirectly improve the financial reporting quality of investee firms. Specifically, we show that female directors play a significant role in triggering the disclosure of hoarded bad news within dedicated investors' portfolio firms and improving their corporate disclosure environment. This is important as improving financial reporting quality is central to dedicated investors' long-term value trading strategy (Bushee et al., 2019). Our study thus provides a novel contribution to the literature by explaining how dedicated investors use female directors as an efficient monitoring mechanism among investees with male dominated boards. Overall, our findings suggest that dedicated institutional investors do not just seek to pay "lip service" to gender diversity by appointing female board directors but see females as critically important actors in monitoring and improving board governance.

2. Research design and data

2.1. Institutional investors and the appointment of female directors

To test whether institutional investors are associated with the appointment of female directors to investee firms with all-male boards, we use the following logistic regression model:

$$Pr\left[FIRSTFDIR_{i,t+1} = 1\right] = \alpha_1 + \alpha_2 DED_{i,t} + \alpha_3 TRA_{i,t} + \alpha_4 OPAQUE_{i,t} + \sum \alpha_q q^{th} Controls_{i,t} + \varepsilon_{i,t+1} \tag{1}$$

where *i* denotes firm and *t* denotes year (2001–2017). The dependent variable $FIRSTFDIR_{t+1}$ is an indicator variable equal to one if at least one female director is appointed to an all-male board in *t* or *t* + *1* but no female director in fiscal years *t-1* and *t-2*, and zero if there is at least one new male director to an all-male board in the current or following fiscal years (*t* or *t* + *1*) but no new male director joins the firm in fiscal years *t-1* and *t-2*. We pick the first instance in which a female director has been appointed as one case. The explanatory variables of interest *DED* and *TRA* capture the degree of dedicated and transient institutional investor ownership, measured as the percentage of dedicated and transient investor ownership relative to outstanding shares, respectively. There is also a third type of investor known as quasi-indexers; defined as highly diversified investors who follow indexing and buy-and-hold strategies. While Monks and Minow (1995) argue that quasi-indexers are motivated to monitor management because of their long investment horizon, Porter (1992) claims that they have little incentive to monitor as a result of passive and fragmented ownership. We follow previous studies (e.g. Callen and Fang, 2013; Borochin and Yang, 2017) and exclude the quasi-indexer institutional ownership type from our study due to the conflicting views regarding their monitoring role. *OPAQUE* is measured by the moving sum of the absolute value of discretionary accruals estimated from the modified Jones model.

Following prior studies (e.g., Hillman et al., 2007), we include several controls: firm size (*SIZE*) measured as the natural logarithm of the market value of equity; leverage (*LEV*) measured as total debt to total assets; accounting performance measured as *ROA;* firm age (*FIRMAGE*) measured as the natural logarithm of the number of years since the firm's initial public offering; market performance measured as turnover (*TURN*), which is the average monthly share turnover over a fiscal year minus the average monthly share turnover over the previous fiscal year; mean of firm-specific weekly stock return over the fiscal year (*RET*); Tobin's Q (*TOBINQ*) measured as the market value of total assets scaled by the book value of assets; the proportion of female employees to total population in each industry (*FEMPRATIO*); and diversifications from similar industries (*RLTD_DIV*) measured using the entropy measure over the fiscal year.

We also control for the expertise and characteristics of newly appointed board members. *NDIREXP* is defined as the proportion of new appointee over existing directors having related expertise or experience. Related expertise or experience is equal to one if an individual has accounting or finance experience (including Chartered Financial Analyst credentials, Certified Public Accountant qualifications, or prior/current experience performing accounting- or finance-related functions), and zero otherwise. We also include board size (*BRDSIZE*), CEO-chairman duality (*CEODUAL*), and board independence (*BRDIND*) as corporate governance controls. Year and industry dummies are included. Definitions for all variables are provided in supplementary Appendix A.

2.2. Dedicated investors and crash risk: the mediating mechanism of female directors

To examine whether dedicated investors indirectly increase the likelihood of a stock price crash (SPC) within investee firms with all-male boards through the appointment of female directors, we perform a path analysis. Path analysis belongs to a class of causal or structural equation models that are used to provide persuasive explanations of correlation structures. Specifically, we follow Baron and Kenny (1986) and decompose the correlation between two variables, a causal variable and dependent variable (*DED* and crash risk in our context), into a direct path and indirect (mediated) path that includes a mediating variable (*FIRSTFDIR*). This decomposition also provides the relative importance of the direct and indirect paths.

The key outputs of a path analysis are the coefficients that link two variables in the path. A direct path includes only one path coefficient, while an indirect path includes a path coefficient between the source variable and the mediating variable, as well as a path coefficient between the mediating variable and the outcome variable. The total magnitude of the indirect path is the product of these two path coefficients. We measure the importance of a direct or indirect path as the ratio of the path coefficient for that path to the total correlation between the source variable and the outcome variable. The analysis allows for a comparison between direct and indirect paths by standardizing all variables in the model with a mean of zero and a standard deviation of one. We adopt the following model to perform the path analysis:

$$CrashMeasures_{i,t+1} = \alpha_1 + \alpha_2 DED_{i,t} + \alpha_3 FIRSTFDIR_{i,t} + \sum \alpha_q q^{th} Controls_{i,t} + \varepsilon_{i,t+1} \quad (2)$$

$$FIRSTFDIR_{i,t} = \beta_1 + \beta_2 DED_{i,t} + \sum \beta_q q^{th} Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

where the dependent variables in Eq. (2), $CrashMeasures_{t+1}$, includes three measures of crash risk: the crash likelihood of each firm (*CRASH*) (Hutton et al., 2009), the negative coefficient of skewness (*NCSKEW*), and down-to-up volatility (*DUVOL*) (Chen et al., 2001). The path coefficient α_2 is the magnitude of the direct path from *DED* to the *CrashMeasures*. The path coefficient $\beta_2 x \alpha_3$ measures the magnitude of the indirect path from *DED* to the *CrashMeasures* mediated through *FIRSTFDIR*. The percentage of the total path explained by the mediated path is given by ($\beta_2 x \alpha_3$) divided by ($\alpha_2 + \beta_2 x \alpha_3$). Fig. 1 illustrates how *FIRSTFDIR* mediates the relationship between *DED* and crash risk.[3]

To construct each firm-specific measure of crash risk, we follow prior studies (e.g., Kim et al., 2011a; Kim and Zhang, 2016) and compute the firm-specific weekly return (*W*), defined as the natural logarithm of one plus the residual return, from the following expanded market model for each firm and year:

$$r_{j,t} = \alpha_j + \beta_{1j} r_{m,t-1} + \beta_{2j} r_{i,t-1} + \beta_{3j} r_{m,t} + \beta_{4j} r_{i,t} + \beta_{5j} r_{m,t+1} + \beta_{6j} r_{i,t+1} + \varepsilon_{j,t} \quad (4)$$

where $r_{j,t}$ is the return on stock *j* in week *t*, $r_{i,t}$ is the return on the Fama-French value-weighted industry index, and $r_{m,t}$ is the CRSP value-weighted market index. We include lead and lag terms for market index return to allow for nonsynchronous trading (Scholes and Williams, 1977; Dimson, 1979). Next, using the firm-specific weekly return (*W*), we estimate each measure of crash risk.

Our first measure of crash risk, *CRASH*, is an indicator variable that equals one if a firm-year contains one or more crash weeks, and zero otherwise. Crash weeks are those in which the firm-specific weekly returns are 3.09 standard deviations below the annual mean. We chose the threshold of 3.09 to generate a frequency of 0.1% in the normal distribution (Hutton et al., 2009). The second measure of crash risk is the negative coefficient of skewness of firm-specific weekly returns, *NCSKEW,* calculated as the negative of the third moment of the firm-specific weekly returns divided by the standard deviation of firm-specific weekly returns raised to the third power.

[3] In additional path analysis test for the dependent variable financial reporting quality reported in Section 3.2, we adopt the same model except we replace crash risk measures with financial reporting quality measures.

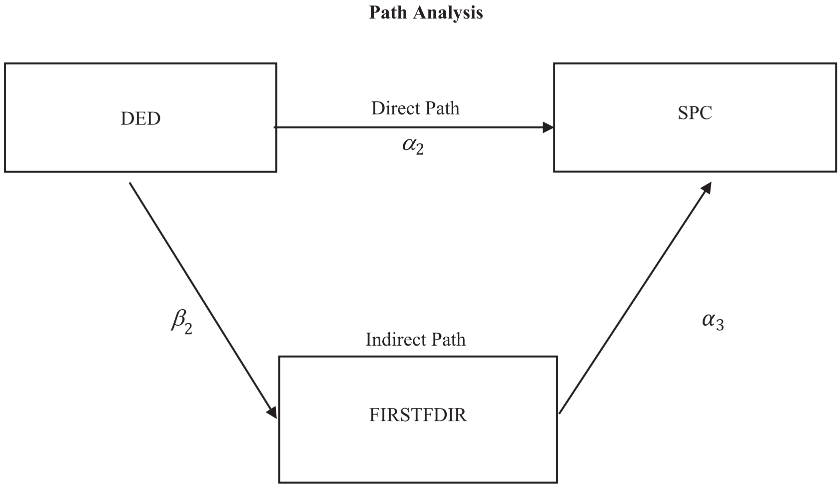

Fig. 1. Paths between Dedicated Institutional Investors and Stock Price Crash Risk

A higher value for *NCSKEW* corresponds to higher crash risk. Following Chen et al. (2001) and Kim et al. (2011a, 2011b), we compute *NCSKEW* for each firm in each fiscal year using Eq. (5):

$$NCSKEW_{jt} = -\left(n(n-1)^{\frac{3}{2}}\sum W_{jt}^{3}\right)\Big/\left((n-1)(n-2)\left(\sum W_{jt}^{2}\right)^{\frac{3}{2}}\right) \tag{5}$$

Our third measure of crash risk is the down-to-up volatility (*DUVOL*) computed with Eq. (6):

$$DUVOL_{jt} = log\left\{\left((n_u-1)\sum_{DOWN} W_{jt}^{2}\right)\Big/\left((n_d-1)\sum_{UP} W_{jt}^{2}\right)\right\} \tag{6}$$

We calculate the average firm-specific weekly return for a stock *j* over each fiscal year *t* and categorize all firm-specific weekly returns into two groups. We group firm-specific weekly returns below the annual mean into the *DOWN* category and those above into the *UP* category. In Eq. (6), n_u and n_d represent the number of *UP* and *DOWN* weeks, respectively. Following prior studies (Chen et al., 2001; Kim et al., 2011a, 2011b), we compute *DUVOL* for each firm and year as the natural logarithm of the ratio of the *DOWN* category's standard deviation to the *UP* category's standard deviation. Since we calculate *DUVOL* without the third moment, it is less likely that a small number of extreme returns will have an excessive impact. A higher value of *DUVOL* represents a higher crash risk.

