Board Gender Diversity and Informativeness of Stock Prices

Abstract

Using idiosyncratic volatility as a proxy, we show that stock prices of firms with gender-diverse boards reflect more firm-specific information. The positive association between gender diversity and idiosyncratic volatility remains significant after controlling for corporate governance, earnings quality and institutional ownership. We interpret this finding as reflecting greater disclosure of firm-specific information by firms that have higher board gender diversity. This interpretation is further bolstered by evidence of more continuous disclosure in firms with gender-diverse boards. Further, we show that gender diversity exhibits substitutive relationships with earnings quality and institutional ownership in the determination of idiosyncratic volatility.

Keywords: Idiosyncratic volatility, Female director, Diversity, Governance, Transparency, Information flow

Classification Code: G11, G14, G34

Recent finance research has documented a relationship between corporate governance and informativeness of stock prices (Morck et al., 2000; Jin and Myers, 2006; Ferreira and Laux, 2007; Ferreira and Fernandez, 2008; Gul et al., 2008). This relationship rests on the notion that corporate governance can improve transparency through management constraints and incentives and thereby influence investors' pricing of equity (Gompers et al., 2003; Cremers and Nair, 2005). Greater transparency encourages disclosure of more public firm-specific information by managers and collection of more private firm-specific information by investors. The public information that is deemed to be price-relevant by investors is directly incorporated into stock prices and the private information collected by informed investors gets incorporated through trading. In this study, we extend the research on the linkage between governance and stock price informativeness by examining whether gender-diverse[1] boards in U.S. listed companies encourage incorporation of more firm-specific information into stock prices. Based on prior literature discussed later, *ceteris paribus,* we expect firms with more gender-diverse boards to disclose more price-relevant information to investors and thereby improve stock price informativeness.

Stock price informativeness, defined as extent to which firm-specific non-market information is reflected in the stock price, is important because stock prices provide signals that are useful in achieving efficient resource allocation (Tobin, 1982). Prior research suggests that when stock prices are close to their fundamental (full information) value, they facilitate efficient resource allocation both within and across firms (Durnev et al., 2003; Durnev et al., 2004) [2]. Empirical evidence supports the link between firm-specific information reflected in stock prices and the efficiency of capital allocation (e.g. Wurgler, 2000). Not surprisingly, stock price informativeness has attracted considerable research

[1] We use the term "gender diverse" to denote either the number or the presence of female directors on corporate boards. In our sample based on US corporations, female directors constitute about 14% of directors though a majority of the corporations have at least one female director on the board.

[2] There is extensive literature that suggests that improved informativeness is necessary for increased allocative efficiency though it might not be sufficient (Blackwell, 1951; Hirshleifer, 1971; Citanna and Villanacci, 2000).

interest because of its potential role in facilitating efficient allocation of capital resources (Morck et al., 2000; Piostroski and Roulstone, 2004; Jin and Myers, 2006).

A recent study by Adams and Ferreira (2008) suggests that gender diverse boards allocate more effort to oversight and monitoring. In particular, they show that female directors improve board inputs - have higher board attendance, improve board attendance of male directors, are more likely to take up monitoring positions on audit, nominating and corporate governance committees rather than on the compensation committee, and are more likely to hold CEOs accountable for poor performance. Audit and corporate governance committees are directly involved in increasing the transparency and improving the quality and amount of value-relevant firm-specific information that is disseminated to investors. However, they find a negative effect of gender diversity on performance measures such as Tobin's Q and Return on Assets (ROA), consistent with the argument that too much board governance can decrease firm value (Almazan and Suarez, 2003; Adams and Ferreira 2007). They do, however, report an improvement in performance in gender-diverse boards when shareholder rights are weak. Instead of focusing on firm performance, we examine the effect of board gender diversity on stock informativeness, which can benefit investors by improving efficient resource allocation.

The ambiguity in evidence regarding the benefits of board gender diversity does not seem to have materially affected the following trends. Majority of firms in most industries across U.S. have female directors and female non-executive directors (see Table II Panel B for a distribution by industry of female directors for our sample period). This pattern is consistent with recent evidence which suggests that over the last ten years U.S. firms have more female directors on corporate boards (Rose, 2007)[3]. Second, proposals for board reform have specifically argued that gender diversity improves board effectiveness and therefore

[3] See Figure 1 later in the paper.

have called for more female directors on the board (Higgs, 2003; Tyson, 2003). In their quest for board reform, Sweden has proposed to make 25% female directorship a legal requirement, Norway requires 40% representation by the end of 2008 and Spain requires 40% representation by the end of 2015. Yet, no study to date has examined (or considered) the role of female directors[4] in improving the informativeness of stock prices. A recent working paper by Ferreira et al. (2009) shows a negative association between stock price informativeness and board independence. This seems to suggest that even if gender diversity makes the board more independent, its effect on the informativeness of stock prices is not clear. Although gender equity *per se* might be a significant driver of these regulations and proposals, the ambiguity of results on its benefits and the spate of current and proposed regulations render the examination of their potential impact on board effectiveness and transparency of corporate disclosures very important.

Although our paper is perhaps the first one to examine the association of gender diversity with stock price informativeness, several organizational studies have examined the effect of gender diversity on behavioral dynamics in board meetings and the resulting effectiveness of the board in implementing better corporate governance (Hambrick et al., 2008; Hillman et al., 2008). These studies suggest that female directors are more likely to increase the information content of discussions in the board by bringing diverse viewpoints, broader perspective and innovative ideas to board meetings. They also suggest that by improving board informedness and increasing its level of oversight and monitoring, female directors create a richer information environment that is conducive to dissemination of value-relevant firm-specific information to investors.

[4] We treat female director presence as equivalent to gender diversity because there is no all-female board in our sample.

Our measures of stock price informativeness are based on the following reasoning. We expect a non-market-related (idiosyncratic) movement of stock price if[5] firm-specific price-relevant information is available to investors. Accordingly, Morck et al. (2000) argue that idiosyncratic stock price movements reflect the incorporation of such information into stock prices. Consistent with their argument, we test whether the stock prices of firms with gender-diversity exhibit higher idiosyncratic volatility, *ceteris paribus*, compared to other firms. Although this measure has been used extensively to assess the informativeness of stock prices (Morck et al. 2000; Ferreira and Laux, 2007; Jin and Myers, 2006; Durnev et al., 2003), all idiosyncratic movements of stock prices might not be driven by firm-specific information. If stock prices react to both information and noise, stock price changes that are not explained by market movements could reflect noise rather than information (Teoh et al. 2008).[6] Even if this is true, large (greater than 5%) abnormal stock price changes are more likely to reflect information than noise. Using this rationale, we test whether the frequency of large idiosyncratic stock price changes is associated with firms with gender-diverse boards. In a similar vein, idiosyncratic stock price movements of large firms are likely to be driven more by information than noise. Therefore, in an additional test, we examine the association between gender diversity and idiosyncratic volatility in a sample limited to large firms. In other tests, we augment these measures with the future Earnings Incremental Explanatory Power (FINC) measure developed by Durnev et al. (2003). One could argue that board directors have greater control over disclosures by the firm than on whether these would be viewed as price-relevant by the market. Based on this argument, we also directly examine the

[5] Idiosyncratic movement is expected if *but not only if* firm-specific information is available to investors.
[6] Roll (1988) suggests that non-market-related stock price movements could be driven by noise or by information that affects the firm differently from the way it affects the market. Rajgopal and Venkatachalam (2006) show that deteriorating financial reporting quality and higher dispersion in analysts' forecasts of earnings are statistically associated with higher idiosyncratic return volatility, which suggests that idiosyncratic volatility might be driven by noise. The literature on unexplained stock price volatility is a rich as can be seen in Shiller (1981) and West (1988).

8-K continuous disclosure filings of firms to test whether gender-diverse firms disclose information more frequently than other firms. In all the above tests, we find evidence consistent with greater stock price informativeness in firms with gender-diverse boards.

Idiosyncratic volatility has been shown in prior literature to be associated with shareholder protection and earnings quality. Good investor protection reduces the proportion of firm's operating cash flows captured by insiders (Gompers et al., 2003; Cremers and Nair, 2005) and increases the proportion available to external investors. Equity prices in firms with higher investor protection are more sensitive to changes in the firm-specific cash flows because they reflect more of the firm's operating cash flows than in low investor-protected firms, In effect, they exhibit higher idiosyncratic volatility. In addition, higher shareholder protection could also encourage both current and potential investors to collect more private information about the firm and use it to trade in the firm's stock. Stock-trading based on firm-specific private information further increases stock price informativeness (Ferreira and Laux, 2007).

In addition to the effect of investor protection, the effect of higher earnings quality on idiosyncratic volatility has also been examined by Ferreira and Laux (2007). Earnings quality could affect private information environment by reducing the benefits of additional private information, thus dampening private information acquisition effort. This 'crowding out effect' discourages informed traders from collecting and trading on private information (Kim and Verrecchia, 2001), substituting it with the less frequent earnings information. The lower frequency of earnings information release and the resulting stock price reaction to it reduces idiosyncratic volatility. A second way in which earnings quality could affect information environment is by reducing the cost of private information collection (Kim and Verrecchia, 1991; Jin and Myers, 2006), thereby encouraging informed traders to collect more of it. This has the effect of increasing idiosyncratic volatility. Through trading activities, stock prices

impound traders' private information, effectively transforming it into public information. This view is consistent with Grossman and Stiglitz (1980) who predict that lower cost of private information leads to higher intensity of informed trading, and hence to 'more informative pricing'. Based on this reasoning, we include earnings quality as a determinant of idiosyncratic volatility.

Ultimately, private firm-specific information collected by sophisticated investors gets incorporated into stock prices only through trading (trading-link hypothesis). Institutions are typically more sophisticated and resourceful in collecting firm-specific information than individual investors. It follows that greater institutional trading could increase idiosyncratic volatility (Hartzell and Starks, 2003). Based on this reasoning, we include institutional trading as another determinant of idiosyncratic volatility.

After controlling for shareholder protection (using the G-index developed by Gompers et al., 2003), we find that firms with gender-diverse boards are associated with higher idiosyncratic volatility and higher frequency of large idiosyncratic stock returns. Our examination of 8-K filings with SEC (under the "other events" category where the managers are expected to voluntarily disclose all items that are judged by them to be of material importance to investors) shows that firms with gender-diverse boards have higher frequency of continuous disclosure. Tests using the FINC measure (Durnev et al. 2003) and the examination of idiosyncratic volatility in a sample limited to large firms provide further supporting evidence of a positive association between gender-diverse boards and stock price informativeness. This result holds after controlling for the effects of earnings quality and institutional holding. Further, we find that idiosyncratic volatility is positively associated with earnings quality, consistent with the "encouragement" view and with institutional holding, consistent with the trading-link hypothesis. We also show that the interactions between earnings quality and gender diversity and between institutional holding and gender diversity

have negative associations with idiosyncratic volatility, consistent with substitutive interactive effects of earnings quality and institutional holding with gender diversity.

Section II provides definitions of variables and background information about several measures used in this analysis. The tests and results are given in section III. Additional test results are given in Section IV and Section V gives concluding remarks.

I. Background and research questions

A. Stock Price Informativeness Measures

a. Idiosyncratic Volatility

Volatility of a stock's return comprises two components – systematic and idiosyncratic (see Durnev et al., 2004, Ferreira and Laux, 2007). Systematic risk refers to the correlation between the firm's stock return and the return of market portfolio (Sharpe, 1964; Lintner, 1964). Idiosyncratic volatility, on the other hand, is the component of stock return volatility that can be diversified away (Markowitz, 1959). This component reflects firm-specific information[7]. Operationally, we use Model (1) to separate systematic and idiosyncratic components of stock return variability:

$$r_{id} = \alpha_i + \beta_i r_{md} + \varepsilon_{id} \qquad (1)$$

In expression (1), r_{id} is daily excess return for stock i and r_{md} is daily excess return of the market portfolio. Both α_i and β_i are estimated using regression analysis for each month. This model assumes that beta (β_i) captures all systematic risk that cannot be diversified away using portfolio techniques and should be priced by the market[8].

[7] It reflects both firm-specific information and noise. Our maintained hypothesis in this paper is that stock price movements are driven only by information – either market-wide or firm-specific. We also note that in our terminology, firm-specific information includes industry information. In additional analysis, we also examine firm-specific volatility after controlling for industry effects in the market model.

[8] We have also computed idiosyncratic volatility measures using the Fama-French three-factor model and industry-controlled model. The results are similar and are given in the section on additional tests.

Equation (1) is commonly estimated using OLS regression under the assumption that $E(\varepsilon_{id}) = Cov(r_{md}, \varepsilon_{id}) = 0$. The variance of residual term is denoted by $Var(\varepsilon_{id})$. Given the assumption of zero covariance between the expected and residual parts in (1), the total variance of stock return $Var(r_{id})$ is the sum of the two variances:

$$Var(r_{id}) = \beta_i^2 Var(r_{md}) + Var(\varepsilon_{id}) \tag{2}$$

By definition, we have $\beta_i = \frac{\sigma_{imd}}{\sigma^2_{md}}$, where $\sigma_{imd} = Cov(r_{imd}, r_{md})$ and $\sigma^2_{md} = Var(r_{md})$. The variance of the market portfolio (related to β_i) is defined as systematic variance and the variance of the error term (ε_{id}) as idiosyncratic variance. Idiosyncratic variance (σ^2_{ied}) is formally expressed as

$$\sigma^2_{ied} \equiv \sigma^2_{id} - \frac{\sigma^2_{imd}}{\sigma^2_{md}} \tag{3}$$

where $\sigma^2_{id} \equiv Var(r_{id})$.

