Board gender diversity and firm performance: The impact of information environment

John Puthenpurackal
University of Nevada – Las Vegas
Lee Business School – Finance Department
Las Vegas, NV 89154-6008
john.puthenpurackal@unlv.edu
001-702-895-1184

Arun Upadhyay
University of Nevada - Reno
College of Business – Finance Department
Reno, NV 89557
aupadhyay@unr.edu
001-775-682-9167

Abstract

Prior literature documents higher level of board functioning when women directors are on boards but the impact on firm performance is unclear. Yet, corporate governance proponents, social activists and governments are seeking greater representation of women on corporate boards. The performance impact of greater monitoring has been shown to depend on firms' information environments. We hypothesize and find that the performance impact of women directors depends on firms' information environments as well as their prior experience. Specifically, women directors appear to be more beneficial in less opaque firms. Women directors with senior corporate experience are associated with higher firm performance relative to women directors with lower level corporate and non-corporate experience. Consistent with these valuation effects, we find that firms appear to take into account their information environment while deciding on appointing women directors.

1. Introduction

Major corporate governance reforms have occurred in recent years. Part of the motivations for the Sarbanes-Oxley Act and for changes to the listing requirements of major stock exchanges such as the NYSE and NASDAQ were attempts to improve the quality of monitoring by boards of directors. While the initial emphasis was on board independence, board diversity is also considered desirable for improved decision making (Higgs, 2003). Gender diversity is one aspect of board diversity. A more diverse board could add value by bringing new ideas and different perspectives to the table. Despite significant progress by women in most walks of life, women held only 14.8% of Fortune 500 board seats in 2007 in the U.S. (Catalyst, 2007). Some countries, dissatisfied with the level of female representation on boards that has arisen voluntarily, are requiring or proposing to require certain minimum levels. For example, in Norway since 2006, all publicly listed firms are required to reserve 40% of board seats for women. The European Union is planning to introduce similar regulation that will apply to all the countries in the EU.[1] In 2009, the securities exchange commission (SEC) in the U.S. mandated new disclosure rules requiring listed firms to disclose whether they consider diversity when recruiting new directors.[2]

Despite this trend towards greater representation of women on corporate boards, their impact on firm performance is still not clear. Some have suggested that this trend is driven by political and social considerations than by economic ones. For example, Ahern and Dittmar (2011) study the 2006 exogenous policy shock in Norway that required higher female representation on corporate boards and find a substantial value loss for firms that were forced to comply. They conclude that forced compliance to this policy resulted in less experienced and potentially less capable boards. Matsa and Miller (2011) in a study of the same event also find a reduction in profits but interpret the results as being consistent with women being more stakeholder and long-term

[1] See http://online.wsj.com/article/SB10001424052748703712504576244671196828968.html.
[2] See http://www.sec.gov/news/press/2009/2009-268.htm

oriented. Due to lack of sufficient data post 2006 however, they are unable to test whether this orientation is consistent with shareholder value maximization. Note that although the above two studies exploit an exogenous event, they still have a potential drawback. Finding that Norwegian firms are hurt by this policy does not imply that women directors are suboptimal. Rather, the requirement of 40% female representation may have been too high given the available pool of qualified women directors.

Analyzing U.S. firms where inclusion of women directors is voluntary, Adams and Ferreira (2009) document that boards with women directors have lower director attendance problems and that CEO turnover in such firms is more sensitive to firm performance, consistent with more effective monitoring. They however find that female directors have a negative impact on firm performance, especially for well governed firms. Farrell and Hersch (2005) find that director gender has no impact on firm performance and conclude that the addition of women to the board of directors appears to be driven by tokenism. While Carter, Simkins and Simpson (2003) find a positive relation between gender diversity of the board and firm performance, Adams and Ferreira (2009) show that this relationship disappears once endogeneity issues are fully addressed.