FIRSTFDIR is the independent variable as defined earlier. Following prior studies on crash risk (e.g., Hutton et al., 2009; Kim et al., 2011a; Callen and Fang, 2015), we include firm size (*SIZE*), financial leverage (*LEV*), return on assets (*ROA*), financial reporting opacity (*OPAQUE*), market-to-book ratio (*MB*) defined as total debt divided by total assets, and lagged *NCSKEW* as control variables. We also include (*TURN*), defined as the average monthly share turnover over the fiscal year minus the average monthly share turnover over the previous fiscal year, as a proxy for the intensity of disagreement among investors. Further, since volatile stocks are more prone to crashes (Kim et al., 2016), we control for stock volatility (*SIGMA*), defined as the standard deviation of firm-specific weekly returns over the fiscal year. We also control for the mean of firm-specific weekly return (*RET*), dedicated (*DED*), and transient (*TRA*) investors, and include board size (*BRDSIZE*), CEO-chairman duality (*CEODUAL*), and percentage of independent directors (*BRDIND*) (see supplementary Appendix A for variable definitions). Industry and year-fixed effects are included.

2.3. Data and sample

To test the relation between institutional investor ownership (dedicated versus transient) and the appointment of female directors, we constructed a sample of firms listed on the Compustat and BoardEx databases to first collect firm-level variables of interest (*FIRSTFDIR* and board-related variables) between 2001 and 2018 as shown in Table 1. This comprised 57,393 firm-year observations. We then merged the data with CRSP. From the CRSP data, we were able to specify the proportion of shares owned by dedicated versus transient investors following Bushee (1998). As we restricted the sample to those firms that had all-male boards in *t-1* and *t-2*, boards that appoint first-time female directors in *t* and $t+1$, and all-male boards with new male appointments in *t* and $t+1$, our sample dropped to 12,579 firm-year observations. We excluded observations with missing variables (3517) from estimating Eq. (1), which left us with a final sample of 9062 firm-year observations.[4] All continuous variables were winsorized at 1% and 99% to address potential

[4] Of the 9062 firms that comprised our sample, over 75% had an all-male board (6823 firms). On average, it took approximately 7 years for these firms to appoint at least one female director. While <11 firms took <2 years to appoint a female director, there were 24 firms that took >15 years.

Table 1
Sample selection.

Description			Observations
Listed firm years with female directors data between 2001 and 2018			57,393
After constructing the treatment and control firm of FIRSTFDIR			12,579
Less missing control variables			(3517)
Final sample for H1			9062
Less missing variables for Crash Risk model			(1258)
Final sample for H2 (Crash Risk)	7804	7804	7804
Less missing data for Opaque/AQ/REM measures	(3920)	(4442)	(4345)
Final sample for H2 (Opaque/AQ/REM measures)	5142	4.620	4717

problems arising from extreme observations or outliers.[5]

Next, to test the indirect relation between dedicated institutional investor ownership and investee firms' financial reporting quality (FRQ), as proxied by crash risk, we merged daily stock data from CRSP with the sample firms derived from testing Eq. (1). Specifically, we converted firms' daily returns into weekly returns[6] and merged these data to the yearly data with the original sample. Following prior studies, we excluded firms with year-end closing prices of less than $1 and fewer than 26 weeks of stock-return data for a full fiscal year (Hutton et al., 2009). The final sample for estimating Eq. (2) consisted of 7804 firm-year observations. In additional tests when we replace the three *CrashMeasures* with measures of FRQ using *OPAQUE*, accruals quality (*AQ*), and real earnings management (*REM*), the sample drops to 5142, 4620, and 4717 firm-year observations, respectively, due to missing data. Again, all continuous variables were winsorized at 1% and 99%.

2.4. Descriptive statistics and correlations

Table 2 reports the descriptive statistics and correlations. Panel A presents the descriptive statistics of variables used to predict whether dedicated (*DED*) and transient (*TRA*) investors are associated with the appointment of female directors (*FIRSTFDIR*). The mean values of *DED* and *TRA* are 0.017 and 0.076, respectively, which are comparable to the statistics reported in prior studies (e.g., Bushee, 2001; Dikolli et al., 2009; Callen and Fang, 2013; Borochin and Yang, 2017).

Panel B presents the descriptive statistics of variables used to predict whether appointing female directors to all-male boards improves investee firms' FRQ. We find that our crash risk measures are comparable to prior studies (e.g., Chen et al., 2001; Kim et al., 2011a). The mean $CRASH_{i,t+1}$ is 0.214 during the sample period, which means that 21.4% of our sample observations show one or more SPC in year $t+1$. The mean values of $NCSKEW_{i,t+1,}$ and $DUVOL_{i,t+1}$ are 0.060 and − 0.029, respectively.

Panel C presents the correlations between the variables used to examine the association between *DED/TRA* and *FIRSTFDIR*, and between *FIRSTFDIR* and crash risk. There are positive and significant correlations between institutional investors (*DED* and *TRA*) and the appointment of female directors. The correlation coefficient between *TRA* and *FIRSTFDIR* (0.028) is much smaller than the correlation coefficient between *DED* and *FIRSTFDIR* (0.121). The variable capturing new board members' experience or expertise (*NDIREXP*) is positively associated with *FIRSTFDIR*. The appointment of female directors is positively correlated with all crash risk measures, with correlation coefficients ranging between 0.051 and 0.066. The correlation coefficients between *NDIREXP* and the three crash risk measures are positive, ranging between 0.014 and 0.027. Except for the correlations between *SIGMA* and *RET*,[7] the highest variance inflation factor (VIF) of 4.042 is well below the threshold of 10, which suggests that multicollinearity is not an issue among the majority of our variables (Kennedy, 2003).

Table 3 Panel A provides a univariate analysis illustrating the inherent differences in corporate governance characteristics—proxied by board independence (*BRDIND*) and CEO-chairman duality (*CEODUAL*) and FRQ—proxied by *OPAQUE* between all-male boards and diverse boards. Our findings show that diverse boards have higher board independence, lower CEO duality, and better FRQ.

Panel B presents the results of a comparative analysis by comparing *DED* and *TRA* on the likelihood of appointing first-time female directors. The mean values of $FIRSTFDIR = 1$ are higher than those with $FIRSTFDIR = 0$ for both groups of institutional investors. More importantly, two-sample *t*-tests show a significant difference only for the dedicated investor sub-sample. Table 3 also compares the three crash risk proxies' mean values at $t+1$ across firm-years with and without new female appointments at *t*. The mean values of all three crash risk proxies are significantly higher for firms with new female director appointments ($FIRSTFDIR = 1$) than those without

[5] There are 88 large unique institutional investors appointing female directors in our sample. Among the 88 institutional investors, 11 belong to the category of dedicated investors. Of the 9062 firm year observations, there are 2239 firm-year observations with FIRSTFDIR = 1. Out of the 2239 observations, 719 firm-year observations have DED and FIRSTFDIR =1. The findings illustrate that our results are not driven by outliers.

[6] The extant crash risk literature uses both daily (Chen et al., 2001; Callen and Fang, 2013) and weekly returns (Jin and Myers, 2006; Hutton et al., 2009; Kim et al., 2011a, 2011b) to calculate firm-specific crash risk. Researchers normally use weekly returns to avoid substantial bias associated with nonsynchronous trading and other microstructure effects at the daily level.

[7] We find that the variance inflation factors (VIF) of *SIGMA* and *RET* are higher than 10, suggesting some potential multicollinearity problems in our main regression analysis (Table 4). The VIFs and the correlation are similar to prior findings (e.g. Kim et al., 2011a; Kim et al., 2016; Kim and Zhang, 2016). However, our main results remain unchanged when we drop one of these control variables.

Table 2
Descriptive statistics.

Variable	N.	Q1	Mean	Median	Q3	SD
Panel A: Association between *DED/TRA* and *FIRSTFDIR*						
$FIRSTFDIR_{t+1}$	9062	0.000	0.247	0.000	0.000	0.431
DED_t	9062	0.000	0.017	0.000	0.000	0.044
TRA_t	9062	0.000	0.076	0.005	0.128	0.111
$SIZE_t$	9062	4.749	5.931	6.013	7.123	1.740
LEV_t	9062	0.000	0.177	0.118	0.302	0.192
ROA_t	9062	−0.042	−0.020	0.032	0.083	0.245
$FIRMAGE_t$	9062	6.504	15.785	12.498	21.583	12.342
$Ln\_FIRMAGE_t$	9062	1.872	2.447	2.526	3.072	0.835
$OPAQUE_t$	9062	0.107	0.768	0.306	0.970	0.986
$TURN_t$	9062	−0.308	0.042	0.014	0.362	1.018
RET_t	9062	−0.262	−0.222	−0.140	−0.076	0.259
$TOBINQ_t$	9062	1.123	2.006	1.526	2.289	1.568
$FEMPRATIO_t$	9062	30.727	43.183	51.481	52.009	14.280
$RLTD\_DIV_t$	9062	0.000	0.019	0.000	0.000	0.075
$NDIREXP_t$	9062	0.250	0.441	0.455	0.636	0.243
$BRDSIZE_t$	9062	6.000	7.431	7.000	8.000	1.799
$CEODUAL_t$	9062	0.000	0.450	0.000	1.000	0.511
$BRDIND_t$	9062	0.571	0.634	0.667	0.727	0.140
Panel B: Association between *FIRSTFDIR* and Crash Risk						
$CRASH_{t+1}$	7804	0.000	0.214	0.000	0.000	0.410
$NCSKEW_{t+1}$	7804	−0.425	0.060	0.012	0.465	0.855
$DUVOL_{t+1}$	7804	−0.284	−0.029	−0.038	0.212	0.379
$FIRSTFDIR_t$	7804	0.000	0.236	0.000	0.000	0.425
$SIZE_t$	7804	4.974	6.119	6.191	7.312	1.714
MB_t	7804	1.252	2.840	1.958	3.272	2.948
LEV_t	7804	0.000	0.182	0.127	0.307	0.192
ROA_t	7804	−0.023	0.002	0.035	0.084	0.179
$OPAQUE_t$	7804	0.098	1.104	0.287	0.898	2.841
$NCSKEW_t$	7804	−0.409	0.068	0.012	0.466	0.826
$TURN_t$	7804	−0.351	−0.043	−0.007	0.307	1.023
$SIGMA_t$	7804	0.038	0.056	0.050	0.069	0.026
RET_t	7804	−0.231	−0.187	−0.125	−0.070	0.194
DED_t	7804	0.000	0.018	0.000	0.001	0.046
TRA_t	7804	0.000	0.076	0.012	0.132	0.106
$BRDSIZE_t$	7804	7.000	7.634	7.000	9.000	1.779
$CEODUAL_t$	7804	0.000	0.430	0.000	1.000	0.507
$BRDIND_t$	7804	0.571	0.642	0.667	0.750	0.138
CONTFDIR	5687	0.000	0.192	0.000	0.000	0.394