The ratio of idiosyncratic variance to total volatility ($\frac{\sigma^2_{iet}}{\sigma^2_{it}}$) for each firm-month t reflects the proportion of volatility that is *not* explained by systematic components and equals ($1-R_{it}^2$) of the regression (1). Since ($1-R_{it}^2$) is skewed (Durnev et al., 2004), we measure idiosyncratic volatility by logistic transformation of the ratio ($1-R_{it}^2$) / R_{it}^2, as suggested by Theil (1971, Chapter 12). Formally, idiosyncratic volatility ψ_{it} is defined as:

$$\Psi_{it} = Ln\left(\frac{1-R^2_{it}}{R^2_{it}}\right) = Ln\left(\frac{\sigma^2_{ie,t}}{\sigma^2_{it} - \sigma^2_{ie,t}}\right) \tag{4}$$

Such transformation maps $1 - R_{it}^2 \in [0,1]$ to $\Psi \in \Re$.

b. *Frequency of Large Idiosyncratic Stock Price Changes (FLISP)*

We compute the error term (ε_{id}) from expression (1) as before and define $FLISP_{it}$ as the frequency during the month in which $|\varepsilon_{id}| \geq .05$.

B. Gender Diversity in Corporate Boards and Stock Price Informativeness

Literature on the differences between men and women directors in their traits and behavior suggests that women in leadership positions (i) exhibit higher ethical standards in their decisions than their male counterparts (Betz et al., 1989; Clikeman et al., 2001; Mason and Mudrack, 1996), (ii) employ a more democratic, transformational and trust-building leadership style (Cohen et al., 1998; Klenke, 2003; Trinidad and Normore, 2005) and (iii) exhibit greater risk aversion in financial decision-making settings (Riley and Chow, 1992; Powell and Ansic, 1997; Sunden and Surette, 1998; Hinz et al., 1997). Previous literature also shows that in financial dealings, men are more overconfident (Lenney, 1977;Barber and Odean, 2001) and have a greater preference for competition (Niederle and Vesterlund, 2007) than women.

These findings suggest that a gender-diverse board is likely to engage in a higher level of monitoring and facilitate more informative disclosures compared to one without female directors. For example, overconfident male directors are less likely to verify managers' reports compared to female directors who do not exhibit such overconfidence. Such verification makes the reports more informative. A gender-diverse board is more likely to deem inaccurate and uninformative disclosures as unethical and therefore devote more effort to detect and prevent them. In their attempt to lead by trust rather than by command, female leaders are likely to encourage greater information exchange among directors and employees, creating a richer information environment resulting in more informative disclosures. Further, if gender-diverse boards are more risk-averse as suggested by prior studies, they will seek to disclose more information and thereby transfer a higher proportion of firm-specific cash-flow risk from insiders to outside to investors (who can diversify it).

In addition to the evidence on individual differences between men and women, Daily et al. (2000) and Rose (2007) suggest that gender diversity fosters a more open culture because female directors typically have different childhood and adulthood socialization experiences[9] which enable them to bring different viewpoints to the boardroom compared to men. Stated differently, female directors typically bring up issues that men often overlook (Carter et al., 2003). This "open discussion culture" (Hambrick et al., 2008) can overcome group processes (such as pluralistic ignorance[10]) and encourage broader and more candid discussions than those that take place in all-male boards. These discussions are more likely to add value to an organization and also foster more informative disclosures. Furthermore, resource dependence literature suggests that directors who are more connected to the environment of the firm as individuals contribute more to board effectiveness (Pfeffer, 1972; Pfeffer and Salancik, 1978). Gender-diverse boards are more representative of the typical environment of most firms. For example, women make 88 percent of all purchases and controlling spending in almost half of all households with assets of more than $500,000 (Kanner, 2004). Together, these differences between gender-diverse and all-male boards seem to encourage more informative disclosure in firms with gender-diverse boards. Recent studies in accounting document higher levels of audit (Gul et al., 2008) and lower earnings management (Gul et al., 2007) in firms with gender-diverse boards, thereby providing evidence that is consistent with the informativeness argument.

Gender diversity could also influence the effectiveness of corporate boards if in a pool of individuals with equal capabilities, men are more likely to be selected to corporate boards than women (Glass ceiling argument). Documented evidence shows that women constitute 30% of managers but only 6% of directors in U.K. (Higgs, 2003). In the U.S., 45% of the

[9] Socialization both during childhood and adulthood for women is more oriented towards caring, trust-building and communication whereas for men it is oriented towards individualistic values such as self-assertion, mastery and self-expansion (Mason and Mudrack, 1996; Eagly, 1987)
[10] See Westphal and Bednar (2005)

managers were women (up from 21% in 1976) but only 10% were directors (Powell and Graves, 2003). If one were to assume that the pool of director-relevant talent is equally distributed among senior managers, these numbers suggest that women face higher barriers to entry into corporate boards. Even in the absence of gender differences in attributes and behavior, women who overcome this higher barrier and get into boards are likely be more competent and demand greater transparency than their male counterparts [11].

The above arguments based on the findings of previous literature suggest that firms with gender-diverse boards are likely to provide more informative firm-specific disclosures and also improve firm performance. However, there is evidence of lower performance by firms with gender-diverse boards (Adams and Ferreira, 2008) as well as evidence of lower informativeness in firms with independent boards (Ferreira et al. 2009). This mix of evidence suggests that whether gender diversity makes disclosures more or less informative is still an unresolved empirical question. Using idiosyncratic volatility, frequency of large idiosyncratic stock price changes and voluntary 8-K filing frequency as proxies, we examine in this paper whether firms with gender-diverse boards are associated with more or less informative stock prices.

C. Shareholder protection, Earnings quality, Institutional trading and Stock Price Informativeness

Ferrerira and Laux (2007) provide evidence on the association between shareholder protection and stock price informativeness. On the one hand, fewer anti-takeover restrictions increase the incentive for investors to collect private firm-specific information to better assess the potential gains of a takeover. On the other hand, fewer takeover restrictions diminish the bargaining power of managers (Comment and Schwert, 1995) and allow informed investors

[11] It is not the purpose of this paper to distinguish between the two arguments for the positive effects of gender diversity in boards. We establish greater idiosyncratic volatility and argue that it results from more frequent disclosure and greater transparency in firms with gender-diverse boards, irrespective of whether the primary *cause* is gender difference *per se*.

to jockey for a quick control of the firm. Managers' exposure to market forces when there are fewer restrictions on takeover constrain their expropriating behavior and in turn, protect and attract uninformed investors. The presence of relatively more uninformed investors makes informed trading even more rewarding for resourceful investors who can collect and trade on private firm-specific information. Such trading allows private information to get reflected in stock price early and thereby increases stock price informativeness. Based on Ferriera and Laux (2007), we control for shareholder protection as measured (inversely) by the G-index developed by Gompers et al. (2003).

Review of prior literature suggests that the net effect of accounting earnings quality on private information collection effort by informed investors is determined by a tradeoff between "crowding out" and "encouragement" effects. Support for the 'encouragement effect' view comes from Durnev et al. (2004), who suggest that higher earnings quality reduces the cost of information collection and encourages private information collection resulting in more intensive informed trading. Durnev et al. (2004) states that "in a market with many risky stocks, during any given time interval, information about the fundamental values of some firms might be cheap, while information about the fundamental values of others might be dear. Traders, *ceteris paribus*, obtain more private information about the former and less about the latter. Consequently, the stock prices of the former, moving in response to informed trading, are both more active and more informative than the stock prices of the latter" (Durnev et al., 2004, p.67).

Consistent with the above reasoning, Morck et al. (2000) provide evidence of more idiosyncratic firm-specific price variation in countries with better accounting information. Higher quality accounting system provides more firm-specific public information to all investors, which allows risk arbitrageurs to make more precise predictions about firm-specific

stock price movements[12]. Jin and Myers (2006) also discuss the linkage between the quality of accounting information and stock price synchronicity. In their theoretical model they show that lack of transparency increases R^2 of the market model. They argue that unless the firm is completely transparent, insiders will capture more cash flow if the hidden firm-specific information is positive (the firm has more cash than investors can observe) and less when the hidden information is negative (the firm has less cash than investors can observe). That is, the lack of transparency will require insiders to absorb more firm-specific risk, and pass through less firm-specific risk to investors. Since the market will only reflect the firm-specific risk faced by outside investors, higher opaqueness (lack of transparency) causes firm-specific return to be driven less by firm-specific information and more by market return which increases R^2 in the market model. Consistent with their theoretical model, Jin and Myers (2006) report positive relations between R^2 and several measures of opaqueness using stock returns from 40 markets around the world from 1990 to 2001.

An alternative view of the effect of earnings quality is that as more information is channeled through the public accounting system, less private information needs to be collected. In other words, higher quality earnings information *crowds out* private information. Public accounting reports are periodic (quarterly and annual) and less frequent than disclosures that would be reflected in daily returns. Lower frequency of firm-specific accounting information to the market should therefore reduce the frequency of firm-specific price movements and thereby reduce idiosyncratic price variation.

Out of these two opposing views regarding the relationship between earnings quality and idiosyncratic volatility, 'encouragement effect' appears to have better support in the literature (Kim and Verrecchia, 1991; Kim and Verrecchia, 1994). Accordingly, we posit that

[12] Morck et al (2000) failed to find evidence in support of their conjecture but their reasoning for the relationship is consistent with the "encouragement" view.

higher earnings quality [13], leads to lower information cost (Francis et al., 2004; 2005) triggering more private information collection and higher stock price informativeness (Durnev et al., 2004; Jin and Myers, 2006). In addition, we also explore whether earnings quality affects idiosyncratic volatility jointly with gender diversity.

While shareholder protection and earnings quality encourage the collection of private firm-specific information, such information gets reflected in stock prices through trading by privately informed traders. Typically, institutional investors are more sophisticated and are more likely than individual investors to collect and trade on private firm-specific information (Hartzell and Starks, 2003). The *trading-link* hypothesis suggests that increased institutional trading allows faster and more complete incorporation of privately collected firm-specific information into stock prices. Correspondingly, firms with more institutional shareholding are likely to exhibit a higher idiosyncratic price variation. Based on this argument, we control for earnings quality and institutional shareholding and examine their interactions with gender diversity in additional tests.

II. Tests and Results

A. Sample descriptions and graphical presentations

Table I gives the definitions of variables used in the analysis. Definitions of variables that capture stock informativeness are given in Panel A, 8-K continuous disclosure items are given in Panel B and gender diversity variables are given in Panel C. Gender diversity variables (GDIV) in Panel C are of two types. The number of female directors on the board (FDIR) and the number of female independent non-executive directors on the board (FINED) measure gender diversity relative to the number of directors on the board (DIR). The second type of variables are indicator variables for (i) presence of at least one female director on the

[13] High quality or transparent accounting information is also defined as more timely and conservative information (see Ball et al., 2000).

board (FD); (ii) CEO being female (FCEO); and (iii) chairman being female (FCHAIR). Further, we define indicator variables for CEO and chairman being the same person (CEODUAL) and that person being female (FCEODUAL).

Investor protection variables are defined in Panel D. We measure investor protection either by the G-index developed in Gompers et al. (2003) directly or by an indicator variable GD that is coded as zero if $G \leq 7$ (high shareholder rights) or one if $G \geq 11$ (low shareholder rights). The quarterly absolute change in holdings by institutional investors is denoted as INST and earnings quality as EQ. Control variables defined in Panel E include profitability (ROE), profit volatility (VROE), leverage (LEV), market-to-book ratio (MB), equity capitalization (SIZE), dividend payment dummy (DD), firm age (AGE), and an internal diversification dummy (DIVER) and a dummy variable (MERGER) from Compustat (AFTNT1) that identifies merger and acquisition activity. These control variables are similar to the ones used by Ferreira and Laux (2007).

Insert Table 1 here

Table 2 Panel A provides details about sample selection. The initial sample consists of 487,331 firm-month observations, drawn from the Center for Research in Stock Prices (CRSP) over the years 2001-2006. After excluding firms in the utilities (SIC code between 4900 and 4999) and financial industries (SIC code between 6000 and 6999), the sample size is reduced to 313,017. We draw our data on investor protection rights (G index) from the IRRC dataset and board characteristics and director data from the Corporate Library database. After merging our sample with the IRRC dataset and the corporate library database, excluding all firm-month observations without the Gompers G-Index and removing all firm-month observations that do not have data related to control variables (4,654), our sample consists of

78,768 firm-month observations. Out of these, board characteristics including gender data are not available in Corporate Library database for 11,788 firm-months. For our analysis of the relationship between gender diversity and idiosyncratic volatility, we are left with a final sample of 66,980 firm-months. Out of this sample, 11,535 firm-months do not have institutional ownership data in Thomson's institutional ownership database compiled from SEC's 13F filings. Information on the variables needed for computing earnings quality is not available from S&P Compustat database for 12,404 firm-months. This leaves us with a sample of 55,445 for our analysis using institutional ownership and a sample of 51,942 for our analysis using earnings quality. For the joint analysis that uses both institutional ownership and earnings quality, the sample size is 43,041 firm-months. Following Ferreira and Laux (2007), we estimate monthly idiosyncratic volatility using daily returns for all 66,823 firm-months during the sample period. We estimate the frequency of large idiosyncratic stock price changes (FLISP) for each of these firm-months. We let the FLISP = 0 in months where a firm does not experience a large abnormal price change.