In this paper, we provide a detailed analysis of the relationship between board gender diversity and firm performance taking into account the information environment of firms and the prior experience of women directors. Duchin, Matsusaka and Ozbas (2010) find that Sarbanes-Oxley mandated independent director requirements are value increasing (decreasing) for firms when the cost of acquiring information by outsiders is low (high). Coles, Naveen and Daniel (2008), Boone, Field, Karpoff and Raheja (2007) and Linck, Netter and Yang (2008) similarly find that firms that are costly to monitor for outsiders have a greater proportion of inside directors. This literature suggests that women directors, who are mostly outside directors, are likely to be less effective in more opaque firms.

The potential impact of having just one woman director on a board extends beyond just that director's impact since Adams and Ferreira (2009) find that not only do women directors have fewer attendance problems but also that overall attendance behavior of directors (including men) improves the more women are on the board. Pertinent to this higher level of board functioning, Almazan and Suarez (2003), Adams and Ferreira (2007) and Faleye, Hoitash and Hoitash (2011) argue that there can be costs to intense monitoring. For example, Faleye et al. (2011) find evidence of these costs in firms where acquisitions or corporate innovation are important value drivers. Thus, a potential explanation for Adams and Ferreira's (2009) apparently contradictory findings of higher level of monitoring for boards with women directors but yet lower firm value is that the net benefit of monitoring depends on the information environment of firms.

To examine the impact of information environment on the relationship between the presence of women directors and firm performance, we construct an information opacity index from firm-specific proxies of the cost of acquiring information. We use both Tobin's Q and ROA as performance measures. For a sample of S&P 1500 firms from 1996 to 2005, using OLS and median regressions and controlling for various firm characteristics, we find that women directors are associated with higher firm performance in low opacity firms but their impact becomes less favorable as firm opacity increases. We find that the median level of women ratio (10%) is associated with 1.9% higher Tobin's Q for firms at the 25th percentile of opacity and almost zero change in Tobin's Q for firms at the 75th percentile of opacity.

Several papers have shown that board structure is endogenously determined (Hermalin and Weisbach, 1998, 2003; Boone et al., 2007; Coles et al., 2008; and Linck et al., 2008). It has been argued that prior performance may potentially influence the board structure that a firm adopts. It is also possible that omitted firm characteristics may affect both the selection of female directors and firm performance, producing a spurious correlation between women directors and firm

performance. To mitigate these endogeneity concerns, we use 2SLS (IV) and firm fixed effects estimations and find that our results are generally robust to these methods, using both Tobin's Q and ROA as performance measures. We also use alternative proxies for the cost of acquiring information such as firm age, stock return volatility and ratio of intangible assets, and obtain generally consistent results.

We also find that women directors with senior corporate experience are associated with higher firm performance relative to women directors with non-corporate or junior corporate backgrounds. This is consistent with women directors with senior corporate experience having greater monitoring and advising capability and being better informed given their background and business connections. This may also indicate that women directors with senior corporate experience are able to elicit value adding incremental monitoring efforts from other board members.

Given our finding that the performance impact of the presence of women directors is partly determined by the information environment of firms, we examine whether firms take this into account while deciding on appointing women directors. We hypothesize that more opaque firms would be less likely to appoint women directors. On the other hand, firms with low cost of information acquisition would be more likely to appoint women directors. To test this, we estimate the relation between the information environment of a firm and the ratio of female directors on its board. We find that, after controlling for board independence, board size and firm size, more opaque firms are less likely to appoint female directors. This suggests that firms take into account their information environment while appointing women directors, which tends to reflect their valuation consequences.

Our paper contributes to a growing body of literature indicating that optimal board composition depends on firm characteristics, i.e., one size does not fit all (e.g., Balsam, Puthenpurackal and Upadhyay, 2012; Duchin et al., 2010; Coles et al., 2008; Boone et al., 2007;

Linck et al., 2008). Specifically, our evidence that the impact of the presence of women directors on firm performance depends on their prior experience and the information environment of firms supports Raheja (2005), Adams and Ferreira (2007), Harris and Raviv (2008) and Duchin et al. (2010) who argue that the cost of information acquisition is an important consideration in the suitability of outside directors. This paper also provides additional insight on the performance impact of gender diversity, complementing the findings of Adams and Ferreira (2009), Ahern and Dittmar (2011), and Matsa and Miller (2011).