Panel C Pearson correlation between the variables used in examining the association between *DED/TRA* and *FIRSTFDIR*

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	VIF
1.*FIRSTFDIR*$_t$	1.000																
2.*DED*$_t$	0.121^{a}	1.000															1.363
3.*TRA*$_t$	0.028^{a}	0.360^{a}	1.000														1.360
4.*OPAQUE*$_t$	−0.024^{b}	−0.041^{a}	−0.041^{a}	1.000													1.331
5.*SIZE*$_t$	0.202^{a}	0.149^{a}	0.237^{a}	−0.092^{a}	1.000												2.011
6.*LEV*$_t$	0.056^{a}	0.050^{a}	0.019^{c}	−0.052^{a}	0.167^{a}	1.000											1.318
7.*ROA*$_t$	0.010	0.014	0.118^{a}	−0.100^{a}	0.313^{a}	0.040^{a}	1.000										1.533
8.*FIRMAGE*$_t$	−0.028^{a}	0.036^{a}	0.045^{a}	−0.040^{a}	−0.036^{a}	−0.084^{a}	0.189^{a}	1.000									1.202
9.*TURN*$_t$	−0.009	−0.005	0.028^{a}	0.001	0.045^{a}	0.035^{a}	0.001	−0.034^{a}	1.000								1.122
10.*RET*$_t$	0.052^{a}	0.078^{a}	0.079^{a}	−0.104^{a}	0.395^{a}	0.036^{a}	0.400^{a}	0.174^{a}	−0.227^{a}	1.000							1.645
11.*TOBINQ*$_t$	0.049^{a}	0.015	0.032^{a}	0.101^{a}	0.207^{a}	−0.217^{a}	−0.193^{a}	−0.125^{a}	0.085^{a}	−0.066^{a}	1.000						1.423
12.*FEMPRATIO*$_t$	0.028^{a}	0.042^{a}	0.004	−0.019^{c}	−0.139^{a}	−0.126^{a}	−0.094^{a}	−0.010	−0.019^{c}	−0.075^{a}	0.081^{a}	1.000					4.042
13.*RLTD_DIV*$_t$	0.093^{a}	0.144^{a}	−0.019^{c}	−0.038^{a}	0.027^{a}	0.086^{a}	0.022^{b}	0.082^{a}	−0.018^{c}	0.050^{a}	−0.072^{a}	−0.038^{a}	1.000				1.648
14.*NDIREXP*$_t$	0.048^{a}	−0.030^{a}	−0.030^{a}	−0.001	0.039^{a}	0.047^{a}	−0.009	−0.128^{a}	−0.005	0.009	−0.027^{a}	−0.027^{b}	0.064^{a}	1.000			1.114
15.*BDSIZE*$_t$	0.171^{a}	0.087^{a}	0.084^{a}	−0.050^{a}	0.402^{a}	0.147^{a}	0.088^{a}	0.024^{b}	0.008	0.167^{a}	−0.073^{a}	−0.057^{a}	0.008	−0.046^{a}	1.000		1.357
16.*CEODUAL*$_t$	−0.030^{a}	−0.010	0.040^{a}	−0.024^{b}	0.075^{a}	0.040^{a}	0.083^{a}	0.027^{b}	0.026^{b}	0.043^{a}	0.000	−0.053^{a}	−0.062^{a}	−0.079^{a}	−0.052^{a}	1.000	1.106
17.*BRDIND*$_t$	0.071^{a}	0.051^{a}	0.085^{a}	−0.004	0.045^{a}	−0.042^{a}	−0.008	0.042^{a}	−0.005	0.019^{c}	0.012	−0.006	−0.010	0.029^{a}	0.080^{a}	0.136^{a}	1.107

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	VIF
1.*CRASH*$_{t+1}$	1.000																		
2.*NCSKEW*$_{t+1}$	0.651^{a}	1.000																	
3.*DUVOL*$_{t+1}$	0.592^{a}	0.958^{a}	1.000																
4.*DED*$_t$	−0.001	0.005	0.007	1.000															1.251
5.*FIRSTFDIR*$_t$	0.051^{a}	0.066^{a}	0.065^{a}	0.101^{a}	1.000														1.151
6.*SIZE*$_t$	0.051^{a}	0.124^{a}	0.157^{a}	0.125^{a}	0.190^{a}	1.000													2.184
7.*MB*$_t$	0.051^{a}	0.056^{a}	0.060^{a}	0.047^{a}	0.082^{a}	0.264^{a}	1.000												1.253
8.*LEV*$_t$	−0.012	0.017	0.023^{b}	0.048^{a}	0.058^{a}	0.171^{a}	0.068^{a}	1.000											1.275
9.*ROA*$_t$	0.024^{b}	0.041^{a}	0.077^{a}	0.005	0.014	0.315^{a}	−0.083^{a}	0.007	1.000										1.486
10.*OPAQUE*$_t$	0.002	−0.003	−0.012	−0.036^{a}	−0.021^{c}	−0.067^{a}	0.039^{a}	−0.031^{a}	−0.041^{a}	1.000									1.162
11.*NCSKEW*$_t$	0.028^{b}	0.048^{a}	0.035^{a}	0.015	0.030^{a}	0.045^{a}	−0.050^{a}	0.013	0.012	0.006	1.000								1.070
12.*TURN*$_t$	0.031^{a}	0.033^{a}	0.034^{a}	0.010	−0.060^{a}	0.042^{a}	0.034^{a}	0.031^{a}	0.052^{a}	−0.027^{b}	0.012	1.000							1.100
13.*SIGMA*$_t$	−0.027^{b}	−0.055^{a}	−0.099^{a}	−0.089^{a}	−0.101^{a}	−0.472^{a}	−0.026^{b}	−0.051^{a}	−0.396^{a}	0.046^{a}	0.055^{a}	0.145^{a}	1.000						15.923
14.*RET*$_t$	0.027^{b}	0.055^{a}	0.095^{a}	0.074^{a}	0.084^{a}	0.413^{a}	0.012	0.019^{c}	0.384^{a}	−0.036^{a}	−0.007	−0.166^{a}	−0.959^{a}	1.000					14.014
15.*TRA*$_t$	0.011	0.040^{a}	0.051^{a}	0.274^{a}	0.003	0.200^{a}	0.028^{b}	0.009	0.092^{a}	−0.015	0.006	−0.007	−0.052^{a}	0.057^{a}	1.000				1.267
16.*NDIREXP*$_t$	0.014	0.024^{b}	0.027^{b}	−0.005	0.061^{a}	0.034^{a}	0.003	0.060^{a}	−0.053^{a}	−0.015	0.026^{b}	−0.012	0.009	−0.005	−0.018	1.000			1.094
17.*BRDSIZE*$_t$	0.003	0.029^{b}	0.035^{a}	0.066^{a}	0.210^{a}	0.407^{a}	0.005	0.145^{a}	0.071^{a}	−0.013	0.016	0.010	−0.206^{a}	0.174^{a}	0.060^{a}	−0.051^{a}	1.000		1.383
18.*CEODUAL*$_t$	0.003	0.008	0.011	−0.038^{a}	−0.029^{b}	0.075^{a}	−0.003	0.034^{a}	0.081^{a}	−0.030^{a}	−0.005	0.014	−0.049^{a}	0.042^{a}	0.016	−0.081^{a}	−0.043^{a}	1.000	1.100
19.*BRDIND*$_t$	0.025^{b}	0.029^{b}	0.022^{c}	0.059^{a}	0.095^{a}	0.064^{a}	0.021^{c}	−0.037^{a}	−0.018	−0.021^{c}	0.017	−0.029^{b}	−0.024^{b}	0.020^{c}	0.098^{a}	0.035^{a}	0.106^{a}	0.136^{a}	1.119

Notes. See Appendix A for variable definitions.

Pearson correlation between the variables used in examining the association between *FIRSTFDIR* and Crash Risk.

Notes. The last column presents the Variance Inflation Factors (VIF). Subscripts a, b, and c denote significance at the 1%, 5%, and 10% levels. See Appendix A for variable definitions.

Table 3
Comparative analysis.

Panel A: Comparison of *Corporate Governance and FRQ* on *Board Diversity*

Variable	*Diverse Board* $FIRSTFDIR_t = 1$	*All-male Board* $FIRSTFDIR_t = 0$	Diff in means
CEODUAL	0.409	0.446	−0.037**
BRDIND	0.665	0.633	0.032***
OPACITY	0.605	0.993	−0.388***

Panel B: Comparison of *DED*/*TRA* on *FIRSTFDIR*

Variable	$FIRSTFDIR_{t+1} = 1$	$FIRSTFDIR_{t+1} = 0$	Diff in means
DED	0.2950	0.2294	0.0656***
TRA	0.2476	0.2465	0.0011

Panel C: Comparison of *FIRSTFDIR* on Crash Risk

Variable	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
FIRSTFDIR = 1 ($n = 1842$)	0.251	0.161	0.016
FIRSTFDIR = 0 ($n = 5962$)	0.202	0.029	−0.042
Diff in means	0.049***	0.132***	0.058***

Notes. Panel A provides comparisons of means for corporate governance characteristics and FRQ between all-male boards and gender-diverse boards using two-sample t-tests. Panel B provides comparisons of means for dedicated and transient institutional investors between firms with and without first-time female directors using two-sample t-tests. Panel C provides comparisons of means for firms with and without female directors under different crash risk measures using two-sample t-tests. See Appendix A for variable definitions.

female directors (*FIRSTFDIR* = 0). These results are in line with our assertions, indicating a positive relationship between female director appointments and the likelihood of a SPC.