The data for disclosure frequency is obtained from DirectEdgar search engine. Merging the CRSP data with DirectEdgar gives a total of 449,209 firm-months over the sample period of 2001-2006. Going through the sample selection process as described above, we get a sample of 67,110 firm-months for our analysis of board diversity on continuous disclosure.

Insert Table 2 here

The distribution of female directors across different industries given in Panel B shows that certain industries that provide service (e.g. railroad transportation) or supply products that are directly sold to consumers (e.g. food stores) are more likely to have female directors

on their boards. The large variation in the presence of female directors across different industries suggests that controlling for industries is important in our analysis. Therefore, we report estimates of industry fixed effects regressions.

Panel A of Table III gives means and medians of independent variables for the full sample and for samples with gender-diverse boards and all-male boards separately. Out of an average of 9.873 directors on boards, just over one is likely to be a female director. Female CEOs are found in only 2% and female chairpersons in less than 1.5% of firms. As such, we have presented results for female chairpersons and female CEOs in succeeding tables but given the small percentage of firms in which they occupy these positions, our ability to draw inference from these results is admittedly limited. Descriptive statistics are shown for the number of female (female non-executive) directors but their log values are used in the regressions. The differences between the mean values between gender-diverse and all-male boards justify using these as independent variables in our regressions. Panel B gives the Pearson correlations above the diagonal and Spearman correlations below it. Though most of the correlations between independent variables are significant, none are at a level that would present a serious multicollinearity problem in the regression analysis.

Insert Table 3 here

The upward trend both in the average number of female directors on board and in the number of firms with female directors among US corporations over time is depicted in Figure 1. Figure 2 shows a near-monotonic increase in idiosyncratic volatility with the number of female directors.

Insert Figures 1 and 2 here

B. Number of Female Directors and Stock Price Informativeness – Model and Results

We examine the effect of gender diversity as measured by the number of female directors on stock price informativeness using regression (5) given below. The dependent variable *SI* is measured either by the idiosyncratic volatility, Ψ or by the frequency of large idiosyncratic stock price changes, *FLISP*. In this regression analysis, we control for investor rights that has been shown by Ferreira and Laux (2007) to be a significant determinant of idiosyncratic volatility. Our hypothesis is tested by β_1.

$$\begin{aligned} SI_{it} = \alpha &+ \beta_1 GDIV_{it-1} + \beta_2 LDIR_{it-1} + \gamma_1 GOV_{it-1} + \gamma_2 ROE_{it-1} + \gamma_3 VROE_{it-1} \\ &+ \gamma_4 LEV_{it-1} + \gamma_5 MB_{it-1} + \gamma_6 SIZE_{it-1} + \gamma_7 DD_{it-1} + \gamma_8 AGE_{it-1} \\ &+ \gamma_9 DIVER_{it-1} + \gamma_{10} MERGER_{it-1} + \sum industries\ dummy + \varepsilon_{it} \end{aligned} \quad (5)$$

In equation (5), i and t denote the indexes for firm and month respectively. Gender diversity is measured by LFDIR, the natural logarithm of the number of female directors plus 1 (we add 1 to the number so that we get a value of LFDIR = 0 when there are no female directors on the board). LDIR is the natural logarithm of number of directors. The corporate governance measure, GOV, is either G-Index (Gompers et al., 2003) or dummy variable GD that is coded as zero if the G-index is less than or equal to seven (portfolio open to takeover activity) and as one if the index is greater than or equal to 11 (closed portfolio). These measures of governance are similar[14] to the ones used by Ferreira and Laux (2007).

Table 4 presents the results of regressions using (5). Panels A and B give the results with Ψ and FLISP as the dependent variables respectively. In Panel A, Columns (1), (2), (5) and (6) replicate Ferreira and Laux (2007) for our sample from 2001 to 2006. Consistent with their results, we find that strong corporate governance (low G-index or GD=0) is associated with higher idiosyncratic volatility. Columns (3) and (7) give the results of regressions (5)

[14] Ferreira and Laux (2007) define GD = 0 when G ≤ 5 and GD = 1 when G ≥ 14. We modified this measure to reflect overall improvements in corporate governance from mid-nineties in the sample of Ferreira and Laux to early 2000's used in our sample.

when the governance variable GOV = G-index or GD respectively, with the number of directors on the board as a control variable. Columns (4) and (8) give the results of (5) with GOV = G-index or GD respectively, with the number of *non-executive* directors on the board as a control variable. Controlling for non-executive directors allows us to examine whether female directorship is just another proxy for non-executive directors. In all four regressions, gender diversity variable exhibits significant positive association with idiosyncratic volatility, a result that supports our hypothesis.

Insert Table 4 here

Panel B gives the results with FLISP as the dependent variable. The results are very similar to the results in Panel A. Using FLISP mitigates the effect of the possibility that idiosyncratic volatility might reflect noise rather than information. The results in Panels A and B of Table 4 provide evidence in support of the proposition that gender diversity on boards is associated with higher stock price informativeness.

C. *Other measures of gender diversity*

Results when gender diversity is measured using other variables are given in Table 5. As in Table 4, Panels A and B give the results with idiosyncratic volatility and FLISP as the dependent variables respectively. The results of regression (5) when we measure gender diversity by the number of female non-executive directors are given in Column (1). The results show that after controlling for G, the number of female non-executive directors is positively related to idiosyncratic volatility (Panel A) and FLISP (Panel B).

We address potential non-linearity in the relationship by using an indicator variable for the presence or absence of female directors to measure gender diversity. The second column in both panels gives the results when gender diversity is measured by female CEO and female chairperson indicators and we control for both board size and the number of

female non-executive directors. The signs of coefficients are all positive and significant for female CEO indicator in both panels. Female chairperson indicator is positive but not significant. The third and fourth columns give the results when GDIV = FCEO or FCHAIR without the control for the number of female non-executive directors. Column (5) includes both FCEO and FCHAIR without additional controls for LFINED. Column (6) gives results when gender diversity is measured by the presence of female directors, i.e., GDIV = FD. GDIV variables show positive and significant associations with idiosyncratic volatility (Panel A) and FLISP (Panel B) in all cases. The sign is consistently positive in all cases.

Insert Table 5 here

As we remarked earlier, the number of firms with female CEOs and chairpersons is small and therefore, we do not base our interpretation primarily on these variables. They are presented here for the sake of completeness. However, they are consistent with our findings with other measures of gender diversity that do not suffer from this problem. In summary, using these different measures of gender diversity, we show consistently that firms with gender diverse boards exhibit greater stock informativeness than other firms after controlling for governance variables.

D. Endogeneity

We address here the possibility that the associations in (5) might be driven by firms with high idiosyncratic volatility opting to have boards with greater gender diversity. An established way of addressing this issue is to examine the change of idiosyncratic volatility subsequent to a change in the number of female directors. We separate our sample into two sub-samples, one containing firm-years with increasing and another with decreasing number

of female directors. For each sub-sample, we regress idiosyncratic volatility ψ on post-event (negative-event) indicator variables $I_{\Delta FDIR+}(I_{\Delta FDIR-})$ that are coded 1 in the year after an increase or decrease in female director number respectively in the two sub-samples (or on changes in the number of female directors $\Delta FD^{+}(\Delta FD^{-})$). In each regression, we include firm-years one year before and one year after change in number of female directors[15]. The coefficients of indicators capture the difference in idiosyncratic volatility from one-year before to one-year after the change in number of female directors.

Insert Table 6 here

From Table 6, it is seen that number of firm years in the Increase sub-sample is significantly higher than for the Decrease sub-sample. This is consistent with the trend of increasing number of female directors. Estimates of change in idiosyncratic volatility in Table 6 show significant results only for the Increase sub-sample, perhaps because of the decrease sub-sample is of smaller size (6,285) compared to the increase sub-sample (15,883). The Increase sub-sample shows that an increase in female director presence results in a positive change in idiosyncratic volatility which suggests that reverse causality is not likely to be driving our results. In the Decrease sub-sample, the signs are generally consistent (positive association – i.e., a decrease in female director number results in a decrease in idiosyncratic volatility) with our expectation but not significant.

E. *Gender Diversity and Disclosure Frequency*

[15] We include only one year before and one year after the change in number of female directors since the number of female directors can be changed every year in our case, as opposed to the case in Ferreira and Laux (2007), where G-Index does not change every year, and they need to address this issue by examining one-year, two-year and three-year before and after the change in G-Index.

Idiosyncratic variation in stock prices measures firm-specific information that is reflected in the stock price. Firm-specific information could come into the market in several ways: directly from firm's disclosures; from other public sources of information; or from analysts and investors who collect private information on the firm and trade on that information. Out of these, the board members have control only on the firm's disclosures.

Information can be disclosed by a firm through different channels in different ways. This makes it difficult to develop a comprehensive disclosure measure. Consistent with prior literature, we examine continuous disclosures through Form 8-K filings with SEC (Pastena 1979; Carter and Soo 1999). The 8-K filings were introduced in 1970 by SEC as a form of continuous reporting (called current reports) and required listed firms to disclose information deemed material to investors. The filings were re-structured in 1977 into 8 categories of which 7 categories were mandated disclosures. Category #5 was classified as "other disclosures". Managers could disclose whatever they judged material for investors in this category. Materiality was never defined (Rahman and Ganesh, 2008). This allows managers the discretion to disclose what they deem fit. The filing requirements were re-classified in 2004 but the current filing retains the "other events" category as category #8. We use the frequency of "other disclosures" or "other events" category disclosures as a proxy for disclosures made by managers. We denote the log of this frequency as Φ_8.

Disclosures can be driven by many factors. We expect disclosure to increase if there is increased activity of relevance to shareholders such as merger or acquisition activity. We control for this by using MERGER, a variable from Compustat that identifies merger or acquisition activity of a firm, as a control variable. Further, mandatory filings with SEC under 8-K could also trigger additional disclosures under category 8, not because of board pressure but because they provide explanatory information for the other mandatory disclosures. We add up all the other seven categories of mandatory filings under 8-K for each

firm-month and use that as an additional control variable. The other independent variables we use in the regression are the same as in (5). The additional variable YEARDUM is a dummy variable for the period 2004-2006 during which the new classification system for 8-K has been in force. Table VII gives the results of this analysis that uses following regression to examine the effect of gender diversity in the board on Φ_8.

$$\begin{aligned}\Phi_{8,i,t} = \alpha + \sum_{i=1}^{N} \lambda_{1i} GDIV_{i,t-1} + \mu_1 G_{i,t-1} + \mu_2 ROE_{i,t-1} + \mu_3 VROE_{i,t-1} + \mu_4 LEV_{i,t-1} \\ + \mu_5 MB_{i,t-1} + \mu_6 SIZE_{i,t-1} + \mu_7 DD_{i,t-1} + \mu_8 AGE_{i,t-1} + \mu_9 DIVER_{i,t-1} \\ + \mu_{10} MERGER_{i,t-1} + \mu_{11} YEARDUM_{i,t} + \sum_{y=1}^{7} \Phi_{y,i,t} + \sum \text{industries dummy} + \varepsilon\end{aligned} \tag{6}$$

All measures of gender diversity have a significantly positive association with disclosure frequency after controlling for G and other variables that could affect disclosure. Consistent with our expectation of a positive effect of shareholder rights on disclosure frequency, G is significantly negatively associated with disclosure frequency.

Insert Table 7 here

III. Additional Tests

A. Firm-specific Effects Model

In order to control for the possibility that time-invariant omitted firm characteristics might be driving the results, we estimated both the idiosyncratic volatility and FLISP models with firm fixed effects. Our models included controlling for the number of directors on the board or the number of non-executive directors on the board (in addition to all the control variables in (5)). Gender diversity variable was positive and significant in three out of these four cases. It was insignificant when idiosyncratic volatility was the dependent variable and the number of directors on the board was the control variable.

B. Fama-Macbeth tests

In order to control for possible time-series and cross-section correlations in the error structure, we estimate yearly regressions of (5) and compute the Fama-Macbeth statistics. The results are qualitatively similar to the ones we have reported in Table 4 for both the idiosyncratic volatility and FLISP measures.

C. Separate test for large firms

A concern that we have tried to address in this paper is the argument that idiosyncratic volatility might be driven by noise rather than by information. The FLISP measure mitigates this concern by focusing only on large abnormal stock price changes that are unlikely to be driven purely by noise. We also split the sample at the median size and examine the effect of gender diversity on idiosyncratic volatility in the large-firm sample using (5). Idiosyncratic movements of stock price are less likely to be driven by noise in large firms compared to small firms. The results for the large firm sample are substantially the same as for the full sample. This gives additional support for the proposition that gender-diverse boards are associated with greater stock price informativeness.

D. Non-linearity in the effect of governance

We control for the possibility of non-linearity in the effect of shareholder rights on idiosyncratic volatility by using the dummy variable GOV = GD in (5). The results were consistent and similar to the results in Table 5.