The rest of the paper is organized as follows. We describe the data sources and our sample in section 2. We present analyses using firms' information environment and women directors' prior experience in sections 3 and 4, respectively. We examine the determinants of women directors in section 5 and present robustness tests in section 6. We conclude in section 7.

2. Data and Sample

2.1. The Sample

Our sample comprises of S&P 1500 firms from 1996 to 2005. Following studies in this area, we exclude regulated financial services and utility firms since regulation can affect firm performance and governance characteristics. Furthermore, we restrict the sample to firms that have data in *Compustat* industrial and segment files, *CRSP*, *I/B/E/S* and *ExecuComp*. This results in a sample of 1602 firms with 8541 firm-year observations. The firm-level accounting data comes from *Compustat*, stock returns data is from *CRSP*, and information on CEO ownership and CEO tenure variables is obtained from *ExecuComp*. Data on analyst following is from *I/B/E/S*. Data on director characteristics is obtained from *IRRC,* which also provides data on director affiliation and gender.

2.2. Variables

The primary objective of our study is to examine the relationship between the presence of women directors on boards and firm performance. Our primary measure of women directors is a continuous variable computed as the ratio of the number of women directors on a firm's board to the board size, computed yearly. We use three proxies of the information environment of firms to create an information opacity index. We use the natural log of the number of analysts reporting earnings estimates for a firm during a fiscal year as a proxy for information availability. To measure the accuracy of information, we use the consensus earnings forecast error from *I/B/E/S*. We compute earnings forecast error as the absolute value of the difference between the median analyst's quarterly forecast within 180 days prior to a quarterly earnings announcement and actual quarterly earnings, scaled by the firm's EPS. The third proxy of information quality is the dispersion of analyst forecasts, measured as the standard deviation of earnings forecasts across analysts prior to a quarterly earnings announcement, normalized by the firm's fiscal year end stock price and averaged across the four quarters in a given year. These measures of the information environment are widely used in the literature (e.g., Duchin et al., 2010).

We create an opacity index by categorizing firms into deciles using each of these three information measures. Decile one indicates lowest opacity while decile ten indicates highest opacity. The number of analysts following a firm is strongly correlated with firm size, so we use the residuals obtained from regressing number of analysts on firm size. Since greater number of analysts indicates higher transparency, we use the inverse of the residuals from the above described regression for creating decile ranks of opacity using this measure. Firms' decile ranks of opacity are separately obtained using the other two information measures. Finally, a normalized opacity value is obtained for each firm by summing the firm's decile rankings using each of the three measures, and dividing by thirty. Thus, the maximum value of the opacity index is 1 while the minimum is 0.1.

We also examine whether the prior experience of outside women directors is associated with firm performance and if it depends on firms' information environments. For this purpose, we classify the prior experience of outside women directors into two categories; corporate and support. Corporate prior experience indicates that the outside woman director has senior level corporate experience of vice president (VP) or higher or has served as a director. Support prior experience indicates that the outside woman director has low level managerial experience or has a non-corporate background such as academic, non-profit, charity etc.

2.2.1. Control Variables

We include several variables to control for industry and firm characteristics. Firm size is measured as the natural log of total sales. We calculated firm leverage as the ratio of the sum of long term and short term debt to book value of total assets. To control for growth opportunities, we include the ratio of R&D investment scaled by firm sales. Firm risk is captured by stock return volatility which is measured as standard deviation of monthly returns over the prior 60 months. Diversification is measured by the number business segments of a firm. We also include board size and board independence as control variables. We control for insider ownership, measured by the equity ownership of company executives and directors, in all specifications since prior studies have found that insider ownership impacts firm performance. Prior literature documents evidence that prior firm performance may impact board structure. Prior firm performance may also impact the corporate information environment. Therefore, in an analysis of the association of board structure and firm opacity, it is important to control for prior firm performance. We include prior firm performance, measured by lagged ROA, in all specifications. Year dummy variables are included in all specifications, and in OLS specifications, industry fixed effects based on 2-digit SIC codes are also included.