3. Empirical results

3.1. Institutional investors and the appointment of female directors

Table 4 provides the results from estimating Eq. (1) using a logistic regression model. Column (1) examines the main effects of *DED* and *TRA* on the likelihood of appointing a female director ($FIRSTFDIR_{t+1}$). The coefficient for *DED* is positive and significant at the 1% level (1.596, $z = 3.78$). In terms of economic significance, the marginal effect of *DED* on *FIRSTFDIR* (evaluated at the mean values of the explanatory variables) is 0.118, suggesting that an increase of one standard-deviation in the composition of *DED* is associated with a ($0.044 \times 0.118 = 0.005$) rise in the likelihood of appointing a female director to investees with all-male boards. Having considered the mean value of *FIRSTFDIR* (0.247), this effect is around 2.1%. The coefficient for *TRA* is nonsignificant ($z = -0.37$). Further, these results remain unchanged when including firm fixed-effects, which are reported in column (2) of Table 4, albeit the direct effect of *DED* increases in magnitude by a factor of three (4.198, $z = 2.08$). This suggests that our results are not driven by time-invariant, firm-specific factors.[8]

To further address omitted variable concerns, beyond the use of firm fixed-effects, in Table 5, we re-performed the full sample regression using a propensity score-matched sample of firms that exhibit similar characteristics (Rosenbaum and Rubin, 1983). To generate a matched sample, we first use logistic regression to estimate the probability that dedicated institutional investors are likely to invest in a firm (*DMYDED*) based on observable firm performance (size (*SIZE*), leverage (*LEV*), return on assets (*ROA*), financial reporting opacity (*OPAQUE*), firm age (*FIRMAGE*), share turnover (*TURN*), firm-specific weekly stock return (*RET*), Tobin's Q (*TOBINQ*), firm diversification from similar industry (*RLTD_DIV*), board characteristics (including board members' experience and expertise (*BRDEXP*), new director's experience and expertise (*NDIREXP*), CEO duality (*CEODUAL*), board size (*BRDSIZE*) and board independence (*BRDIND*)) and industry characteristics (the proportion of employed females to total population in each industry (*FEMPRATIO*)). A propensity score for each observation is then calculated. We then identify matched pairs with the smallest propensity score differences. Specifically, we match each observation *DMYDED* = 1 to a unique observation with *DMYDED* = 0 using a caliper width of 0.001. The success of the matching approach is indicated by the nonsignificant differences between the covariates of these two groups (in Panel A of Table 5). Performing the regression on this matched sample, we again find that *DED* is positive and significant at the 1% level (1.911, $z = 2.79$), and *TRA* is nonsignificant ($z = -0.30$) (shown in Panel B of Table 5).

We also perform a Heckman correction in columns (3) through (4) of Table 5, as different types of institutional investors may select firms that differ in their characteristics, such as risk and earnings change, thereby biasing our sample. To address this concern, we follow Heckman's (1979) two-stage procedure. First, we estimate the probability that a firm is owned by dedicated institutional

8 Our results (untabulated) remain robust when we control for the proportion of institutional ownership and include *DED* and *TRA* separately in the regression analyses.

Table 4
Institutional Ownership and Female Directors.

Dependent variable = $FIRSTFDIR_{t+1}$	Pred.	(1) $FIRSTFDIR_{t+1}$	(2) $FIRSTFDIR_{t+1}$
Intercept		−2.618***	−39.649
		(−13.14)	(−0.74)
DED_t	+	1.569***	4.198**
		(3.78)	(2.08)
TRA_t		−0.071	−1.230
		(−0.37)	(−1.27)
$OPAQUE_t$		−0.030	−0.068
		(−1.44)	−(0.76)
$SIZE_t$		0.160***	0.835***
		(10.38)	(5.30)
LEV_t		0.052	2.879***
		(0.46)	(3.76)
ROA_t		−0.060	−2.049***
		(−0.68)	(−3.55)
$FIRMAGE_t$		−0.015	12.188***
		(−0.62)	(22.13)
$TURN_t$		−0.036**	−0.045
		(−2.21)	(−0.74)
RET_t		−0.247***	−0.104
		(−2.79)	(−0.24)
$TOBINQ_t$		−0.006	−0.016
		(−0.46)	(−0.19)
$FEMPRATIO_t$		0.013***	−0.021
		(5.07)	(−1.26)
$RLTD\_DIV_t$		0.019	2.802**
		(0.07)	(2.20)
$NDIREXP_t$		0.128	1.422***
		(1.50)	(2.81)
$BRDSIZE_t$		0.094***	0.277***
		(7.77)	(4.12)
$CEODUAL_t$		−0.056	−0.427**
		(−1.41)	(−2.29)
$BRDIND_t$		0.693***	1.461*
		(4.62)	(1.72)
Industry and Year FE		Included	
Firm and Year FE			Included
N		9062	9062
Pseudo R^2		0.11	0.42

Notes. This table presents the logistic regression results relating the percentage of dedicated institutional shareholding of firms with all-male boards to the appointment of a female director using industry and year fixed effects in column (1) and firm and year fixed effects in column (2). *z*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

investors (*DMYDED*) using a probit regression. This stage requires an instrument to be included as an exogenous variable. We use an indicator variable capturing the annual reconstitution of the Russell 1000 and 2000 indices (*RUSSELL*) as an instrument since it has been shown to drive exogenous changes in institutional ownership (e.g., Crane et al., 2016). However, it is less likely that the annual reconstitution of indices will exert a direct, first-order effect on the appointment of female directors. The results of this first regression are presented in column (3). We then calculate the inverse Mills ratio using the estimates of the probit regression and include this as a control to re-estimate Eq. (1) in column (4). Again, *DED* is positive and significant at the 1% level (1.624, $z = 3.91$), and *TRA* is nonsignificant ($z = 0.12$).[9][10]

In our analysis thus far, we have used fixed-effects models, a propensity score matching procedure, and a Heckman procedure to address the issues of omitted variable and sample selection biases. However, reverse causality may still represent an issue, as institutional investors may identify firms with better corporate governance (e.g., boards with female directors) and thus increase their ownership in these firms. To empirically investigate which direction of causality dominates, we conduct Granger Causality tests (Granger, 1969) to examine the nature of relations between institutional investors and female directors. Given the time series of the data on two variables X and Y, X is said to "Granger cause" Y if the lagged values of X are significant predictors of Y incremental to

[9] We also estimate the probability that a firm is owned by transient institutional investors (*DMYTRA*) using a probit regression. After calculating the inverse Mills ratio and include it as a control to re-estimate Eq. (1), *DED* remains positive and significant at the 1% level (2.256, z = 3.64), and *TRA* is nonsignificant.

[10] Lennox et al. (2012) explain that multicollinearity can arise even when the exclusion variable is valid. We therefore conduct diagnostic tests for multicollinearity. The variance inflation factor (VIF) for *DED* (*TRA*) is 1.363 (1.360), indicating that there is no strong evidence that multicollinearity is driving the results.

Table 5
Institutional ownership and female directors.

Panel A	$DMYDED_t = 1$ (N = 806)	$DMYDED_t = 0$ (N = 806)	Diff.	t-statistic
TRA_t	0.128	0.121	0.007	1.23
$OPAQUE_t$	0.799	0.742	0.058	1.18
$SIZE_t$	6.395	6.484	−0.089	−1.10
LEV_t	0.189	0.196	−0.007	−0.79
ROA_t	−0.010	−0.010	−0.000	−0.02
$FIRMAGE_t$	2.530	2.594	−0.064	−1.61
$TURN_t$	0.082	0.054	0.028	0.57
RET_t	−0.189	−0.173	−0.016	−1.49
$TOBINQ_t$	1.957	1.924	0.033	0.52
$FEMPRATIO_t$	42.667	43.152	−0.484	−0.67
$RLTD\_DIV_t$	0.020	0.026	−0.006	−1.38
$BRDEXP_t$	0.469	0.462	0.007	0.71
$NDIREXP_t$	0.578	0.602	−0.024	−0.28
$BRDSIZE_t$	8.050	8.053	−0.004	−0.04
$CEODUAL_t$	0.452	0.419	0.032	1.25
$BRDIND_t$	0.648	0.647	0.001	0.19

Panel B		PSM sample		Heckman Correction	
		(1)	(2)	(3)	(4)
	Pred.	$DMYDED_t$	$FIRSTFDIR_{t+1}$	$DMYDED_t$	$FIRSTFDIR_{t+1}$
Intercept		−3.194***	−2.791***	0.863***	−2.350***
		(−3.95)	(−5.84)	(2.69)	(−6.40)
DED_t	+		1.911***		1.624***
			(2.79)		(3.91)
TRA_t		10.249***	−0.142	4.520***	0.025
		(25.92)	(−0.30)	(9.23)	(0.12)
RUSSELL2000				0.199**	
				(2.05)	
$OPAQUE_t$		0.017	−0.021	0.095**	−0.035*
		(0.38)	(−0.48)	(2.18)	(−1.66)
$SIZE_t$		0.153***	0.186***	−0.015	0.163***
		(4.88)	(5.44)	(−0.49)	(10.50)
LEV_t		0.112	0.150	−0.013	0.071
		(0.49)	(0.61)	(−0.07)	(0.63)
ROA_t		−0.632***	−0.081	0.125	−0.060
		(−3.17)	(−0.44)	(1.02)	(−0.68)
$FIRMAGE_t$		0.300***	0.010	0.056	−0.013
		(5.85)	(0.18)	(1.56)	(−0.54)
$TURN_t$		−0.074*	−0.015	−0.001	−0.036**
		(−1.86)	(−0.35)	(−0.02)	(−2.21)
RET_t		0.173	−0.177	−0.087	−0.259***
		(0.77)	(−0.75)	(−0.60)	(−2.94)
$TOBINQ_t$		−0.065**	−0.007	−0.004	−0.009
		(−2.00)	(−0.20)	(−0.17)	(−0.65)
$FEMPRATIO_t$		0.003	0.010*	0.028***	0.004
		(0.25)	(1.66)	(6.62)	(0.86)
$RLTD\_DIV_t$		0.337	0.216	−0.001	−0.015
		(0.60)	(0.34)	(−0.00)	(−0.05)
$NDIREXP_t$		−0.317	−0.019	0.083	0.129
		(−1.62)	(−0.09)	(0.67)	(1.51)
$BRDEXP_t$		0.006	0.031		
		(0.26)	(1.41)		
$BRDSIZE_t$		0.087***	0.092***	−0.003	0.094***
		(3.63)	(3.90)	(−0.16)	(7.66)
$CEODUAL_t$		0.054	−0.054	−0.041	−0.058
		(0.69)	(−0.65)	(−0.66)	(−1.46)
$BRDIND_t$		0.409	0.877***	0.256	0.693***
		(1.38)	(2.78)	(1.23)	(4.63)
IMR					0.187
					(1.45)
Industry and Year FE		Included	Included	Included	Included
N.		5486	1612	9062	9062
Pseudo R^2		0.25	0.16	0.19	0.12

Notes Panel A presents the covariate balance between the control variables in firms with the propensity score matched samples of firm-years with high and low percentage of dedicated institutional shareholding.