E. Future Earnings Incremental Explanatory Power (FINC) Test

Following Durnev et al. (2003) and Ferreira and Laux (2007), we also use FINC as a second measure of stock price informativeness. FINC captures how well current stock prices predict future earnings and is defined as the increase of coefficient of determination (R^2) of

annual regression on each two-digit SIC industry with at least ten firms for regression (7) relative to regression (8) below:

$$r_{it} = b_0^b + b_1^b \Delta E_{it} + \sum_{\tau=1}^{3} b_{2,\tau}^b \Delta E_{it+\tau} + \sum_{\tau=1}^{3} b_{3,\tau}^b \Delta r_{it+\tau} + \varepsilon_{it}^b \qquad (7)$$

$$r_{it} = b_0^c + b_1^c \Delta E_{it} + \varepsilon_{it}^c \qquad (8)$$

In (7) and (8), r_{it} is annual stock return calculated from fiscal year end share price plus dividends adjusted by stock splits and distribution (COMPUSTAT annual item #199/#27 plus #199/#26), and ΔE_{it} is annual change in earnings before interest, taxes, depreciation, and amortization (annual item #13) scaled by previous fiscal year-end market capitalization (annual items #199 times #25). Consistent with the arguments in Collins et al. (1994), future returns have been included in (7) to mitigate the errors-in-variable problem caused by using realized earnings rather than (unobservable) changes in expected earnings. Given that our sample period spans only six years, the need to get three future period returns and earnings severely restricts the size of our sample for this test.[16] We use the following regression model to examine the effect of the number of female directors on FINC:

$$\begin{aligned} FINC_{k,t} = {} & \alpha + \beta_1 LFDIR_{k,t-1} + \beta_2 LDIR_{k,t-1} + \gamma_3 GOV_{k,t-1} + \gamma_4 ROE_{k,t-1} \\ & + \gamma_5 VROE_{k,t-1} + \gamma_6 LEV_{k,t-1} + \gamma_7 MB_{k,t-1} + \gamma_8 SIZE_{k,t-1} + \gamma_8 DD_{k,t-1} \\ & + \gamma_{10} AGE_{k,t-1} + \gamma_{11} DIVER_{k,t-1} + \gamma_{12} MERGER_{k,t-1} + \varepsilon \end{aligned} \qquad (9)$$

In (9), $FINC_{k,t}$ is the annual future earnings incremental explanatory power for industry k at time t. Other regressors are two-digit SIC industry averages of the same regressors in equation (5) for idiosyncratic volatility. Consistent with our results on idiosyncratic volatility, we find that the coefficient for *LFDIR* is positive and significant at 10% level.

F. Other measures of Idiosyncratic Volatility and FLISP

[16] It is for this reason that we present the FINC analysis as an additional rather than as a main test.

We measured idiosyncratic volatility and FLISP using the Fama-French 3-factor model and industry-adjusted models instead of the one-factor model (1). The results (untabulated) using these different measures of idiosyncratic volatility are essentially the same as those reported in the paper.

G. Earnings Quality and Institutional Holding Tests

Ferreira and Laux (2007) indicate two ways in which governance helps in private firm-specific information collection by investors. First, better governance improves transparency and openness by reducing the incentive to hide information. Increased transparency, in turn, reduces the cost of information collection. Second, strong investor protection reduces expropriation by managers that results in a better protection for uninformed investors. In the presence of more uninformed investors, the benefit to private information collection increases. Both these effects – reduced cost and increased benefit – encourage the collection of more information and trading on such information by informed traders. All this information gets reflected in the stock price of the firm. The G-Index that we have used as control captures investor protection and is therefore more focused on the second effect.

As detailed earlier, prior literature has been shown that earning quality (Kim and Verrecchia, 1991) and institutional trading (Piotroski and Roulstone, 2004; Hartzell and Starks, 2003) are related to transparency and increase information usage in price determination. Therefore, both these variables are likely to influence the collection of private firm-specific information by investors. In this section, we show that our findings are robust to additional controls for earning quality and institutional trading. We conduct robustness tests

using two measures of gender diversity, namely the number of female directors, FDIR, and the indicator for the presence of at least one female director, FD.[17]

i. Earning Quality Tests

We measure earning quality (EQ) by the absolute value of firm specific residual from a cross-sectional two-digit SIC annual industry regression of total accruals on lagged, contemporaneous and leading cash flows from operations, change in revenue and fixed assets, all scaled by lagged total assets (Dechow and Dichev, 2002; Francis et al., 2005).[18] Our choice of this measure of earnings quality is motivated by the claim in Francis et al. (2005) that among all the available measures, this one is most closely linked to information risk that is priced by investors. We estimate the following regressions:

$$\begin{aligned}\Psi_{i,t} = \alpha &+ \beta_1 LFDIR_{i,t-1} + \beta_2 LDIR_{i,t-1} + \beta_3 EQ_{i,t-1} + \beta_4 LFDIR_{i,t-1} \times EQ_{i,t-1} \\ &+ \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} \\ &+ \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} \\ &+ \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon\end{aligned} \quad (10a)$$

In (10a), we control for the board size DIR and measure gender diversity by the number of female directors or number of female non-executive directors relative to the board size.

$$\begin{aligned}\Psi_{i,t} = \alpha &+ \beta_1 FD_{i,t-1} + \beta_2 EQ_{i,t-1} + \beta_3 FD_{i,t-1} \times EQ_{i,t-1} \\ &+ \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} \\ &+ \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} \\ &+ \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon\end{aligned} \quad (10b)$$

In (10b), we measure gender diversity by an indicator variable for female director presence.

[17] Robustness tests require data for computing earning quality. This requirement and the availability of data on institutional investors reduce the overall sample. Further, the proportion of female CEOs and chairpersons are of the order of 1%. Given the smaller sample size and the low incidence of other gender diversity variables, we chose to focus on the main variables FDIR and FD.

[18] Although Francis et al. (2005) use the standard deviation of five firm-specific residuals from (t-4) to t as the measure of earnings quality, an alternative measure is the absolute value of the residual. This is indicated in Footnote 6 of Dechow and Dichev (2002).

The first two columns in Table 8 confirm encouragement effect hypothesis that earnings quality increases idiosyncratic volatility (Jin and Myers, 2007). Better shareholder protection as measured by a low G-index continues to increase idiosyncratic volatility significantly after controlling for earning quality. Column 2 results include the interaction between earnings quality and the number of female directors. The results in both columns show significant positive coefficients for FDIR. The interaction term between female directors and earning quality is significantly positive which supports substitutive rather than complementary interaction between female directors and earnings quality in increasing idiosyncratic volatility. The negative sign in Column (3) for the interaction between G-index and earnings quality shows complementary interaction between those two variables. The interaction of female directors and earnings quality remains positive showing a substitutive effect. Columns (4) - (6) show results when gender diversity is measured by FD, the indicator for the presence of female directors, using regression (10 b). Column (4) shows a significant positive effect of female director presence on idiosyncratic volatility, after controlling for earning quality. Column (5) includes the interaction term FD × EQ. The results in (5) support the substitution view similar to the results in Column (3). When the interaction term is included, the main effect of female director presence remains positive but does not show significance. The results are similar in Column (6) where the interaction between G and EQ is included as an additional control variable.

Insert Table VIII here

ii. Institutional Trading: The Trading-Link Hypothesis

Information gets embedded in stock prices through trading activities of informed traders (Piotroski and Roulstone, 2004). Consistent with Ferreira and Laux (2007), we control

for changes in shareholding by institutional investors to proxy for informed trading. We denote quarterly absolute changes in the number of a firm's shares held by institutional investors as a percentage of annual trading volume by INST. As before, we estimate the following regressions with FDIR and FD respectively.

$$\begin{aligned}\Psi_{i,t} &= \alpha + \beta_1 LFDIR_{i,t-1} + \beta_2 LDIR_{i,t-1} + \beta_3 INST_{i,t-1} + \beta_4 GOV_{i,t-1} \times INST_{i,t-1} \\ &+ \beta_5 LFDIR_{i,t-1} \times INST_{i,t-1} + \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} \\ &+ \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} \\ &+ \gamma_9 DIVER_{i,t-1} + \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon\end{aligned} \tag{11a}$$

$$\begin{aligned}\Psi_{i,t} &= \alpha + \beta_1 FD_{i,t-1} + \beta_2 INST_{i,t-1} + \beta_3 GOV_{i,t-1} \times INST_{i,t-1} \\ &+ \beta_4 FD_{i,t-1} \times INST_{i,t-1} + \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} \\ &+ \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} \\ &+ \gamma_9 DIVER_{i,t-1} + \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon\end{aligned} \tag{11b}$$

In addition to the main variable INST that controls for the trading-link hypothesis, we include two interaction terms (G × INST and LFDIR × INST or FD × INST) to test for substitutive or complementary interaction between institutional trading and gender diversity. The results are given in Table IX. Regressions in columns (1) to (3) measure gender diversity by the number of female directors and regressions columns (4) to (6) by the presence of female directors. Coefficients for gender diversity are significantly positive in all six regressions. The results show that in most cases, institutional trading improves idiosyncratic volatility when G-index is controlled, consistent with the hypothesis that institutional trading accelerates incorporation of firm-specific information into stock prices and increases idiosyncratic volatility. The results in columns (2), (3), (5) and (6) show negative coefficients for gender diversity interacted with institutional trading, signifying a substitutive interaction between the two variables in increasing idiosyncratic volatility.

Insert Table 9 here

Panel A of Table 10 gives the results on the effect of number of female directors on idiosyncratic volatility when both earnings quality and institutional ownership (and their interactions) are controlled for. In the first column, only the two main effects are controlled for. The second column includes the interaction between female directors and earnings quality. The third column includes interaction between female directors and institutional ownership. The fourth column includes both these interactions while the fifth column additionally includes the interaction between earnings quality and institutional ownership. The sixth column includes the three-way interaction between institutional ownership, earnings quality and number of female directors.

In all the columns, the effect of female directors on idiosyncratic volatility is consistently positive and significant. Similarly in all columns, earnings quality variable is consistently negative and significant implying that higher earnings quality increases idiosyncratic volatility. In four out of the six cases, institutional ownership is seen to increase idiosyncratic volatility significantly. Earnings quality and institutional ownership interact in a substitutive way with the number of female directors. However, institutional ownership and earnings quality exhibit complementary relationship. The three-way interaction in column (6) shows that female directors substitute for the combined effect of institutional ownership and earnings quality.

Insert Tables 10 and 11 here

The results in Table 11 result from an analysis similar to the one reported in Table X but using FD as the gender diversity variable. The results are similar to those in Table X. In

addition to the above tests, we added other governance variables such as CEO duality as controls and got similar (untabulated) results for gender diversity.

H. Test to control for Tokenism

There has been criticism in some quarters on firms having one female director on the board as a token (Branson, 2006; Bourez, 2005). In our own analysis, Figure 2 suggests a significant increase in idiosyncratic volatility when the number of female directors increases from 4 to 5. In order to control for tokenism, we constructed a dummy variable FD5 that takes a value of 1 when the number of female directors is 5 or higher and 0 otherwise. We repeated all the tests using this as the gender diversity variable and found results that are consistent with those reported here.

IV. Concluding Remarks

Using shareholder rights, institutional trading and other measures of governance, prior research has shown that higher transparency in a firm's disclosures encourages the collection of private firm-specific value-relevant information and trading on it by informed investors (Ferreira and Laux, 2007; Jin and Myers, 2006). This firm-specific information is in turn reflected in the firm's stock price resulting in higher idiosyncratic volatility.

In this paper we add to this literature by investigating gender-diversity in the board as another dimension of corporate governance. Our research is motivated by (1) the increasing number of women on corporate boards in the US, (2) calls in several countries for board reforms specifically requiring more gender diversity, (3) research in Organization Science on factors that foster "open discussion cultures" at board levels, and (4) extensive literature in organizational behavior and psychology which suggest that women are likely to adopt a

transformational leadership style demanding more information exchange in an atmosphere of greater transparency and reliability.

Prior studies also suggest that female directors are associated with more effective monitoring, more investor trading activity, higher information collection and consequently, more transparent and accurate firm-specific value-relevant disclosures. We examine the effect of gender diversity on the board on both idiosyncratic volatility and continuous voluntary 8-K filings and consistent with our expectation, find that effect to be positive. Our findings are robust to alternative definitions of gender diversity such as the presence of at least one female director, presence of 5 or more female directors, number of female directors, female CEO, and female chairperson.

Consistent with prior literature, we find that earnings quality and institutional trading are associated with higher idiosyncratic volatility. Even after controlling for them, gender diversity exhibits a significant positive association with idiosyncratic volatility. Further, we find that the association between female directors and idiosyncratic volatility is weaker for firms with higher earnings quality and greater institutional ownership. One interpretation of our results is that the presence of female directors can motivate traders to collect private information even in firms that exhibit poor earnings quality. Similarly, in firms where institutional ownership is low, gender diversity improves firm-specific information collected by traders. These findings suggest that earnings quality, institutional ownership and gender diversity act as substitutes in motivating traders to collect private information.

Our study is subject to some limitations. First, in our examination of the effect of gender diversity on idiosyncratic volatility, we focused on shareholder rights index as the sole governance variable (and CEO duality in additional tests) out of many possible additional controls. Second, non-availability of female directorship data limits our sample period to 2000-2006 and the results may not generalize to other periods. However, this is the first paper

to provide evidence that female directors affect disclosure and private information collection and that earnings quality, institutional ownership and gender diversity jointly affect idiosyncratic volatility.