2.3. Descriptive Statistics and Univariate Results

In Table 1, we present descriptive statistics of key test variables and control variables for the full sample. The mean (median) total sales of sample firms is $1.542 billion ($1.321 billion) while the mean (median) R&D investment is 0.034 (0.000) of total assets. The median board size is 9 while the mean (median) proportion of the board of directors who are independent is 66.5% (66.7%). The mean (median) of women ratio (women directors/board size) is 9.7% (10%). These are similar to the ratio of women directors of 8.11% reported by Adams et al. (2009) for their sample of S&P 1500 firms from 1996-2003. The mean (median) of outside women ratio (outside women directors/board size) is 8.1% (10%) while the mean (median) of inside women ratio (inside women directors/board size) is 1.6% (0%). Hence, women directors are mostly outside directors (83.5%), on average. The mean proportion of directors who are outside women directors with senior corporate or board level experience is 5.6%. The mean proportion of directors who are outside women directors with low level corporate or non-corporate experience is 2.5%. The information opacity index has a mean (median) of 0.558 (0.567), and ranges from 0.1 to 1. The mean (median) of Tobin's Q and ROA are 1.962 (1.483) and 0.043 (0.043), respectively.

Table 2 Panel A presents a correlation matrix between ratio of women directors, board characteristics, opacity index and other key variables. The ratio of women directors (women ratio, henceforth) is positively correlated to both board size and board independence. Women ratio is also positively associated with firm age and firm size and negatively correlated with opacity index. As expected, opacity index (opacity, henceforth) is positively correlated with analyst forecast dispersion and analyst forecast error and negatively correlated with the number of analysts following the firm. Not surprisingly, opacity is positively correlated with volatility and ratio of intangible assets and is negatively correlated with firm age and size. Overall, the correlation matrix indicates that women

ratio is higher in firms that are larger and older, and in firms with larger and more independent boards, but is lower in more opaque firms.

We next provide descriptive statistics of firms with and without women directors to identify key differences between these subsamples. Panel B of Table 2 presents a comparison of the means of different characteristics for these two groups of firms. The first two columns present mean values of various firm characteristics for firms with at least one woman director, and for firms that do not have a single woman director. The third column presents the difference in the mean value of the two groups of firms and the last column presents t-statistics for the differences-in-mean tests.

The differences in means are statistically significant for all variables except forecast dispersion. Firms with at least one woman director have lower opacity, are larger and older, and are less volatile and more leveraged, relative to firms without a woman director. On average, firms with a woman director also have a smaller ratio of intangible assets and lower R&D intensity, have larger and more independent boards and have lower insider ownership. In terms of firm performance, firms with a woman director have lower Tobin's q but higher ROA, on average, which is similar to what is reported in Adams and Ferreira (2009).

We present in Table 2 Panel C key director characteristics categorized by gender. The average age of women directors is 54.8 years which is significantly lower than that of male directors (59.4 years). Women directors have, on average, served on boards for 7.5 years which is significantly lower than the 10.1 years for male directors. Women directors have, on average, 1.04 external board seats which is significantly higher than the 0.87 external board seats for male directors. Women directors have lower ownership on average (0.45%) relative to male directors (1.20%). In terms of prior experience, 66% of women directors have had senior corporate or board level experience, while 78% of male directors have had similar experience. Overall, these characteristics suggest that male directors on average are older, have greater board tenures and higher ownership, are more

likely to have had senior corporate or board level experience but have fewer external board seats, relative to women directors.

While the above univariate results provide initial insight into characteristics of firms with and without woman directors, and characteristics of women and male directors, our objective is to examine whether the relationship between the presence of women directors and firm performance are influenced by firm and director characteristics. We use multivariate analysis to further explore this issue.