Notes. This table presents the logistic regression results relating the percentage of dedicated institutional shareholding of firms with all-male boards to the appointment of a female director. Columns (1) and (2) present the regression results for the relation between dedicated institutional investors and female directors using the PSM procedure. Columns (3) and (4) present the regression results for the relation between dedicated investors and female directors using the Heckman correction procedure. Inverse Mills Ratio is computed from the probit model presented in Column (3). *z*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

lagged values of Y. We use the following specifications to test the significance of the coefficients on the lagged values of *DED* in Eq. (7) and the lagged values of *FIRSTFDIR* in Eq. (8):

$$FIRSTFDIR_t = \sum_{i=0}^{n} \alpha_t FIRSTFDIR_{t-1} + \sum_{i=0}^{n} \beta_t DED_{t-1} + \varepsilon_t \tag{7}$$

$$DED_t = \sum_{i=0}^{n} \alpha_t DED_{t-1} + \sum_{i=0}^{n} \beta_t FIRSTFDIR_{t-1} + \varepsilon_t \tag{8}$$

To determine the optimal lag lengths, we adopt the Bayesian information criterion (BIC) (Schwarz, 1978; Risannen, 1978) and the Hannan-Quinn information criterion (QIC) (Hannan and Quinn, 1979), and conclude that the appropriate lengths should be 4 years. Our results in Table 6 suggest that the causality from *DED* to *FIRSTFDIR* is much stronger than the reverse causality. Based on the computed Chi-squares and their significance level, Column (1) shows that *DED* Granger causes or leads *FIRSTFDIR* at a significance level of 0.01 and Column (2) shows that *FIRSTFDIR* leads *DED* at a marginal level.

Taken together, this evidence provides strong support for our assertion that the likelihood of appointing a female director to investee firms with all-male boards increases as a function of dedicated investor ownership but not as a function of transient investor ownership.

Next, to examine whether the direct effect of *DED* on $FIRSTFDIR_{t+1}$ is conditional on investee firms' financial reporting opacity, we partitioned the sample based on the median score of *OPAQUE*, with scores above-median being the high opacity sub-sample and below-median the low opacity sub-sample. In column (1) of Table 7, we present the results on the high opacity sub-sample, and in column (2) we present the results on the low opacity sub-sample. We find that *DED* is positive and significant in the high and low sub-samples. However, both the coefficient and the significance level are higher in the high opacity sub-sample. In column (3), we analyze the full sample and include interaction terms between *DED* and firm opacity and *TRA* and firm opacity by introducing an indicator variable of *DMYOPAQUE* to generate interactions. $DMYOPAQUE_t$ is an indicator variable coded one if $OPAQUE_t$ is above its year-industry median, and zero otherwise. For the interactions, we find that *DEDxDMYOPAQUE* is positive and significant (1.544, $z = 2.00$) while *TRAxDMYOPAQUE* is nonsignificant (−0.062, $z = -1.41$).

As a robustness test, we use a measure of pay performance sensitivity (*PPS*) as another proxy for opacity. Bergstresser and Philippon (2006) provide evidence that companies whose overall compensation is more sensitive to company share prices have higher levels of earnings management. *PPS* is defined as the dollar change in the CEO's equity and option holdings in response to a one-percent change in the firm's stock price. We partition the sample based on the median score of CEO pay-performance sensitivity to stock price *(PPS)* and re-estimate Eq. (1), excluding *PPS* from the regression. Our results (untabulated) show that *DED* is positive and significant (1.574, $z = 1.98$) in the high *PPS* sub-sample and nonsignificant in the low *PPS* sub-sample ($z = 0.49$). We also analyze the full sample by including interaction terms between *DED* and firm opacity and *TRA* and firm opacity using an indicator variable of *DMYPPS* to generate interactions. $DMYPPS_t$ is an indicator variable coded one if PPS_t is above its year-industry median, and zero otherwise. Our results (untabulated) show that *DEDxDMYPPS* is positive and significant (1.985, $z = 2.11$) while *TRAxDMYPPS* is nonsignificant (0.062, $z = 0.15$). These results again confirm our assertions and indicate that dedicated investors push for the appointment of female directors to all-male boards, especially for high opacity investees.

To further bolster our findings, we perform a cross-sectional analysis using shareholders' proposals as the independent variable and examine the association between shareholder proposals[11] on board diversity and the appointment of first-time female directors. A shareholder proposal is a type of investor activism used to elicit governance changes in investee firms (PwC, 2015). We operationalize shareholder proposal as an indicator variable equal to one if the firm receives a board diversity proposal in year *t*, and zero otherwise (*PROPOSAL*). We regress *FIRSTFDIR* on firms that receive shareholder proposals (*PROPOSAL*). The control variables are similar to those used in our multivariate analysis. The results presented in Column 1 of Table 8 show a positive and significant association between *PROPOSAL* and *FIRSTFDIR* (0.420, $z = 2.57$).

To execute the difference-in-differences research design (e.g., Armstrong et al., 2012), we define *POSTPR* as an indicator variable coded one in the period after the firm receives the shareholder proposal, and zero otherwise. We include the variable capturing the interaction effect of *PROPOSAL* with *POSTPR* and reperform our regression analysis. The results in Table 8 Column (2) show that *PROPOSALxPOSTPR* is positive and significant (1.072, $z = 2.66$), which is again consistent with our conjecture.[12] When we partition the sample into high and low opacity groups using the median score of *OPAQUE*, the results in Columns (3) and (4) show that *PROPOSAL* is positive and significant (0.714, $z = 2.45$) for high opacity firms and nonsignificant for low opacity firms ($z = 1.35$). When

[11] We obtain governance related shareholder proposal data from Schedule 13D filings in audit analytics. When a shareholder acquires beneficial ownership of >5% of a voting class of a company's equity securities, they are required to file a Schedule 13D with the SEC to indicate that they intend to take an activist position formally. These activists seek to influence target firms by announcing a set of specific demands, such as additional share repurchases, board representation, and governance (Gantchev, 2013; Boyson and Pichler, 2019).

[12] Caution should be exercised in interpreting these results due to the small sample size ($N = 878$).

Table 6
Granger causality test.

Dependent variable	$FIRSTFDIR_t$	DED_t
DED_{t-1}	2.394***	0.912***
	(9.27)	(59.89)
DED_{t-2}	0.684**	0.011
	(2.13)	(0.66)
DED_{t-3}	−0.228	0.018
	(−0.91)	(1.12)
DED_{t-4}	0.377*	−0.067***
	(1.88)	(−5.13)
$FIRSTFDIR_{t-1}$	0.968***	0.002*
	(51.13)	(1.66)
$FIRSTFDIR_{t-2}$	−0.014	−0.005
	(−0.11)	(−0.53)
$FIRSTFDIR_{t-3}$	−0.026	0.000
	(−0.25)	(0.02)
$FIRSTFDIR_{t-4}$	−0.042	0.008
	(−0.63)	(1.62)
N	3089	3089
	H_0: *DED* do not cause *FIRSTFDIR*	H_0: *FIRSTFDIR* do not cause *DED*
Chi-square	80.8259***	1.9161
P-value	<0.0001	0.1003

Notes. This table presents the results of Granger causality test applied to the vector autoregression (VAR) residuals corresponding to the *DED* and *FIRSTFDIR*. The optimal lag length in the test is set to four based on the Bayesian information criterion (BIC) (Schwarz, 1978; Risannen, 1978) and Hannan-Quinn information criterion (QIC) (Hannan and Quinn, 1979). *z* and *t*-statistics, reported in parentheses below each coefficient. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

we partition the sample into high and low opacity groups using the median score of *PPS*, untabulated findings show that *PROPOSAL* is positive and significant (0.678, $z = 2.89$) for high opacity firms and nonsignificant for low opacity firms ($z = 0.62$).

3.2. Path analysis

In this section we first report the tests from our path analysis using Eq. (2) and Eq. (3), which examines whether dedicated investors indirectly increase the likelihood of a SPC within investee firms with all-male boards through the appointment of female directors. To reinforce the idea that dedicated investors use female directors as a mechanism to improve FRQ, we next reperform the path analysis by replacing our crash risk measures with alternative dependent variables that proxy for earnings management.