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Figure 1
Average Number of Female Directors over Time

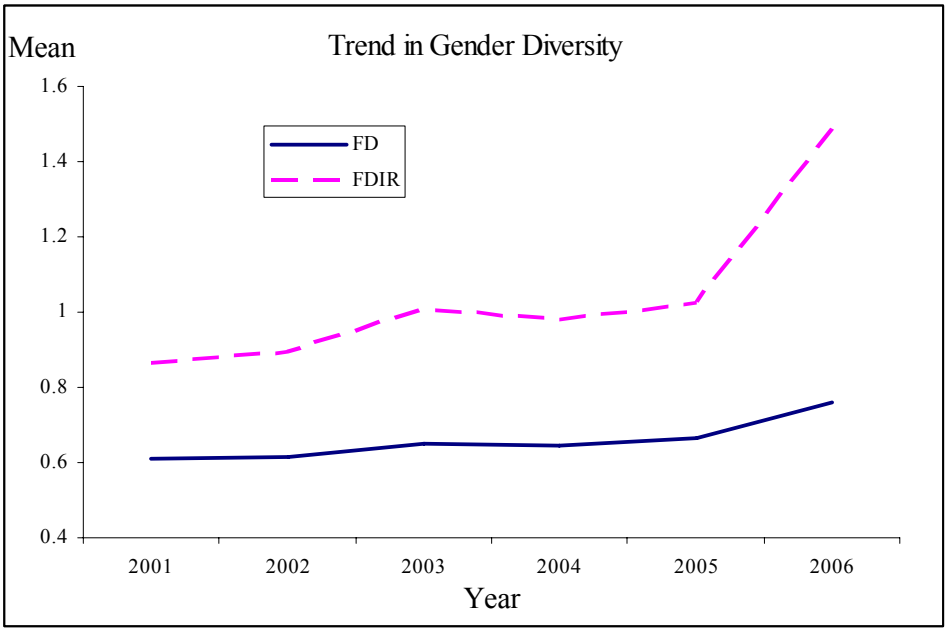

Figure 2
Graphical Representation of Relative Idiosyncratic Volatility
by number of Female Directors for firms with Female Directors

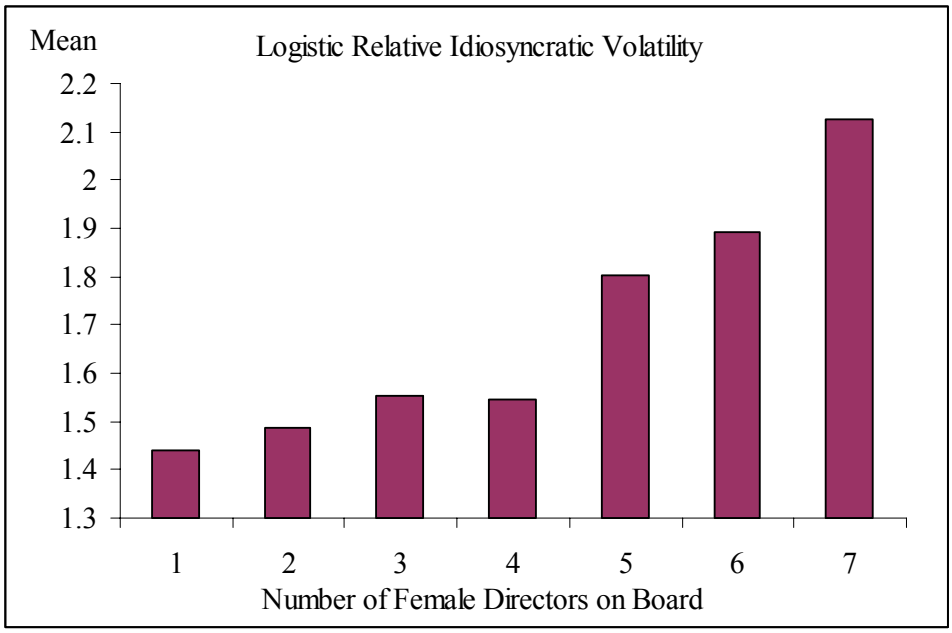

Table 1
Definitions of variables

A. Stock informativeness and Disclosure variables

Stock Price Informativeness	SI		General notation for a variable that could denote one of the following variables
Logistic relative idiosyncratic volatility	ψ	=	Monthly logistic transformed relative idiosyncratic volatility estimated from the market estimated from the market model
Frequency of Large Idiosyncratic Stock Price Changes	FLISP	=	The frequency during the month in which the residual from the market model, $\lvert \varepsilon_{id} \rvert \geq .05$.
Future earnings incremental explanatory power	FINC	=	Increase in the coefficient of determination (R^2) of the annual regression on each two-digit SIC industry with at least 10 firms: $r_{it} = b_0^b + b_1^b \Delta E_{it} + \sum_{\tau=1}^{3} b_{2,\tau}^b \Delta E_{it+\tau} + \sum_{\tau=1}^{3} b_{3,\tau}^b \Delta r_{it+\tau} + \varepsilon_{it}^b$ relative to the regression $r_{it} = b_0^c + b_1^c \Delta E_{it} + \varepsilon_{it}^c$ where r_{it} is annual stock return calculated from fiscal year end share price plus dividends adjusted by stock splits and distribution (COMPUSTAT annual item #199/#27 plus #199/#26), and ΔE_{it} is annual change in earnings before interest, taxes, depreciation, and amortization (annual item #13) scaled by previous fiscal year-end market capitalization (annual items #199 times #25)

B. Disclosure of items on 8-K

Category 1	Φ_1	=	Natural logarithm of number of items related to Registrant's Business and Operations including ENTERAGREE, TERMAGREE and BANKRUPTCY plus one
Category 2	Φ_2	=	Natural logarithm of number of items related to Financial Information including ACQDISPCOMPLETE, OPERATIONS, DIROBLIG, ACCELEROBLIG, EXITCOST and MATIMPAIR plus one
Category 3	Φ_3	=	Natural logarithm of number of items related to Securities and Trading Market including DELIST, UNREGSALE and RIGHTSMODIF plus one
Category 4	Φ_4	=	Natural logarithm of number of items related to Matters Related to Accountants and Financial Statements including AUCHANGE and NONRELIANCE plus one
Category 5	Φ_5	=	Natural logarithm of number of items related to Corporate Governance and Management including CONTROLCHANGE, OFFDIRCHANGE, CHGARTICLES, EBPSUSPEN, ETHICS and SHELL plus one
Category 6	Φ_6	=	Natural logarithm of number of items related to Asset Backed Securities including ABSINFO, SERVTRUST, CREDITENHANC, NODIST and UPDATEDISCL plus one
Category 7	Φ_7	=	Natural logarithm of number of items related to Regulation FD including RFDDISCLOS plus one
Category 8	Φ_8	=	Natural logarithm of number of "other" item disclosed voluntarily on 8-K filings plus one
Category 9	Φ_9	=	Natural logarithm of number of items related to Financial Statements and Exhibits including FINANCIALSTMTS plus one

C. Gender Diversity variables (GDIV)

Number of Female Directors	FDIR LFDIR	= =	Number of female directors on board Natural log of number of female directors on board plus one
Number of Female Independent Non-executive Directors	FINED LFINED	= =	Number of female independent non-executive directors on board Natural log of number of female independent non-executive directors on board plus one
Number of Directors	DIR LDIR	= =	Number of directors on board Natural log of number of directors on board
Number of Independent Non-Executive Directors	NEDIR LNEDIR	= =	Number of independent non-executive directors on board Natural log of number of independent non-executive directors on board
Female CEO	FCEO	=	Dummy Variable: 1 if CEO is female; 0 otherwise
Female Chairman	FCHAIR	=	Dummy Variable: 1 if Chairman of the board is female; 0 otherwise
CEO-Duality	CEODUAL	=	Dummy Variable: 1 if CEO and Chairman of the board are the same person; 0 otherwise
Female CEO-Duality	FCEODUAL	=	Dummy Variable: 1 if CEO and Chairman of the board are the same person and that person is female; 0 otherwise
Existence of Female Director	FD	=	Dummy Variable: 1 if there are at least one female director on board; 0 otherwise

D. Governance Variables

Governance Index	GOV = G	=	IRRC-Gompers et al. (2003), governance index, which is based on 24 anti-takeover provisions
Governance Index Dummy	GOV = GD	=	1 if the Gomper index is greater than or equal to 11 (closed portfolio), 0 if the index is less than or equal to 7 (open portfolio)
Institutional Trading	INST	=	Quarterly absolute change in the number of shares held by institutions, as a fraction of annual trading volume
Earning Quality	EQ	=	Annual absolute value of firm specific residuals from a two-digit SIC annual industry regression of total accruals (change in (Δ) current asset (COMPUSTAT annual item #4) minus Δcurrent liabilities (annual item #5) plus the Δdebt in current liabilities (annual item #34) minus the Δcash (annual item #1), minus depreciation and amortization (annual item #14)) on lagged, contemporaneous, and leading cash flow from operations, change in revenue (annual item #12) growth and fixed asset (annual item #7), variable scaled by lagged total assets

E. Control variables

Return –on-Equity	ROE	=	Quarterly return-on-equity given by most recent quarterly earnings before extraordinary items
Volatility of Returrn-on-Equity	VROE	=	Sample variance of quarterly ROEs over the last 3 years
Leverage	LEV	=	Quarterly leverage defined as the ratio of long-term debt to total assets
Market-to-book	MB	=	Quarterly log of the market-to-book ratio
Market Capitalizatio n	SIZE	=	Monthly log market capitalization
Dividend Dummy	DD	=	Quarterly dividend dummy, which equals 1 if the firms pays dividends, and 0 otherwise
Firm age	AGE	=	Monthly log age defined as the number of months since the stock inclusion in the CRSP database
Diversificati on Dummy	DIVER	=	Quarterly dummy variable that equals 1 when a firm operates in multisegments and 0 otherwise
Merger dummy	MERGER	=	Dummy variable, which equals 1 if Compustat item AFTNT1 = 'AA' or 'AB' or 'AR' or 'AS' or 'FA' or 'FB' or 'FC' or 'FD' or 'FE' or 'FF' or 'FE' and 0 otherwise
Year Dummy	YEARDUM	=	Dummy variable, which equals 1 if year is 2004 or after and 0 otherwise.

Table 2
Panel A: Sample Selection

Number of firm-month with Idiosyncratic Volatility	487331
Firms-month with SIC code between 4900 and 4999 and between 6000-6999	-174314
	313017
Firm-month observations without data on G-Index	-229595
	83422
Firm-month observations without control variables	-4654
	78768
Firm-month observations without data on Board Characteristics	-11788
Preliminary Sample	**66980**
Firm-month observations without change in institution ownership	-11535
Firm-month observations without earnings quality	-12404
Final Sample	**43041**

Panel B: Distribution of Female Directors across Various Industries

	Firm-year with no Female Director on Board	Firm-year with at least one Female Director on Board	Total Number of Firm-Year
AGRICULTURAL PRODUCTION-CROPS	0	103	103
AGRICULTURAL SERVICES	47	0	47
METAL MINING	117	179	296
COAL MINING	26	18	44
OIL AND GAS EXTRACTION	814	1405	2219
NONMETALLIC MINERALS, EXCEPT FUELS	106	36	142
GENERAL BUILDING CONTRACTORS	392	331	723
HEAVY CONSTRUCTION, EX. BUILDING	288	30	318
SPECIAL TRADE CONTRACTORS	59	71	130
FOOD AND KINDRED PRODUCTS	1819	227	2046
TOBACCO PRODUCTS	176	0	176
TEXTILE MILL PRODUCTS	306	81	387
APPAREL & OTHER TEXTILE PRODUCTS	583	245	828
LUMBER AND WOOD PRODUCTS	285	247	532
FURNITURE AND FIXTURES	652	153	805
PAPER AND ALLIED PRODUCTS	1150	457	1607
PRINTING AND PUBLISHING	1363	175	1538
CHEMICALS AND ALLIED PRODUCTS	4439	1294	5733
PETROLEUM AND COAL PRODUCTS	630	130	760
RUBBER & MISC. PLASTICS PRODUCTS	640	92	732
LEATHER AND LEATHER PRODUCTS	330	71	401
STONE, CLAY, AND GLASS PRODUCTS	393	59	452
PRIMARY METAL INDUSTRIES	985	771	1756
FABRICATED METAL PRODUCTS	790	429	1219
INDUSTRIAL MACHINERY & EQUIPMENT	2990	2103	5093
ELECTRONIC & OTHER ELECTRIC EQUIPMENT	2681	4123	6804
TRANSPORTATION EQUIPMENT	1571	926	2497
INSTRUMENTS & RELATED PRODUCTS	2458	1831	4289
MISC. MANUFACTURING INDUSTRIES	398	297	695
RAILROAD TRANSPORTATION	330	12	342
TRUCKING AND WAREHOUSING	351	380	731
WATER TRANSPORTATION	71	275	346
TRANSPORTATION BY AIR	455	126	581
TRANSPORTATION SERVICES	71	166	237
COMMUNICATIONS	1055	364	1419
WHOLESALE TRADE-DURABLE GOODS	1349	546	1895
WHOLESALE TRADE-NONDURABLE GOODS	646	158	804
BUILDING MATERIALS & GARDEN SUPPLIES	197	0	197
GENERAL MERCHANDISE STORES	728	153	881
FOOD STORES	486	47	533
AUTOMOTIVE DEALERS & SERVICE STATIONS	291	71	362
APPAREL AND ACCESSORY STORES	1172	168	1340
FURNITURE AND HOMEFURNISHINGS STORES	470	95	565
EATING AND DRINKING PLACES	1100	376	1476
MISCELLANEOUS RETAIL	1228	203	1431
HOTELS AND OTHER LODGING PLACES	106	35	141