3. Multivariate Analysis

3.1. Women Directors, Opacity and Firm Performance

As discussed in the introduction, prior studies have documented mixed evidence on the relationship between the presence of women directors and firm performance. Adams and Ferreira (2009) show that although boards with women directors appear to monitor conscientiously and are effective in replacing poor performing CEOs, their impact on firm performance is on average negative. We hypothesize that the value impact of the presence of women directors would depend on the information environment of firms: less valuable and potentially value destroying in opaque firms since external monitoring has been found to be less effective and potentially costly in such firms, and more valuable in transparent firms where external monitoring has been found to be effective (e.g., Duchin et al., 2010; Faleye et al., 2011). To study the impact of the corporate information environment on the association between firm performance and the presence of women directors, we use the following model:

$$Performance_{i,t} = \alpha + \beta_1 * (WomenRatio_{i,t}) + \beta_2 * (WomenRatio * Opacity_{i,t}) + \beta_3 * (Opacity_{i,t}) +$$
$$\beta_4 * (BoardSize_{i,t}) + \beta_5 * (BoardIndependence_{i,t}) + \beta_6 * (InsiderOwnersip_{i,t}) +$$
$$\beta_7 * (FirmSize_{i,t}) + \beta_8 * (ROA_{i,t-1}) + \beta_9 * (Leverage_{i,t}) + \beta_{10} * (Diversification_{i,t}) +$$
$$\beta_{11} * (Volatility_{i,t-1}) + \beta_{12} * (R\&DIntensity_{i,t}) + \beta_{13} * (Year_{i,t}) + \beta_{14} * (Industry_{i,t}) + \varepsilon_{i,t}$$

We measure firm performance using an approximation of Tobin's Q, calculated as the ratio of the firm's market value to its book value. The firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. The natural logarithm of Tobin's Q is the primary dependent variable in our performance regressions. In robustness tests, we also use an accounting performance measure, ROA. The key test variable is the interaction term *Women Ratio*Opacity*. If the value impact of women directors declines with opacity of a firm's information environment, the coefficient of this interaction term would be negative. On the other hand, if the value impact of women directors does not depend on the information environment, the interaction term would be insignificant. We start the analysis by running OLS regressions. To control for industry level factors, we include industry fixed effects. We also include year dummy variables in all specifications. The coefficients of these indicator variables and the intercept are not presented for the sake of brevity. In all these and subsequent models, we use the White-Huber sandwich estimator of variance, clustering on firm level identifiers.

The results using different estimation methods are presented in Table 3. Results obtained using OLS are reported in the first column. The coefficient on *Women Ratio* is 0.503 which is significant at the 5% level and the coefficient on the interaction term *Women Ratio*Opacity* is -0.715, significant at the 10% level. This suggests that the performance impact of the presence of women directors is positive in low opacity firms but becomes less favorable as firm opacity increases. Using OLS estimates, we also compute the economic effect of women directors in firms at the 25th percentile and 75th percentile of opacity. We find that the median level of women ratio (10%) is associated with 1.9% higher Tobin's Q for firms at the 25th percentile of opacity and almost zero change in Tobin's Q for firms at the 75th percentile of opacity. To ensure that outliers are not driving the results, we also conduct a least absolute deviation estimation (median regression) and obtain similar results, as reported in the second column of Table 3. Although the above results suggest that

the performance impact of the presence of women directors is influenced by the information environment of firms, further analysis is required to control for endogeneity issues and omitted variable bias. We next attempt to address these issues.

3.2. Women Directors, Opacity and Firm Performance: Fixed Effects and 2SLS

We control for potential omitted variable bias using firm fixed effects estimation. As reported in column (3) of Table 3, the coefficient on *Women Ratio* is positive but insignificant while the coefficient on the interaction term *Women Ratio*Opacity* is negative (-0.501) and significant at the 5% level. The results using firm fixed effects support the earlier results that the performance impact of the presence of women directors becomes less favorable with increasing firm opacity.