3.2.1. Dedicated investors, female directors and crash risk

Table 9 provides the results of our path analysis from estimating Eq. (2) and Eq. (3). The results show that dedicated institutional investors indirectly induce a SPC among investee firms with all-male boards through the appointment of female directors. The direct path coefficients between *DED* and all crash risk measures are negative and significant (*CRASH*: −1.008, $z = -2.45$; *NCSKEW*: −0.411; $t = -2.06$; *DUVOL*: −0.213, $t = -2.39$), consistent with prior work (e.g., Callen and Fang, 2013). The path coefficient between *DED* and *FIRSTFDIR* is positive and significant, confirming our earlier findings, and the path coefficient between *FIRSTFDIR* and crash risk is positive and significant (*CRASH*: 0.102, $z = 2.59$; *NCSKEW*: 0.082; $t = 3.58$; *DUVOL*: 0.032, $t = 3.12$). This is consistent with our assertion that dedicated institutional investors push for the appointment of female directors to improve FRQ. While the direct path explains the reduction of bad news hoarding when the percentage of *DED* ownership is higher, the indirect path captures the effect of the release of bad news subsequent to female director's appointment. The total mediated paths for *FIRSTFDIR* [*p(DED, FIRSTFDIR)xp (FIRSTFDIR, CRASH/NCSKEW/DUVOL*] are all positive, with coefficients of 0.092, 0.074, and 0.029. The proportions of the effect of *DED* on *CRASH, NCSKEW,* and *DUVOL* measures that are caused by female director appointments are approximately 10.1% (|0.092/−1.008 + 0.092|), 22.0% (|0.074/−0.411 + 0.074), and 15.7% (0.029/−0.213 + 0.029), respectively.[13]

3.2.2. Dedicated investors, female directors and financial reporting quality

We use three other proxies for FRQ namely *OPAQUE*, accruals quality, and real earnings management. According to Hutton et al. (2009), *OPAQUE* is used as a proxy for the firm's financial reporting opacity. The second proxy is accruals quality (*AQ*), defined as the abnormal change in working capital accruals (Dechow and Dichev, 2002; McNichols, 2002). The third proxy is real earnings management (*REM*), developed by Roychowdhury (2006). Following prior studies, we add abnormal discretionary expenses, abnormal cash flows from operations, and abnormal production costs in developing the *REM* measure (e.g., Cheng et al., 2016).

We include the following controls: firm size using the natural logarithm of market capitalization (*SIZE*), firm age (*FIRMAGE*),

[13] Results are qualitatively similar when we reperform our path analysis by examining the high opacity group (samples that are above the median score of *OPAQUE*) only.

Table 7
Institutional ownership and female directors: high versus low opacity.

Dependent variable = $FIRSTFDIR_{t+1}$	Pred.	(1) High opacity	(2) Low opacity	(3) Full sample
Intercept		−2.461***	−2.875***	−2.600***
		(−8.61)	(−10.50)	(−12.88)
DED_t	+	2.382***	0.976*	0.966*
		(3.62)	(1.86)	(1.89)
TRA_t		−0.082	−0.059	0.018
		(−0.29)	(−0.23)	(0.08)
$DMYOPAQUE_t$				−0.237
				(−0.71)
$DED_t xDMYOPAQUE_t$	+			1.544**
				(2.00)
$TRA_t xDMYOPAQUE_t$				−0.062
				(−1.41)
$SIZE_t$		0.170***	0.147***	0.158***
		(7.66)	(6.95)	(10.27)
LEV_t		−0.049	0.132	0.055
		(−0.32)	(0.86)	(0.49)
ROA_t		−0.152	0.093	−0.052
		(−1.35)	(0.69)	(−0.59)
$FIRMAGE_t$		−0.039	0.017	−0.016
		(−1.21)	(0.49)	(−0.66)
$TURN_t$		−0.061***	−0.012	−0.036**
		(−2.61)	(−0.51)	(−2.17)
RET_t		−0.260**	−0.237**	−0.249***
		(−1.97)	(−2.12)	(−2.81)
$TOBINQ_t$		−0.021	0.012	−0.005
		(−1.21)	(0.63)	(−0.36)
$FEMPRATIO_t$		0.010***	0.016***	0.013***
		(2.73)	(4.58)	(4.95)
$RLTD\_DIV_t$		0.182	−0.073	−0.002
		(0.45)	(−0.18)	(−0.01)
$NDIREXP_t$		0.054	0.176	0.128
		(0.44)	(1.56)	(1.50)
$BRDSIZE_t$		0.072***	0.120***	0.094***
		(4.20)	(7.55)	(7.79)
$CEODUAL_t$		−0.010	−0.100*	−0.055
		(−0.18)	(−1.89)	(−1.38)
$BRDIND_t$		0.903***	0.532***	0.697***
		(4.44)	(2.72)	(4.64)
Industry and Year FE		Included	Included	Included
N.		4315	4747	9062
Pseudo R^2		0.12	0.12	0.11

Notes. This table presents the regression results relating the percentage of dedicated institutional shareholding of firms with all-male boards to the appointment of a female director. Columns 1 and 2 present the regression results using high-opacity (*DMYOPAQUE* = 1) and low-opacity (*DMYOPAQUE* = 0) sub-samples, respectively. Column 3 presents the regression results after including an opacity indicator variable (*DMYOPAQUE*) and its interaction with the percentage of dedicated and transient institutional shareholdings. *DMYOPAQUE* is an indicator variable coded 1 if a firm's opacity is above its year-industry median, and 0 otherwise. *z*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

leverage (*LEV*), market to book ratio (*MB*), volatility of sales (*σ(SALE)*), volatility of operating cash flows (*σ(OCF)*), operating cycle (*OCYCLE*), innovation intensity (*INTINT*), capital intensity (*CAPINT*), incurrence of loss (*LOSS*), auditor size (*BIGN*), sales growth (*GROWTH*), and abnormal stock return (*ABRET*). We also control for firm and board governance, including board size (*BRDSIZE*), CEO-chairman duality (*CEODUAL*), and the percentage of board independence (*BRDIND*).

For our assertions to hold, we expect *DED* to be negatively related to measures of FRQ through *FIRSTFDIR*. This is because female directors improve FRQ by reducing earnings management. We first find that the direct paths between *DED* and FRQ measures are negative and significant (*OPAQUE*: −1.065, $t = -2.03$; *AQ*: −0.032; $t = -2.10$; *REM*: −0.193, $t = -1.97$). Consistent with our assertions, the results in Table 10 show that the coefficients of the indirect paths between *DED* and *FIRSTFDIR* are positive and significant for the three models using different FRQ measures (*OPAQUE*: 1.672, $z = 2.94$; *AQ*: 1.332; $z = 2.09$; *REM*: 1.510, $z = 2.53$) while the path coefficients between *FIRSTFDIR* and FRQ are negative and significant (*OPAQUE*: −0.172, $t = -3.06$; *AQ*: −0.003; $t = -2.56$; *REM*: −0.025, $t = -2.30$). The percentage of the total path explained by the mediating variable, *FIRSTFDIR,* is 21.3% (|-0.288/−1.065–0.288|) for *OPAQUE*, 11.1% (|-0.004/−0.032–0.004|) for *AQ*, and 16.5% (|-0.038/−0.193–0.038|) for *REM*.

Untabulated results using *PPS* also show similar findings. The direct path coefficient between *DED* and *PPS* is negative and significant (−0.134, $t = -1.74$). The indirect path coefficient between *DED* and *FIRSTFDIR* is positive and significant (1.556, $z = 1.95$) while the indirect path coefficient between *FIRSTFDIR* and *PPS* is negative (−0.018, $t = -2.31$). The total mediated path through

Table 8
Shareholder activism and *FIRSTFDIR*.

	(1) Full sample	(2) Difference-in-differences	(3) High opacity	(4) Low opacity
Intercept	−2.600***	−2.252	−2.438***	−2.845***
	(−13.02)	(−0.99)	(−8.47)	(−10.38)
$PROPOSAL_t$	0.420**	0.371	0.714**	0.270
	(2.57)	(1.22)	(2.45)	(1.35)
$PROPOSAL_t xPOSTPR_t$		1.072***		
		(2.66)		
$POSTPR_t$		−0.550		
		(−1.57)		
DED_t	1.579***	2.021	2.390***	0.992*
	(3.81)	(1.34)	(3.62)	(1.89)
TRA_t	−0.080	0.864	−0.100	−0.057
	(−0.41)	(1.03)	(−0.35)	(−0.22)
$OPAQUE_t$	−0.030	−0.019	−0.007	−0.037
	(−1.43)	(−0.19)	(−0.22)	(−0.90)
$SIZE_t$	0.156***	0.048	0.165***	0.144***
	(10.08)	(0.66)	(7.40)	(6.75)
LEV_t	0.057	0.212	−0.045	0.131
	(0.51)	(0.33)	(−0.29)	(0.85)
ROA_t	−0.060	−0.867	−0.153	0.098
	(−0.68)	(−1.51)	(−1.36)	(0.73)
$FIRMAGE_t$	−0.016	−0.386***	−0.040	0.015
	(−0.66)	(−3.89)	(−1.24)	(0.43)
$TURN_t$	−0.035**	0.037	−0.059**	−0.011
	(−2.13)	(0.61)	(−2.51)	(−0.49)
RET_t	−0.243***	0.349	−0.255*	−0.235**
	(−2.74)	(0.49)	(−1.94)	(−2.10)
$TOBINQ_t$	−0.006	0.128**	−0.022	0.013
	(−0.45)	(2.19)	(−1.25)	(0.64)
$FEMPRATIO_t$	0.013***	0.043	0.010***	0.016***
	(5.07)	(1.29)	(2.73)	(4.63)
$RLTD\_DIV_t$	0.027	−0.757	0.211	−0.066
	(0.09)	(−0.63)	(0.51)	(−0.16)
$NDIREXP_t$	0.130	−0.150	0.054	0.183
	(1.53)	(−0.39)	(0.44)	(1.63)
$BRDSIZE_t$	0.094***	−0.028	0.072***	0.121***
	(7.75)	(−0.55)	(4.16)	(7.57)
$CEODUAL_t$	−0.057	−0.226	−0.015	−0.099*
	(−1.44)	(−1.20)	(−0.27)	(−1.87)
$BRDIND_t$	0.688***	−0.886	0.900***	0.523***
	(4.58)	(−1.35)	(4.42)	(2.68)
Ind. and Year FE	Included	Included	Included	Included
N	9062	878	4315	4747
Pseudo R^2	0.11	0.17	0.12	0.12

Notes. This table presents the regression results relating the first-time females appointed to all-male boards to shareholder proposal on board diversity. Column 1 presents the logistic regression results using the full sample. Column 2 presents the difference-in-differences regression results. Columns 3 and 4 present the logistic regression results using high and low opacity sub-samples, respectively. $PROPOSAL_t$ is an indicator variable coded 1 if a firm receives a shareholder proposal on board diversity in year *t*, and 0 for the propensity score-matched firm which did not receive a proposal. $POSTPR_t$ is an indicator variable coded 1 (0) in the two years following (preceding) the year of a shareholder proposal. *z*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

Table 9
Path analysis: dedicated institutional ownership, female directors, and crash risk.