	Firm-year with no Female Director on Board	Firm-year with at least one Female Director on Board	Total Number of Firm-Year
PERSONAL SERVICES	261	109	370
BUSINESS SERVICES	4401	3057	7458
AUTO REPAIR, SERVICES, AND PARKING	171	24	195
MOTION PICTURES	86	23	109
AMUSEMENT & RECREATION SERVICES	309	126	435
HEALTH SERVICES	869	444	1313
EDUCATIONAL SERVICES	150	32	182
SOCIAL SERVICES	48	0	48
ENGINEERING AND MANAGEMTN SERVICES	603	329	932
OTHERS	166	119	285
Total	43658	23322	66980

Table 3
Panel A: Descriptive Statistics of Independent variables

	Full Sample (N=66980)		With Female Directors (N=43658)		With No Female Directors (N=23322)			
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**	**T-Stat**	**Z-Stat**
FDIR	1.019	1	1.564	1	-	-	-	-
DIR	9.873	9	10.814	10	8.111	8	-127.72	-105.69
FD	0.652	1	1	1	-	-	-	-
FPCT	0.097	0.1	0.148	0.125	-	-	-	-
FNEDIR	0.939	1	1.441	1	-	-	-	-
CEODUAL	0.590	1	0.611	1	0.550	1	-15.25	-15.31
FCEODUAL	0.012	0	0.018	0	-	-	-	-
FCEO	0.020	0	0.031	0	-	-	-	-
FCHAIR	0.014	0	0.022	0	-	-	-	-
EQ**	0.120	0.049	0.119	0.044	0.123	0.061	1.78	21.40
INST***	0.030	0.014	0.030	0.014	0.028	0.014	-4	0.76
G	9.269	9	9.695	10	8.472	8	-60.93	-52.66
GD****	0.561	1	0.663	1	0.363	0	-58.07	-55.94
ROE	0.018	0.027	0.026	0.031	0.003	0.021	-28.33	-35.41
VROE	0.047	0.000	0.051	0.000	0.041	0.001	-3.58	4.72
LEV	0.183	0.173	0.194	0.184	0.164	0.140	-23.47	-20.47
MB	0.887	0.841	0.941	0.886	0.786	0.759	-28.17	-19.82
SIZE	14.403	14.279	14.766	14.662	13.724	13.681	-90.27	-69.56
DD	0.520	1	0.604	1	0.361	0	-61.98	-59.98
AGE	2.963	2.949	3.093	3.146	2.718	2.674	-65.79	-51.52
DIVER	0.550	1	0.568	1	0.516	1	-12.73	-12.74
MERGER	0.226	0	0.219	0	0.238	0	5.49	5.54

** There are 51,942, 32,912 and 19,030 observations for EQ in full sample, sample with female directors and sample without female directors respectively.
** There are 55,445, 36,857 and 18,588 observations for INST in full sample, sample with female directors and sample without female directors respectively.
**** There are 38,080, 25,121 and 12,959 observations for GD in full sample, sample with female directors and sample without female directors respectively.
FINC: future earnings incremental explanatory power; FDIR: number of female director on board; DIR: number of director on board; FD: 1 if there is at least 1 female director on board, 0 otherwise; FINED: number of female independent non-executive directors on board; CEODUAL: Dummy Variable: 1 if CEO and Chairman of the board are the same person; 0 otherwise; FCEODUAL: Dummy Variable: 1 if CEO and Chairman of the board are the same person and that person is female; 0 otherwise; FCEO: Dummy Variable: 1 if CEO is female; 0 otherwise ; FCHAIR: Dummy Variable: 1 if Chairman of the board is female; 0 otherwise; EQ: Earning Quality ; INST: Institutional Trading; G: IRRC-Gompers et al. (2003), governance index, which is based on 24 anti-takeover provisions; GD: 1 if the Gomper index is greater than or equal to 14 (closed portfolio), 0 if the index is less than or equal to 7 (open portfolio); ROE: Quarterly return-on-equity given by most recent quarterly earnings before extraordinary items; VROE: Sample variance of quarterly ROEs over the last 3 years; LEV: Quarterly leverage defined as the ratio of long-term debt to total assets; MB: Quarterly log of the market-to-book ratio; SIZE: Monthly log market capitalization; DD: Quarterly dividend dummy, which equals 1 if the firms pays dividends, and 0 otherwise; AGE: Monthly log age defined as the number of months since the stock inclusion in the CRSP database; DIVER: Quarterly dummy variable that equals 1 when a firm operates in multi-segments and 0 otherwise; MERGER: Dummy variable that equals 1 if firm is engaged in a merger or acquisition (as reported in AFTNT1 of Compustat), and 0 otherwise; INST: Quarterly absolute change in the number of shares held by institutions, as a fraction of annual trading volume; EQ: Annual absolute value of firm specific residuals from a two-digit SIC annual industry regression of total accruals on lagged, contemporaneous, and leading cash flow from operations, change in revenue (annual item #12) growth and fixed asset (annual item #7), variable scaled by lagged total assets.

Table 4
Effect of Number of Female Directors on Stock Price Informativeness

$$SI_{i,t} = c_0 + c_1 LFDIR_{i,t-1} + c_2 LDIR_{i,t-1} + c_3 LNEDIR_{i,t-1} + c_4 GOV_{i,t-1} + c_5 ROE_{i,t-1} + c_6 VROE_{i,t-1} + c_7 LEV_{i,t-1} + c_8 MB_{i,t-1} + c_9 SIZE_{i,t-1} + c_{10} DD_{i,t-1} + c_{11} AGE_{i,t-1} + c_{12} DIVER_{i,t-1} + c_{13} MERGER_{i,t-1} + \sum industries\ dummy + \varepsilon$$

Panel A: SI = Idiosyncratic Volatility (Ψ)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	2.035***	5.36***	4.307***	4.455***	1.846***	5.245***	3.987***	4.141***
	(19.403)	(41.269)	(32.281)	(34.218)	(15.085)	(32.113)	(23.980)	(25.920)
GDIV = LFDIR			0.113***	0.152***			0.128***	0.155***
			(6.214)	(8.308)			(5.234)	(6.314)
LDIR			0.13***				0.138***	
			(4.624)				(3.533)	
LNEDIR				-0.026				0.021
				(-1.114)				(0.657)
GOV = G	-0.031***	-0.008***	-0.013***	-0.011***				
	(-12.403)	(-3.075)	(-4.544)	(-3.969)				
GOV = GD					-0.236***	-0.071***	-0.104***	-0.099***
					(-13.611)	(-3.744)	(-5.059)	(-4.763)
ROE		-0.19***	-0.285***	-0.285***		-0.249***	-0.378***	-0.382***
		(-3.039)	(-3.676)	(-3.672)		(-2.902)	(-3.406)	(-3.438)
VROE		0.07***	0.045**	0.048**		0.096***	0.061*	0.063**
		(4.061)	(2.018)	(2.182)		(4.243)	(1.946)	(2.015)
LEV		0.105**	0.11**	0.144***		0.049	0.027	0.044
		(2.342)	(2.196)	(2.859)		(0.818)	(0.400)	(0.640)
MB		-0.034***	0.004	-0.003		-0.067***	-0.03*	-0.035**
		(-2.982)	(0.311)	(-0.206)		(-4.322)	(-1.700)	(-2.008)
SIZE		-0.237***	-0.233***	-0.224***		-0.232***	-0.231***	-0.225***
		(-45.663)	(-38.243)	(-36.964)		(-33.731)	(-28.663)	(-28.027)
DD		-0.096***	-0.13***	-0.127***		-0.097***	-0.126***	-0.125***
		(-6.233)	(-7.967)	(-7.768)		(-4.700)	(-5.750)	(-5.683)
AGE		0.017*	0.001	0.008		0.03**	0.004	0.009
		(1.725)	(0.049)	(0.702)		(2.324)	(0.271)	(0.615)
DIVER		-0.053***	-0.049***	-0.048***		-0.085***	-0.089***	-0.088***
		(-3.846)	(-3.332)	(-3.277)		(-4.646)	(-4.497)	(-4.434)
MERGER		-0.03**	-0.01	-0.012		-0.05**	-0.03	-0.032
		(-1.982)	(-0.592)	(-0.723)		(-2.534)	(-1.431)	(-1.525)
R^2	0.0334	0.0872	0.0769	0.0766	0.0461	0.1007	0.0929	0.0926
N	83350	78768	66980	66980	47668	45179	38080	38080
F-Stat	52.411***	116.832***	84.316***	83.979***	42.131***	78.832***	60.065***	59.854***

Panel B: SI = Frequency of Large Idiosyncratic Stock Price Changes (FLISP)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.092***	0.263***	0.224***	0.213***	0.074***	0.249***	0.201***	0.196***
	(15.120)	(46.030)	(44.047)	(43.050)	(9.841)	(35.074)	(31.504)	(31.805)
GDIV = LFDIR			0.004***	0.006***			0.002*	0.004***
			(4.886)	(7.752)			(1.952)	(4.080)
LDIR			-0.018***				-0.012***	
			(-16.090)				(-7.804)	
LNEDIR				-0.022***				-0.017***
				(-20.842)				(-11.433)
GOV = G	-0.005***	-0.001***	-0.001***	-0.001***				
	(-36.273)	(-11.088)	(-9.154)	(-6.740)				
GOV = GD					-0.035***	-0.012***	-0.009***	-0.008***
					(-37.508)	(-14.366)	(-11.705)	(-10.032)
ROE		-0.183***	-0.168***	-0.168***		-0.19***	-0.188***	-0.188***
		(-35.609)	(-27.502)	(-27.527)		(-26.763)	(-21.308)	(-21.291)
VROE		0.017***	0.008***	0.008***		0.02***	0.009***	0.009***
		(15.242)	(8.118)	(8.420)		(12.986)	(6.431)	(6.612)
LEV		0.016***	0.017***	0.019***		0.008**	0.01***	0.013***
		(6.652)	(6.826)	(7.875)		(2.400)	(2.942)	(3.817)
MB		-0.016***	-0.012***	-0.012***		-0.015***	-0.01***	-0.01***
		(-22.318)	(-16.030)	(-16.359)		(-15.129)	(-10.181)	(-10.586)
SIZE		-0.011***	-0.008***	-0.007***		-0.01***	-0.007***	-0.007***
		(-37.908)	(-25.527)	(-23.905)		(-28.796)	(-19.040)	(-17.698)
DD		-0.022***	-0.021***	-0.021***		-0.024***	-0.022***	-0.022***
		(-32.398)	(-32.684)	(-32.575)		(-26.771)	(-26.137)	(-26.125)
AGE		-0.01***	-0.003***	-0.003***		-0.008***	-0.002***	-0.002***
		(-18.932)	(-6.098)	(-5.241)		(-13.205)	(-4.019)	(-3.216)
DIVER		-0.004***	-0.002***	-0.002***		-0.003***	-0.002**	-0.002**
		(-5.750)	(-3.551)	(-3.681)		(-3.068)	(-2.124)	(-2.053)
MERGER		-0.004***	-0.004***	-0.004***		-0.002**	-0.002***	-0.002***
		(-5.660)	(-5.451)	(-5.765)		(-2.498)	(-2.709)	(-2.881)
R^2	0.0736	0.2772	0.224	0.2274	0.0949	0.2909	0.232	0.2345
N	83350	78768	66980	66980	47668	45179	38080	38080
F-Stat	119.219***	465.851***	289.545***	295.221***	90.279***	286.2***	175.278***	177.71***

Note: Industries based on two-digits SIC are controlled for but not reported.
Refer to Table 1 for variable definitions
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 5
Effect of Other Gender Diversity Variables on Idiosyncratic Volatility (N=66980)

$$SI_{i,t} = c_0 + \sum_{i=1}^{N} c_{1i} GDIV_{i,t-1} + c_{1a} LDIR + c_2 GOV_{i,t-1} + c_3 ROE_{i,t-1} + c_4 VROE_{i,t-1} + c_5 LEV_{i,t-1} + c_6 MB_{i,t-1} + c_7 SIZE_{i,t-1} + c_8 DD_{i,t-1} + c_9 AGE_{i,t-1} + c_{10} DIVER_{i,t-1} + c_{11} MERGER_{i,t-1} + \sum industries\ dummy + \varepsilon$$

Panel A: SI = Idiosyncratic Volatility (Ψ)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.269***	4.235***	4.069***	4.063***	4.063***	4.103***
	(31.917)	(31.643)	(31.869)	(31.796)	(31.801)	(31.293)
GDIV = LFNEDIR	0.09***	0.084***				
	(4.922)	(4.590)				
GDIV = FCEO		0.183**	0.271***		0.18**	
		(2.526)	(5.291)		(2.481)	
GDIV = FCHAIR		0.138		0.304***	0.159*	
		(1.613)		(5.051)	(1.864)	
GDIV = FD						0.011
						(0.627)
LDIR	0.149***	0.151***	0.192***	0.196***	0.194***	0.191***
	(5.374)	(5.418)	(7.334)	(7.467)	(7.381)	(6.972)
GOV = G	-0.013***	-0.012***	-0.011***	-0.011***	-0.011***	-0.011***
	(-4.520)	(-4.367)	(-3.753)	(-3.888)	(-3.796)	(-3.948)
ROE	-0.283***	-0.29***	-0.289***	-0.292***	-0.291***	-0.284***
	(-3.646)	(-3.738)	(-3.720)	(-3.770)	(-3.757)	(-3.667)
VROE	0.047**	0.037*	0.04*	0.043*	0.04*	0.049**
	(2.107)	(1.696)	(1.804)	(1.955)	(1.800)	(2.228)
LEV	0.106**	0.124**	0.13***	0.13***	0.133***	0.115**
	(2.116)	(2.457)	(2.590)	(2.591)	(2.645)	(2.283)
MB	0.004	0.006	0.004	0.003	0.004	0.002
	(0.275)	(0.452)	(0.345)	(0.196)	(0.309)	(0.139)
SIZE	-0.232***	-0.23***	-0.224***	-0.224***	-0.224***	-0.226***
	(-37.905)	(-37.506)	(-37.750)	(-37.558)	(-37.588)	(-37.466)
DD	-0.129***	-0.129***	-0.122***	-0.124***	-0.123***	-0.123***
	(-7.886)	(-7.861)	(-7.460)	(-7.596)	(-7.519)	(-7.539)
AGE	0.001	0	0.003	0.001	0.002	0.003
	(0.112)	(0.042)	(0.294)	(0.105)	(0.195)	(0.271)
DIVER	-0.049***	-0.051***	-0.053***	-0.051***	-0.052***	-0.05***
	(-3.312)	(-3.438)	(-3.566)	(-3.464)	(-3.540)	(-3.420)
MERGER	-0.01	-0.01	-0.012	-0.013	-0.012	-0.012
	(-0.632)	(-0.597)	(-0.718)	(-0.777)	(-0.737)	(-0.760)
R^2	0.0767	0.0772	0.0768	0.0768	0.0769	0.0764
F-Stat	84.066***	82.164***	84.194***	84.138***	83.025***	83.665***