One of the most difficult issues in board related studies is endogeneity and interpretation of causality. A number of studies empirically (Boone et al., 2007; Coles et al., 2008 and Linck et al., 2008) and theoretically (Hermalin and Weisbach, 1998; Raheja, 2005; Adams and Ferreira, 2007, and Harris and Raviv, 2006) show that board structure and firm performance are not exogenously determined. In the context of women directors and firm performance, it is possible that women directors may join more transparent firms which may also be more valuable. To address this issue, we need an instrument that is correlated with the presence of women directors but is uncorrelated with firms' information environment and performance. In corporate finance, it is difficult to find a perfect instrument. However, one can use a reasonable instrument that is not correlated with firm performance and test for the validity of the instrument (Bartels, 1991). We apply this approach and use 2SLS (IV) estimation to address the issue of reverse causality related to women directors and firm performance.

To predict the presence of women directors, we use an instrument which is less likely to have a direct impact on firm performance or the information environment of the firm. We use the proportion of firms (excluding the sample firm in question) headquartered in the same county where

the sample firm in question is located with at least one women director, calculated yearly. The choice of this instrument is driven by some studies that find evidence that companies follow their local peers when designing governance structure (Glaeser and Scheinkman, 2002; John and Kadyrzhanova, 2010 and Anderson et al. 2011). The proportion of firms with women directors in a given county is less likely to have a direct impact on sample firms' performance or information environment, making it a potentially suitable instrument.[3]

An endogeneity test (Hausman, 1978) yields a χ^2- statistics of 16.27 which indicates that women ratio and firm performance are endogenously determined. Hence, correcting for endogeneity is important. Before using 2SLS (IV) estimation to control for endogeneity concerns, it is important to first test the power and validity of our instrument. Since we use only one instrument, over-identification is not a problem for this estimation. To test the predictive power of the instrument, we conduct a partial F-test and obtain an F statistic of 12.64. Staiger and Stock (1997) recommend a value of 10 or more to classify an instrument as a good predictor. So, our chosen instrument appears suitable.

Results for the 2SLS (IV) estimation are presented in the last two columns of Table 3. The fourth column presents results from the 1st stage of the 2SLS (IV) estimation. The instrument, ratio of firms with women directors in a county, has a positive and significant coefficient (0.157 with a t-statistics 8.121) indicating that in counties where a greater proportion of firms have women directors, the likelihood of a firm recruiting women directors is greater. In terms of the predictive power of other variables, we find that the firms with greater board independence, larger firms, firms with greater leverage and R&D intensity are also more likely to have women directors. However, more volatile firms are less likely to have women directors.

[3] There is a possibility that the fraction of firms with a woman director in a county is correlated with firm performance through the location. To mitigate that possibility, we add firm fixed effects to the estimation and find similar results.

In the last column of Table 3, we present results for the 2nd stage of 2SLS (IV) estimation. In this stage, we use the predicted value of ratio of women directors from the 1st stage. Similar to the results using firm fixed effects, we find a positive but insignificant coefficient on predicted *Women Ratio* while the interaction term *Women Ratio*Opacity* is negative (-0.823) and significant at the 10% level. Overall, the results obtained using different estimation methods indicate that the positive association between the presence of women directors and firm performance declines with increasing opacity of firms' information environments.

3.3. Women Directors, Opacity and Firm Performance: ROA

We have so far measured firm performance using the natural logarithm of Tobin's Q. Since our measure of Tobin's Q may also capture growth opportunities, we also use an accounting measure of performance, ROA, to test the robustness of our results. Results using ROA as dependent variable are presented in Table 4, using OLS, median, firm fixed effects and 2SLS regressions.[4] Consistent with the results presented earlier, the coefficient on the interaction term *Women Ratio*Opacity* is negative and significant across all the four regressions. Overall, results using different estimation methods with both Tobin's Q and ROA as performance measures, suggest that the benefit of the presence of women directors measured by performance impact declines with increasing opacity of firms' information environments.