	Pred.	(1) $CRASH_{t+1}$	(2) $NCSKEW_{t+1}$	(3) $DUVOL_{t+1}$
Direct path				
p(DED, Crash Risk*)* α_2		−1.008**	−0.411**	−0.213**
		(−2.45)	(−2.06)	(−2.39)
Mediated path for *FIRSTFDIR*				
p(DED, FIRSTFDIR) β_2	+	**0.904****	**0.904****	**0.904****
		(2.34)	**(2.34)**	**(2.34)**
p(FIRSTFDIR,* Crash Risk*) α_3	+	**0.102*****	**0.082*****	**0.032*****
		(2.59)	**(3.58)**	**(3.12)**
Total mediated path for *FIRSTFDIR* β_2 x α_3		0.092	0.074	0.029
Percentage of effect mediated $\beta_2 x\alpha_3/\ (\alpha_2+\beta_2 x\alpha_3)$		10.1%	22.0%	15.7%
Controls		Included	Included	Included
Industry and Year FE		Included	Included	Included
N.		7804	7804	7804
Eq. (2) (Pseudo R^2) Adj R^2		(0.03)	0.03	0.04
Eq. (3) Pseudo R^2		0.13	0.13	0.13

Notes. This table reports the results from a path analysis that examines the effect of dedicated institutional investors on crash risk through the appointment of female directors. *z* and *t*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

Table 10
Path analysis: dedicated investors, female directors, and FRQ.

	Pred.	(1) $OPAQUE_{t+1}$	(2) AQ_{t+1}	(3) REM_{t+1}
Direct path				
p(DED, FRQ) α_2		−1.065**	−0.032**	−0.193**
		(−2.03)	(−2.10)	(−1.97)
Mediated path for *FIRSTFDIR*				
p(DED, FIRSTFDIR) β_2	+	**1.672*****	**1.332****	**1.510****
		(2.94)	**(2.09)**	**(2.53)**
p(FIRSTFDIR, FRQ) α_3	−	**−0.172*****	**−0.003****	**−0.025****
		(−3.06)	**(−2.56)**	**(−2.30)**
Total mediated path for *FIRSTFDIR* $\beta_2\ x\alpha_3$		−0.288	−0.004	−0.038
Percentage of effect mediated $\beta_2 x\alpha_3/\ (\alpha_2+\beta_2\ x\alpha_3)$		21.26%	11.10%	16.45%
Controls		Included	Included	Included
Industry and Year FE		Included	Included	Included
N.		5142	4620	4717
Eq. (2) Adj R^2		0.27	0.32	0.21
Eq. (3) Pseudo R^2		0.07	0.07	0.07

Notes. This table reports the results from a path analysis that examines the effect of dedicated institutional investors on financial reporting quality through the appointment of female directors. *z* and *t*-statistics, reported in parentheses below each coefficient, are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

FIRSTFDIR is −0.028, which is about 17.3% of total effect of *DED* on *PPS*. These results suggest that dedicated investors, through female directors, improve FRQ by decreasing earnings management.[14][15][16]

4. Additional tests

4.1. Beyond the "glass ceiling"

It is not entirely clear why firms with more dedicated institutional investors are more likely to appoint female directors to change investee firms' FRQ. One explanation, however, is that those females who are considered for director roles possess more skill, expertise, and experience than their male counterparts. This explanation is logical, as women are significantly disadvantaged compared to males in their ability to secure corporate board positions and are severely underrepresented (Huber and Simpkins, 2019). Given this male leadership bias, prospective female directors are unable to compete on parity and likely have to be better than their male counterparts just to be considered for a board role. Thus, female directors may add value because they have greater expertise or industry experience than male directors. Indeed, prior studies have shown that director expertise and experience are consequential for improving FRQ (Krishnan et al., 2011; Chychyla et al., 2019).

To test this, we follow Fedaseyeu et al. (2018) and create a *Qualifications Index* for each director in our sample based on the sum of six experience variables (legal/consulting, academic, accounting/finance, management, political, and military) and three education variables (undergraduate degree, advanced degree, and MBA). We identify directors with legal or consulting experience by their prior or current positions as consultants, lawyers, attorneys, or judges. Directors currently or previously employed by academic institutions or who earned doctorate degrees are identified as those with academic experience. Directors with accounting and finance experience are those that have Chartered Financial Analyst (CFA™), Certified Public Accountant (CPA), or Chartered Accountant (CA) credentials, and have performed accounting or finance-related functions in other firms. Directors who have prior or current executive positions, including current and retired CEOs, are considered to have management experience. Directors who have prior or current employment, service, or consulting experience with any Presidential Administration since President Lyndon B. Johnson and Congress members and Senators are identified as those with political experience. We also identify directors having military experience by their prior or current employment, service, or consulting experience with the U.S. Department of Defense, its divisions, or the U.S. Department of Homeland Security. We collect these director characteristics from BoardEx.

As shown in Table 11, we find that the female directors appointed to all-male boards have higher average values than male directors in the qualification, experience, and education indices. The differences in *t*-values are statistically significant. These univariate results suggest that newly appointed female directors contribute more distinct skills and expertise to incumbent boards than their male counterparts, thereby providing an explanation for why dedicated institutional investors may choose to appoint female directors.

4.2. Continuous female director service and crash risk

Our empirical analyses thus far have shown that dedicated institutional investors are more likely to appoint female directors to investee firms with all-male boards and, through their appointment, indirectly improve their FRQ. Further, we find that the reporting environment of investee firms improves immediately, as signalled by lower discretionary accruals, accruals quality, and real earnings management. For our assertions to hold, however, we would expect that the continued presence and service of a female director on all-male boards should serve to lower the likelihood of a future SPC as they continue to improve the firm's corporate disclosure policies and reduce the likelihood of holding bad news.

To test this, we create an indicator variable that captures continued service (*CONTFDIR*), coded one if the female director inducted at time $t\text{-}1$ or t continues to serve at $t+1$ and $t+2$, and zero otherwise. We then regress *CONTFDIR* on our three *CrashMeasures* with the same controls used in Eq. (2). The results presented in Table 12 show that the coefficients of *CONTFDIR* are negatively and significantly related to all crash risk measures (*CRASH*: −0.116, $z=-2.21$; *NCSKEW*: −0.085, $t=-2.72$; *DUVOL*: −0.029, $t=-2.08$). This confirms our prediction that boards with continuously serving female directors improve FRQ by decreasing the likelihood of a SPC.

[14] When an additional female director (*AFDIR*) joins a diverse board, we find that the associations between *AFDIR* and *OPAQUE*, and *AQ* are negative and significant, while the association between *AFDIR* and *REM* is negative and insignificant. When we examine the association between *AFDIR* and crash risk, we find positive and significant results for *NCSKEW* and *DUVOL* measures, but positive and insignificant results for *CRASH* measure (results not tabulated). The results imply that an additional female director is able to bring benefits to the corporate governance of the board. We also test whether the results hold when a board has two more new female directors on board. However the associations between *AFDIR* and FRQ, and crash risk disappear possibly due to small sample size.

[15] For robustness check, we conduct an analysis to test for the association between losing a female director and financial reporting quality. When we test *OPAQUE*, *AQ* and *REM* of these firms, our results (untabulated) show that the association between losing a female director and FRQ is insignificant. In addition, contrary to the findings that boards that continuously appoint female directors are negatively associated with SPC, we find that the association disappears upon losing a female director.

[16] We also examine whether the appointment of male director to the board would result in better financial reporting transparency. We find that *OPAQUE* and *AQ* are positive and significant at the 1% level and 5% level respectively while *REM* is nonsignificant. We also test whether the appointment would lead to an increase in current crash risk and a decrease in future crash risk but fail to find any significant results (untabulated), confirming the rationality of the institutional investors adding females to boards.

Table 11
Univariate analysis: director qualification indices.

	FIRSTFDIR = 1	*FIRSTFDIR* = 0	Diff	*t-test*
Qualification Index	2.159	1.977	0.182	14.8***
Experience Index	0.535	0.489	0.046	6.09***
Education Index	1.615	1.473	0.142	15.5***
N	7756	61,822		

Notes. This table provides the comparison in means between firms with *FIRSTDIR* = 1 and *FIRSTDIR* = 0 for director qualifications. Experience index includes legal/consulting experience, academic experience, accounting/finance experience, management experience, political experience, and military experience. Education index includes undergraduate, graduate, and MBA degrees. Qualifications Index is the sum of the previous six experience variables and the three education variables. All variables are defined in Appendix A.

Table 12
Continuous presence of female directors and crash risk.

		(1)	(2)	(3)
Dependent variable	Pred.	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$Intercept_t$		−1.094***	−0.445***	−0.225***
		(−5.52)	(−3.48)	(−4.00)
$CONTFDIR_t$	–	−0.116**	−0.085***	−0.029**
		(−2.21)	(−2.72)	(−2.08)
$SIZE_t$		0.082***	0.088***	0.043***
		(5.05)	(8.91)	(10.09)
MB_t		−0.006	−0.001*	−0.001**
		(−1.38)	(−1.70)	(−1.99)
LEV_t		−0.100	−0.068	−0.044
		(−0.86)	(−0.89)	(−1.35)
ROA_t		0.085	−0.004	0.013
		(0.71)	(−0.07)	(0.43)
$OPAQUE_t$		−0.002	0.001	−0.000
		(−0.19)	(0.21)	(−0.20)
$NCSKEW_t$		−0.001	0.022	0.006
		(−0.05)	(1.40)	(0.89)
$TURN_t$		0.026	0.016**	0.007**
		(1.27)	(2.11)	(2.27)
$SIGMA_t$		3.533	3.324**	0.744
		(1.62)	(2.52)	(1.19)
RET_t		0.393	0.377***	0.125*
		(1.64)	(2.88)	(1.92)
DED_{t-1}		0.771**	0.529	0.167
		(1.98)	(1.64)	(1.47)
TRA_{t-1}		0.057	0.230*	0.104*
		(0.27)	(1.84)	(1.87)
$BRDSIZE_t$		−0.019	−0.020**	−0.009**
		(−1.46)	(−2.50)	(−2.50)
$CEODUAL_t$		−0.012	−0.010	−0.003
		(−0.30)	(−0.41)	(−0.31)
$BRDIND_t$		0.126	0.073	0.011
		(0.82)	(0.77)	(0.27)
Ind. and Year FE		Included	Included	Included
N.		5687	5687	5687
Adj. R^2 (or Pseudo R^2)		(0.04)	0.03	0.04

Notes. This table presents the logistic (OLS) regression results relating crash risk to the continuous presence of females appointed to all-male boards in Columns (1, 2, and 3). *z* and *t*-statistics reported in parentheses below each coefficient are calculated based on standard errors clustered by firm. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

4.3. Events surrounding female directors appointment and crash risk

To provide some direct evidence that bad news is being released after the appointment of female directors, we examine the events surrounding stock price crashes. Specifically, we analyzed events, news, press releases, and information disclosures coinciding with a SPC for our sample of 463 observations for the period 2003–2018 by searching 8-K filings and Factiva news. We find that most of the 463 observations in our sample release some form of bad news including downward revision of management guidance (>90%). Other news such as adverse legal or regulatory rulings and management change etc. cover <10%.