Panel B: SI = Frequency of Large Idiosyncratic Stock Price Changes (FLISP)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.434***	4.404***	4.204***	4.201***	4.199***	4.269***
	(33.887)	(33.632)	(33.292)	(33.243)	(33.237)	(33.177)
GDIV = LFNEDIR	0.128***	0.123***				
	(6.852)	(6.580)				
GDIV = FCEO		0.198***	0.274***		0.188***	
		(2.715)	(5.343)		(2.584)	
GDIV = FCHAIR		0.117		0.302***	0.15*	
		(1.367)		(5.007)	(1.756)	
GDIV = FD						0.036**
						(2.145)
LNEDIR	-0.015	-0.017	0.04*	0.045**	0.042*	0.031
	(-0.647)	(-0.725)	(1.842)	(2.047)	(1.897)	(1.361)
GOV = G	-0.012***	-0.011***	-0.009***	-0.01***	-0.009***	-0.01***
	(-3.996)	(-3.826)	(-3.154)	(-3.314)	(-3.200)	(-3.534)
ROE	-0.282***	-0.289***	-0.289***	-0.293***	-0.292***	-0.286***
	(-3.632)	(-3.718)	(-3.718)	(-3.767)	(-3.753)	(-3.682)
VROE	0.051**	0.042*	0.045**	0.048**	0.045**	0.054**
	(2.302)	(1.892)	(2.029)	(2.183)	(2.025)	(2.441)
LEV	0.14***	0.157***	0.164***	0.163***	0.166***	0.146***
	(2.770)	(3.118)	(3.247)	(3.230)	(3.297)	(2.900)
MB	-0.004	-0.001	-0.004	-0.005	-0.004	-0.005
	(-0.282)	(-0.106)	(-0.278)	(-0.425)	(-0.311)	(-0.426)
SIZE	-0.223***	-0.221***	-0.213***	-0.212***	-0.213***	-0.216***
	(-36.657)	(-36.243)	(-35.996)	(-35.835)	(-35.851)	(-36.013)
DD	-0.126***	-0.125***	-0.116***	-0.118***	-0.117***	-0.118***
	(-7.671)	(-7.635)	(-7.092)	(-7.233)	(-7.148)	(-7.246)
AGE	0.009	0.009	0.011	0.009	0.01	0.011
	(0.812)	(0.768)	(1.029)	(0.829)	(0.933)	(0.951)
DIVER	-0.048***	-0.05***	-0.052***	-0.05***	-0.051***	-0.05***
	(-3.235)	(-3.365)	(-3.516)	(-3.411)	(-3.491)	(-3.372)
MERGER	-0.013	-0.012	-0.015	-0.015	-0.015	-0.014
	(-0.774)	(-0.738)	(-0.899)	(-0.954)	(-0.916)	(-0.890)
R^2	0.0763	0.0768	0.0761	0.076	0.0761	0.0757
F-Stat	83.592***	81.698***	83.352***	83.276***	82.187***	82.883***

Note: Industries based on two-digits SIC are controlled for but not reported.
Refer to Table 1 for variable definitions
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 6
Change in Idiosyncratic Volatility Following
Change in number of Female Directors

This table provides estimates of event study regressions for Ψ, the logistic transformed relative idiosyncratic volatility, on changes in number of female directors. The event window includes, alternatively, the 1-year period before and after the year of the event. We run separate regressions for positive and negative changes in number of female directors, using only data with in window. In each case, the regressor is one of the several post-event dummy variables. $I\Delta_{FIR+}$ is a dummy variable that takes the value of one for the years that fall on and after the positive change in number of female directors and zero for the years that falls before the increase. $I\Delta_{FIR-}$ is a dummy variable that takes the value of one for the years that fall on and after the negative change in number of female directors and zero for the years that falls before the decrease. The sample period is from January 2001 to December 2006. Financial and utilities industries are omitted (SIC 6000-6999 and 4900-4999). All variables are winsorized at the bottom and top 1% level (except variables related to number of female-directors). T-statistics are in parentheses.

	(1)	(2)
$I\Delta_{FDIR+}$	0.0873***	0.0884***
	(2.71)	(2.80)
$\Delta FDIR^{+}$	0.1049***	0.0980***
	(5.52)	(5.23)
Number of Events	16021	
$I\Delta_{FDIR-}$	0.00408	0.00444
	(0.09)	(0.10)
$\Delta FDIR^{-}$	0.01016	0.000353
	(0.26)	(0.01)
Number of Events	6237	
Industry Dummies	No	Yes

Refer to Table 1 for variable definitions
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 7
Effect of Gender Diversity on Continuous Disclosure of "Other" items on 8-K (N=67110)

$$\Phi_{8,i,t} = c_0 + \sum_{i=1}^{N} c_{1i} GDIV_{i,t-1} + c_2 G_{i,t-1} + c_3 ROE_{i,t-1} + c_4 VROE_{i,t-1} + c_5 LEV_{i,t-1}$$
$$+ c_6 MB_{i,t-1} + c_7 SIZE_{i,t-1} + c_8 DD_{i,t-1} + c_9 AGE_{i,t-1} + c_{10} DIVER_{i,t-1} + c_{11} MERGER_{i,t-1}$$
$$+ c_{12} YEARDUM_{i,t} + \sum_{y=1}^{7} \Phi_{y,i,t} + \sum \text{industries dummy} + \varepsilon$$

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-1.024***	-1.024***	-1.064***	-1.053***	-1.035***	-1.068***	-1.001***
	(-16.598)	(-16.554)	(-17.226)	(-17.896)	(-18.082)	(-18.149)	(-16.841)
GDIV = LFIDR	0.048***						
	(5.988)						
GDIV = LFNEDIR		0.046***	0.038***				
		(5.682)	(4.660)				
GDIV = FCEO			-0.11***	0.118***		-0.108***	
			(-3.940)	(5.222)		(-3.864)	
GDIV = FCHAIR			0.39***		0.331***	0.395***	
			(11.128)		(12.250)	(11.295)	
GDIV = FD							
LDIR	0.062***	0.066***	0.073***				0.038***
	(4.915)	(5.276)	(5.824)				(5.338)
GOV = G	-0.015***	-0.015***	-0.015***	-0.013***	-0.012***	-0.013***	-0.014***
	(-11.620)	(-11.685)	(-11.675)	(-10.124)	(-9.480)	(-10.340)	(-10.886)
ROE	-0.604***	-0.603***	-0.613***	-0.605***	-0.665***	-0.613***	-0.605***
	(-18.153)	(-18.110)	(-18.344)	(-18.069)	(-19.152)	(-18.242)	(-18.121)
VROE	0.132***	0.133***	0.129***	0.133***	0.145***	0.133***	0.136***
	(13.529)	(13.588)	(13.232)	(13.552)	(14.485)	(13.599)	(13.876)
LEV	0.828***	0.826***	0.839***	0.856***	0.947***	0.864***	0.844***
	(37.637)	(37.522)	(38.102)	(38.992)	(42.701)	(39.358)	(38.462)
MB	-0.106***	-0.106***	-0.106***	-0.11***	-0.118***	-0.112***	-0.11***
	(-18.722)	(-18.736)	(-18.726)	(-19.626)	(-20.737)	(-19.846)	(-19.518)
SIZE	0.102***	0.102***	0.104***	0.112***	0.117***	0.114***	0.108***
	(38.096)	(37.768)	(38.682)	(45.050)	(47.016)	(45.716)	(42.448)
DD	-0.073***	-0.073***	-0.074***	-0.065***	-0.079***	-0.067***	-0.068***
	(-9.991)	(-10.001)	(-10.187)	(-9.001)	(-10.736)	(-9.296)	(-9.355)
AGE	0.021***	0.022***	0.019***	0.027***	0.034***	0.025***	0.026***
	(4.374)	(4.389)	(3.914)	(5.575)	(6.855)	(5.089)	(5.248)
DIVER	0.014**	0.014**	0.014**	0.013*	0.013**	0.014**	0.014**
	(2.099)	(2.126)	(2.139)	(1.915)	(1.973)	(2.096)	(2.059)
MERGER	0.112***	0.112***	0.112***	0.109***	0.125***	0.108***	0.11***
	(15.752)	(15.746)	(15.693)	(15.300)	(17.492)	(15.191)	(15.440)
YEARDUM	-0.182***	-0.182***	-0.18***	-0.193***	0.13***	-0.193***	-0.192***
	(-13.362)	(-13.387)	(-13.277)	(-14.224)	(21.634)	(-14.283)	(-14.173)
R^2	0.1565	0.1564	0.1584	0.1557	0.13	0.1574	0.1557
F-Stat	171.559***	171.492***	169.382***	172.922***	152.928***	172.686***	172.881***

Note: Other disclosures in 8-K and Industries based on two-digits SIC are controlled for but not reported. Refer to Table 1 for variable definitions

***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 8
Effect of Number of Female Directors on Idiosyncratic Volatility: Controlling for Earnings Quality (N = 51942)

$$\Psi_{i,t} = \alpha + \beta_1 LFDIR_{i,t-1} + \beta_2 LDIR_{i,t-1} + \beta_3 EQ_{i,t-1} + \beta_4 LFDIR_{i,t-1} \times EQ_{i,t-1} + \beta_5 GOV_{i,t-1} \times EQ_{i,t-1}$$
$$+ \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1}$$
$$+ \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon$$

$$\Psi_{i,t} = \alpha + \beta_1 FD_{i,t-1} + \beta_2 EQ_{i,t-1} + \beta_3 FD_{i,t-1} \times EQ_{i,t-1} + \beta_4 GOV_{i,t-1} \times EQ_{i,t-1}$$
$$+ \gamma_1 GOV_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1}$$
$$+ \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \gamma_{10} MERGER_{i,t-1} + \sum \text{industries dummy} + \varepsilon$$

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	5.16***	5.197***	5.181***	5.012***	5.033***	5.019***
	(49.043)	(49.327)	(48.925)	(48.356)	(48.487)	(48.143)
LFDIR	0.06***	0.036***	0.035***			
	(5.466)	(3.152)	(3.018)			
LDIR	0.013***	0.014***	0.014***			
	(3.175)	(3.287)	(3.290)			
FD				0.032*	0.004	0.001
				(1.664)	(0.215)	(0.039)
EQ	-0.233***	-0.437***	-0.284***	-0.233***	-0.398***	-0.266***
	(-8.618)	(-9.815)	(-2.840)	(-8.583)	(-7.020)	(-2.684)
LFDIR × EQ		0.185***	0.195***			
		(5.493)	(5.575)			
FD × EQ					0.22***	0.251***
					(3.500)	(3.596)
G × EQ			-0.017*			-0.016
			(-1.682)			(-1.506)
G	-0.009***	-0.008**	-0.006*	-0.005	-0.005	-0.003
	(-2.605)	(-2.472)	(-1.802)	(-1.530)	(-1.504)	(-0.923)
ROE	-0.152	-0.17*	-0.168*	-0.153	-0.162*	-0.161*
	(-1.635)	(-1.823)	(-1.806)	(-1.644)	(-1.733)	(-1.720)
VROE	0.019	0.017	0.017	0.03	0.034	0.035
	(0.843)	(0.766)	(0.767)	(1.337)	(1.508)	(1.536)
LEV	0.099	0.099	0.099	0.141**	0.137**	0.137**
	(1.627)	(1.628)	(1.635)	(2.328)	(2.270)	(2.266)
MB	0.018	0.019	0.019	0.006	0.007	0.007
	(1.168)	(1.234)	(1.230)	(0.401)	(0.448)	(0.450)
SIZE	-0.262***	-0.262***	-0.262***	-0.243***	-0.243***	-0.243***
	(-35.823)	(-35.917)	(-35.905)	(-35.185)	(-35.178)	(-35.168)
DD	-0.132***	-0.131***	-0.131***	-0.116***	-0.116***	-0.116***
	(-6.779)	(-6.735)	(-6.730)	(-5.986)	(-5.978)	(-5.977)
AGE	-0.004	-0.007	-0.007	0.005	0.005	0.005
	(-0.307)	(-0.523)	(-0.533)	(0.391)	(0.348)	(0.341)
DIVER	-0.043**	-0.043**	-0.044**	-0.044**	-0.045**	-0.045**
	(-2.409)	(-2.424)	(-2.456)	(-2.494)	(-2.507)	(-2.538)
MERGER	0.042**	0.042**	0.042**	0.038*	0.037*	0.037*
	(2.134)	(2.154)	(2.159)	(1.955)	(1.907)	(1.905)
R^2	0.0778	0.0784	0.0784	0.0768	0.077	0.077
F-Stat	92.273***	91.169***	89.385***	92.941***	91.238***	89.408***

Note: Industries based on two-digits SIC are controlled for but not reported. Refer to Table 1 for variable definitions.
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 9
Effect of Number of Female Directors on Idiosyncratic Volatility: Controlling for Institutional Ownership (N=55445)

$$\Psi_{i,t} = \alpha + \beta_1 LFDIR_{i,t-1} + \beta_2 LDIR_{i,t-1} + \beta_3 INST_{i,t-1} + \beta_4 G_{i,t-1} \times INST_{i,t-1} + \beta_5 LFDIR_{i,t-1} \times INST_{i,t-1}$$
$$+ \gamma_1 G_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} +$$
$$\gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \sum industries \quad dummy \quad + \varepsilon$$

$$\Psi_{i,t} = \alpha + \beta_1 FD_{i,t-1} + \beta_2 INST_{i,t-1} + \beta_3 G_{i,t-1} \times INST_{i,t-1} + \beta_4 FD_{i,t-1} \times INST_{i,t-1}$$
$$+ \gamma_1 G_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1} + \gamma_7 DD_{i,t-1} +$$
$$\gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \sum \text{industries} \quad \text{dummy} \quad + \varepsilon$$

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.464***	4.429***	4.412***	4.247***	4.212***	4.194***
	(32.792)	(32.434)	(32.155)	(31.420)	(31.078)	(30.801)
LFDIR	0.077***	0.09***	0.089***			
	(7.993)	(8.733)	(8.671)			
LDIR	0.012***	0.011***	0.011***			
	(4.011)	(3.898)	(3.896)			
FD				0.052***	0.08***	0.079***
				(2.968)	(4.154)	(4.061)
INST	0.135	0.782***	1.302***	0.125	0.854***	1.395***
	(1.144)	(3.461)	(2.735)	(1.058)	(3.308)	(2.870)
G	-0.007**	-0.007**	-0.005	-0.004	-0.004	-0.003
	(-2.271)	(-2.254)	(-1.571)	(-1.381)	(-1.414)	(-0.772)
LFDIR × INST		-0.909***	-0.878***			
		(-3.539)	(-3.395)			
FD × INST					-0.965***	-0.922***
					(-3.342)	(-3.163)
G × INST			-0.056			-0.059
			(-1.230)			(-1.298)
ROE	-0.297***	-0.3***	-0.301***	-0.298***	-0.302***	-0.302***
	(-2.823)	(-2.852)	(-2.857)	(-2.822)	(-2.857)	(-2.861)
VROE	0.046	0.047	0.047	0.07**	0.071**	0.071**
	(1.586)	(1.600)	(1.604)	(2.377)	(2.420)	(2.422)
LEV	0.099*	0.097*	0.097*	0.145***	0.141***	0.142***
	(1.807)	(1.764)	(1.769)	(2.647)	(2.580)	(2.586)
MB	-0.016	-0.016	-0.016	-0.027*	-0.027*	-0.027*
	(-1.072)	(-1.091)	(-1.089)	(-1.855)	(-1.853)	(-1.851)
SIZE	-0.223***	-0.222***	-0.222***	-0.202***	-0.201***	-0.201***
	(-33.533)	(-33.265)	(-33.249)	(-31.590)	(-31.457)	(-31.440)
DD	-0.139***	-0.139***	-0.14***	-0.122***	-0.122***	-0.123***
	(-7.790)	(-7.825)	(-7.838)	(-6.852)	(-6.889)	(-6.903)
AGE	-0.022*	-0.022*	-0.022*	-0.01	-0.011	-0.011
	(-1.744)	(-1.771)	(-1.784)	(-0.805)	(-0.857)	(-0.871)
DIVER	-0.054***	-0.054***	-0.054***	-0.057***	-0.057***	-0.057***
	(-3.338)	(-3.355)	(-3.355)	(-3.542)	(-3.543)	(-3.544)
MERGER	-0.03*	-0.03*	-0.03*	-0.036**	-0.036**	-0.036**
	(-1.726)	(-1.714)	(-1.716)	(-2.066)	(-2.046)	(-2.048)
R^2	0.0727	0.0729	0.0729	0.0707	0.0708	0.0708
F-Stat	67.845***	67.016***	66.036***	66.865***	66.025***	65.047***

Note: Industries based on two-digits SIC are controlled for but not reported.
Refer to Table 1 for variable definitions
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 10A
Effect of Female Directors on Idiosyncratic Volatility: Controlling for Earnings Quality and Institutional Ownership (N=43041)

$$\Psi_{i,t} = \alpha + \beta_1 LFDIR_{i,t-1} + \beta_2 LDIR_{i,t-1} + \beta_3 EQ_{i,t-1} + \beta_4 INST_{i,t-1} + \beta_5 LFDIR_{i,t-1} \times EQ_{i,t-1}$$
$$+ \beta_6 LFDIR_{i,t-1} \times INST_{i,t-1} + \beta_7 EQ_{i,t-1} \times INST_{i,t-1} + \beta_8 LFDIR_{i,t-1} \times EQ_{i,t-1} \times INST_{i,t-1}$$
$$+ \gamma_1 G_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1}$$
$$+ \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \sum industries \quad dummy \quad + \varepsilon$$

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.366***	4.389***	4.34***	4.363***	4.364***	4.361***
	(20.629)	(20.732)	(20.481)	(20.584)	(20.597)	(20.582)
FDIR	0.131***	0.094***	0.159***	0.122***	0.122***	0.124***
	(5.828)	(3.928)	(6.591)	(4.775)	(4.775)	(4.855)
DIR	-0.001	-0.001	-0.003	-0.002	-0.002	-0.002
	(-0.027)	(-0.001)	(-0.082)	(-0.055)	(-0.051)	(-0.054)
EQ	-0.197***	-0.402***	-0.197***	-0.402***	-0.419***	-0.4***
	(-6.755)	(-7.449)	(-6.759)	(-7.439)	(-7.536)	(-7.410)
INST	0.173	0.17	0.805***	0.801***	0.719***	0.799***
	(1.341)	(1.320)	(3.274)	(3.256)	(2.879)	(3.250)
FDIR × EQ		0.301***		0.301***	0.296***	0.275***
		(4.438)		(4.428)	(4.340)	(3.787)
FDIR × INST			-0.882***	-0.88***	-0.867***	-0.952***
			(-3.212)	(-3.210)	(-3.179)	(-3.408)
EQ × INST					0.667	
					(1.120)	
FDIR × EQ × INST						0.732
						(1.268)
G	0.001	0.001	0.001	0.001	0.001	0.001
	(0.098)	(0.157)	(0.077)	(0.136)	(0.136)	(0.132)
ROE	-0.078	-0.091	-0.082	-0.095	-0.096	-0.097
	(-0.652)	(-0.762)	(-0.686)	(-0.796)	(-0.809)	(-0.810)
VROE	0.056**	0.056**	0.057**	0.057**	0.056**	0.055**
	(1.999)	(2.003)	(2.041)	(2.046)	(2.024)	(1.988)
LEV	0.105*	0.106*	0.102	0.102	0.102	0.102
	(1.676)	(1.683)	(1.624)	(1.631)	(1.625)	(1.631)
MB	-0.023	-0.022	-0.023	-0.022	-0.022	-0.022
	(-1.372)	(-1.288)	(-1.385)	(-1.301)	(-1.306)	(-1.301)
SIZE	-0.223***	-0.223***	-0.222***	-0.222***	-0.222***	-0.222***
	(-29.385)	(-29.476)	(-29.181)	(-29.271)	(-29.267)	(-29.267)
DD	-0.137***	-0.135***	-0.138***	-0.136***	-0.136***	-0.136***
	(-6.798)	(-6.724)	(-6.835)	(-6.760)	(-6.758)	(-6.758)
AGE	-0.034**	-0.036**	-0.034**	-0.037***	-0.037***	-0.037***
	(-2.407)	(-2.554)	(-2.451)	(-2.597)	(-2.598)	(-2.597)
DIVER	-0.047**	-0.047**	-0.048***	-0.048***	-0.048***	-0.048***
	(-2.574)	(-2.561)	(-2.611)	(-2.598)	(-2.602)	(-2.595)
MERGER	0.016	0.015	0.016	0.016	0.015	0.015
	(0.791)	(0.779)	(0.803)	(0.791)	(0.768)	(0.783)
R^2	0.0755	0.0759	0.0756	0.0761	0.0761	0.0761
F-Stat	64.869***	64.1***	63.897***	63.158***	62.09***	62.091***

Note: Industries based on two-digits SIC are controlled for but not reported. Refer to Table 1 for variable definitions

***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.

Table 10B
Effect of Existence of Female Directors on Idiosyncratic Volatility: Controlling for Earnings Quality and Institutional Ownership (N=43041)

$$\Psi_{i,t} = \alpha + \beta_1 FD_{i,t-1} + \beta_2 EQ_{i,t-1} + \beta_3 INST_{i,t-1} + \beta_4 FD_{i,t-1} \times EQ_{i,t-1}$$
$$+ \beta_5 FD_{i,t-1} \times INST_{i,t-1} + \beta_6 EQ_{i,t-1} \times INST_{i,t-1} + \beta_7 FD_{i,t-1} \times EQ_{i,t-1} \times INST_{i,t-1}$$
$$+ \gamma_1 G_{i,t-1} + \gamma_2 ROE_{i,t-1} + \gamma_3 VROE_{i,t-1} + \gamma_4 LEV_{i,t-1} + \gamma_5 MB_{i,t-1} + \gamma_6 SIZE_{i,t-1}$$
$$+ \gamma_7 DD_{i,t-1} + \gamma_8 AGE_{i,t-1} + \gamma_9 DIVER_{i,t-1} + \sum industries \quad dummy \quad + \varepsilon$$

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.237***	4.251***	4.206***	4.22***	4.221***	4.219***
	(20.791)	(20.860)	(20.600)	(20.669)	(20.684)	(20.667)
FD	0.051***	0.024	0.081***	0.054**	0.054**	0.057**
	(2.597)	(1.127)	(3.735)	(2.307)	(2.318)	(2.424)
EQ	-0.196***	-0.364***	-0.196***	-0.362***	-0.381***	-0.362***
	(-6.715)	(-6.040)	(-6.703)	(-6.009)	(-6.122)	(-6.008)
INST	0.185	0.182	0.93***	0.922***	0.834***	0.922***
	(1.430)	(1.412)	(3.330)	(3.300)	(2.963)	(3.300)
FD × EQ		0.216***		0.215***	0.209***	0.187***
		(3.245)		(3.217)	(3.118)	(2.694)
FD × INST			-0.986***	-0.979***	-0.97***	-1.067***
			(-3.154)	(-3.130)	(-3.109)	(-3.346)
EQ × INST					0.746	
					(1.257)	
FD × EQ × INST						0.84
						(1.398)
G	0.002	0.002	0.002	0.002	0.002	0.002
	(0.609)	(0.614)	(0.588)	(0.592)	(0.593)	(0.588)
ROE	-0.076	-0.084	-0.081	-0.089	-0.09	-0.09
	(-0.638)	(-0.705)	(-0.676)	(-0.742)	(-0.757)	(-0.756)
VROE	0.064**	0.068**	0.066**	0.069**	0.068**	0.068**
	(2.283)	(2.402)	(2.336)	(2.454)	(2.427)	(2.421)
LEV	0.121*	0.119*	0.117*	0.115*	0.115*	0.115*
	(1.953)	(1.918)	(1.886)	(1.851)	(1.847)	(1.846)
MB	-0.027	-0.026	-0.027	-0.026	-0.026	-0.026
	(-1.625)	(-1.569)	(-1.629)	(-1.573)	(-1.580)	(-1.575)
SIZE	-0.214***	-0.214***	-0.213***	-0.213***	-0.213***	-0.213***
	(-29.753)	(-29.756)	(-29.603)	(-29.607)	(-29.601)	(-29.600)
DD	-0.128***	-0.127***	-0.128***	-0.127***	-0.127***	-0.127***
	(-6.368)	(-6.323)	(-6.390)	(-6.344)	(-6.343)	(-6.338)
AGE	-0.03**	-0.031**	-0.031**	-0.032**	-0.032**	-0.032**
	(-2.167)	(-2.221)	(-2.228)	(-2.281)	(-2.283)	(-2.286)
DIVER	-0.049***	-0.049***	-0.05***	-0.049***	-0.05***	-0.049***
	(-2.687)	(-2.680)	(-2.699)	(-2.693)	(-2.697)	(-2.690)
MERGER	0.014	0.013	0.015	0.014	0.013	0.013
	(0.718)	(0.670)	(0.737)	(0.689)	(0.665)	(0.675)
R^2	0.0748	0.075	0.075	0.0752	0.0752	0.0752
F-Stat	65.431***	64.425***	64.44***	63.468***	62.381***	62.384***

Note: Industries based on two-digits SIC are controlled for but not reported. Refer to Table 1 for variable definitions
***, ** and * indicate significant at a p-value of less than 1% level (2-tailed), 5% level (2-tailed) and 10% level (2-tailed) respectively.