As a formal test, we also analyze whether the impact of dedicated institutional investors on the appointment of female directors are positively associated with the downward revision of management forecasts. *DownMF* is defined as an indicator variable coded as one if average management earnings forecast in a year is lower than that of the previous year, and zero otherwise. We regress changes in

DownMF on *FIRSTFDIR* and the interacting variable DED_{t-1}x$FIRSTFDIR_t$. Our results (untabulated) show that *FIRSTFDIR* and DED_{t-1}x$FIRSTFDIR_t$ are positively associated with *DownMF* (0.466, $z = 1.98$ and 0.786, $z = 1.85$ respectively). This suggests that the heightened crash risk following the release of bad news is more likely to be concentrated in firms with higher dedicated institutional ownership after appointing a female director(s).

5. Conclusion

Based on theory and prior evidence that dedicated investors tend to be more closely involved in the operations of portfolio firms than their transient counterparts and have access to insider information, we examined whether dedicated investors are more likely to influence the FRQ of investee firms by inducing the appointment of female directors to all-male boards. We find that the likelihood of appointing a female director increases as a function of dedicated investor ownership, particularly for high opacity firms. Further, we demonstrated that, through the appointment of female directors to firms with all-male boards, dedicated investors improve investee firms' FRQ by inducing the release of stockpiled negative accounting information.

These results are robust to alternative explanations and when addressing issues of endogeneity. Additional tests showed that firms with high opacity and with a higher percentage of dedicated investors that push for new female appointments are more likely to be associated with the sudden release of stockpiled negative news, compared with the subgroup that has low opacity. Through a battery of further empirical tests, we confirmed that dedicated investors improve reporting quality through female director appointments by decreasing earnings management proxied by discretionary accruals, accruals quality, and real earnings management. Overall, these findings support the view that dedicated investors focus on the real (long-term) performance of their investees. We argued that dedicated investors push for the appointment of female directors to investees with all-male boards and high opacity as an efficient monitoring mechanism to improve FRQ. Our findings support this conclusion and contribute to the literature by highlighting a novel channel—female directors—through which dedicated investors pursue their value trading strategy. That is, by improving investee firms' reporting quality, female directors are likely agents to drive price improvements over the long-term. The findings also enrich our understanding of the effect of "stewardship" on firms' disclosure policies—especially the practice of negative information hoarding—through the appointment of female directors onto all-male boards.

While our study is subject to the usual limitations of the empirical methodology using archival data, other limitations are also worth noting. First, while it is not possible to completely rule out the problem of endogeneity, which remains a limitation of our study, we performed several tests and alternative specifications to alleviate endogeneity concerns that all confirm our assertions and main findings. Second, while our results hold when a board appoints two female directors, we face barriers when we attempt to examine firms that appoint more than two female directors. Therefore, we leave future research to examine when the benefits of better corporate governance from female directors still outweigh the cost of losing appropriate risk-taking from male directors when firms appoint more female directors. Third, while we included as many corporate governance variables as possible, we cannot rule out the possibility that our variables may be picking up the effects of one or more unidentified corporate governance variables. We hope our research stimulates further work on understanding the indirect role that institutional play in the governance of their investee firms.

Data availability

Data will be made available on request.

Appendix A. Variable definitions

Variable	Definition
Dependent and test variables	
$FIRSTFDIR_{t+1}$	Indicator variable coded 1 if there is at least one female director on the board in current or following fiscal years (t or $t+1$), but no female director exists in fiscal years t-1 and t-2, and 0 if there is at least one new male directors to an all-male board in current or following fiscal years (t or $t+1$), but no new male director exists in fiscal years t-1 and t-2. We treat a firm that appoints a female director after another female left the firm as one case. $FIRSTFDIR_{t+1}$ equals 0 if the boards do not appoint female directors in t and $t+1$.
DED	The percentage of shares outstanding held by dedicated institutional investors.
TRA	The percentage of shares outstanding held by transient institutional investors.
CRASH	Indicator variable coded 1 for a firm-year that experiences one or more firm-specific weekly returns being 3.09 standard deviations lower than the mean firm-specific weekly returns over the fiscal year.
NCSKEW	Negative skewness of firm-specific weekly returns over the fiscal-year.
DUVOL	Natural logarithm of the ratio of the standard deviations of down-week to up-week firm-specific returns. Down-week (up-week) is when the firm-specific weekly returns below (above) its annual mean.
Control variables	
OPAQUE	Three-year moving sum of the absolute value of discretionary accruals estimated from the modified Jones model (Hutton et al., 2009).
SIZE	Natural logarithm of the market value of equity.
LEV	The ratio of total debt to total assets.
ROA	The ratio of income before extraordinary items to lagged total assets.

(continued on next page)

(*continued*)

Variable	Definition
FIRMAGE	Natural logarithm of the number of years since the firm's initial public offering.
TURN	Average monthly share turnover over a fiscal year minus the average monthly share turnover over the previous fiscal year, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.
RET	Mean of firm-specific weekly returns over the fiscal year, times 100.
TOBINQ	The market value of total assets divided by the book value of total assets. The market value of assets is calculated as the book value of total assets minus the book value of common equity plus the number of common shares outstanding times the stock price.
FEMPRATIO	The proportion of employed females to total population in each industry, as extracted from the *U.S. Bureau of Labor Statistics*.
RLTD_DIV	The extent to which the firm's sales are derived from similar or related industries.
NDIREXP	The proportion of new appointee over existing directors having related expertise and experience. Related expertise or experience coded 1 if the new director has accounting or finance experience (including Chartered Financial Analyst credentials, Certified Public Accountant qualifications, or prior or current experience performing accounting- or finance-related functions.
BRDEXP	The average accounting or finance experience or experience (Chartered Financial Analyst credentials, Certified Public Accountant qualifications, or prior or current experience performing accounting- or finance-related functions) of the board.
BRDSIZE	The number of directors on the board.
CEODUAL	Indicator variable coded 1 if the CEO is Chair of the board, and 0 otherwise.
BRDIND	The number of independent directors divided by the number of directors on the board.
MB	The ratio of the market value of equity to the book value of equity.
SIGMA	The standard deviation of firm-specific weekly returns over the fiscal year.
PPS	A dollar change in the value of a CEO's stock and options holdings that would come from a one percentage point increase in the company stock price. One percentage point = 0:01*company share price x (number of shares and options held by CEO).
Variables in additional analyses	
PROPOSAL	Indicator variable coded 1 if a firm receives a shareholder proposal on board diversity, and 0 otherwise.
POSTPR	Indicator variable coded 1 if the period falls after the firm receives the shareholder proposal, and 0 otherwise.
AQ	Accruals quality is estimated based on the Dechow and Dichev (2002) model modified by McNichols (2002) and Francis et al. (2005). A firm's current accruals are regressed on its lagged, current, and lead operating cash flows, change in revenues and current property, plant, and equipment across each year and industry according to the Fama and French 48 industry classification codes.
REM	Real earnings management is defined as the sum of *AB_CASH*, *AB_PROD*, and *AB_EXP,* as defined by Roychowdhury (2006). *AB_CASH* is abnormal cash flow from operations, measured as deviations from the predicted values of the corresponding industry-year regression. *AB_PROD* is abnormal discretionary expenses, measured as deviations from the predicted values of the corresponding industry-year regression. *AB_EXP* is abnormal production cost, measured as deviations from the predicted values of the corresponding industry-year regression.
σ(SALE)	The standard deviation of sales revenue over at least three years within *t-4* to *t*.
σ(OCF)	The standard deviation of cash flow from the operations over at least three years within *t-4* to *t*.
OCYCLE	Natural log of the length of the firm operating cycle, calculated as the average of sales turnover plus days in inventory over at least three years within *t-4* to *t*.
INTINT	Research and development and advertising expense divided by total sales revenue.
CAPINT	Tangible fixed assets divided by total assets.
LOSS	Indicator variable coded 1 if the firm experiences loss from continuing operations in any of the past three years, and 0 otherwise.
BIGN	Indicator variable coded one if the firm's auditor is one of the Big 4/5 audit firms, and 0 otherwise.
GROWTH	Annual percentage change in sales.
ABRET	One-year market-adjusted buy-and-hold return for year t where market returns are value-weighted.
POST	Indicator variable coded 1 if the period falls after the new appointment of a female director, and 0 otherwise.
Experience Index	Legal/consulting experience (indicates prior or current employment as a consultant, lawyer, attorney, or judge) + Academic experience (indicates prior or current employment by an academic institution or a Ph.D. degree) + Accounting/Finance experience (indicates Chartered Financial Analyst credentials, Certified Public Accountant qualification, or prior or current experience performing finance-related functions) + Management experience (indicates prior employment in an executive including CEO) + Political experience (indicates prior or current employment, service or consulting experience with a U.S. Presidential Administration (since the Lyndon B. Johnson Administration), and members of U.S. Congress and U.S. Senators position) + Military experience (indicates prior or current employment, service, or consulting experience with the U.S. Department of Defense, one of the agencies of the U.S. Department of Defense, or the U.S. Department of Homeland Security)
Education Index	Undergraduate (indicates that the director has an undergraduate degree) + Graduate (indicates that the director has a graduate degree) + MBA (indicates that the director has an MBA)
Qualification Index	Experience Index + Education Index
CONTFDIR	Indicator variable coded 1 if a newly appointed female director to an all-male board in the *t* or *t-1* continue to serve in fiscal year *t + 1 and t + 2*, and 0 otherwise.

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