3.4. Inside and Outside Women Directors, Opacity and Firm Performance

As discussed earlier, one potential explanation for the above results is the following. Women directors are mostly outside directors and the presence of women directors is associated with greater overall board monitoring (Adams and Ferreira, 2009). Greater board monitoring has been found to be valuable in more transparent firms and costly in more opaque firms (e.g., Duchin et al., 2010; Faleye et al., 2011). We provide a test of this explanation by classifying women directors into two

[4] Table 4 presents results from only the 2nd stage of 2SLS (IV) estimation as there is no change in the 1st stage estimation reported in Table 3.

categories: one where women directors are inside (employee or affiliated) directors and the other where women directors are outside directors. Employee and affiliated women directors have easier access to firm-specific information and therefore information acquisition should not be costly for such women directors. These inside women directors are also less likely to monitor intensely nor are they likely to encourage other directors to monitor intensely. On the other hand, for outside women directors, acquiring information about a firm would be more costly and they have the incentive to monitor diligently and to encourage other directors to do so. We introduce additional variables in the specifications: *Inside Women Ratio* and *Outside Women Ratio* along with their interactions with *Opacity*. *Inside Women Ratio* is the fraction of the board who are women directors categorized either as employee or affiliated.[5] *Outside Women Ratio* is the fraction of the board who are women directors categorized as independent directors.

We present results using OLS, firm fixed effects and 2SLS (IV) estimations in Table 5. The coefficients of both *Inside Women Ratio* and *Inside Women Ratio*Opacity* are insignificant across all the regressions. *Outside Women Ratio* is positive and significant in OLS and firm fixed effects estimations while the interaction term *Outside Women Ratio*Opacity* is negative and significant at the 10% level in both OLS and firm fixed effects estimations and negative and significant at the 5% level in 2SLS (IV) regression. This indicates that our earlier findings using *Women Ratio* is driven by *Outside Women Ratio*, as we hypothesized. We confirm this by repeating the OLS and firm fixed effects analyses of Tables 3 and 4, using *Outside Women Ratio* in place of *Women Ratio.* As reported in Table 6, *Outside Women Ratio* is positive and significant in 3 out of 4 specifications while *Outside Women Ratio*Opacity* is negative and significant in all the specifications.

Overall, our results suggest that the presence of outside women directors are associated with higher firm performance in low opacity firms but their impact becomes less favorable as firm

[5] Keeping only women employee directors and excluding affiliated women directors from the category of *Inside Women Ratio* does not change the results.

opacity increases. This result helps reconcile Adams and Ferreira's (2009) findings of higher level of monitoring for boards with women directors but yet lower firm value. Recall that Faleye et al. (2011) find that intense board monitoring can be costly especially in growth and innovative firms. Duchin et al. (2011) also find that Sarbanes Oxley (SOX) mandated independent directors are, on average, costly to growth firms. Our results indicate that greater board monitoring associated with the presence of women directors (Adams and Ferreira, 2009) is valuable in less opaque firms. However, since monitoring intensity is less effective and potentially costly in more opaque information environments, the presence of women directors appears to be less valuable in more opaque firms.

4. Effect of outside women director experience

We expect that women directors with senior corporate or board level experience would be more valuable than women directors with lower level corporate or non-corporate experience. This is because women with senior corporate experience will have greater monitoring and advising capability and are likely to be better informed given their background and business connections. Women directors with senior corporate experience may also be able to elicit value adding incremental monitoring efforts from other board members. To test this hypothesis, we use two variables, *Corporate Women Ratio* and *Support Women Ratio* and their interactions with *Opacity*.[6] *Corporate Women Ratio* is the proportion of directors who are outside women directors with senior corporate or board level experience. *Support Women Ratio* is the proportion of directors who are outside women directors with low level corporate or non-corporate experience.

The results are reported in Table 7 using OLS and firm fixed effects regressions for both Tobin's Q and ROA. *Corporate Women Ratio* is positive and significant in all specifications while *Support Women Ratio* is insignificant in 3 out of the 4 models. Hence, consistent with our hypothesis,

[6] Information to create these variables is obtained from *IRRC*.

the presence of outside women directors with senior corporate or board level experience appear to be more valuable than the presence of outside women directors with lower level corporate or non-corporate experience. We also examine how these relationships are impacted by firm opacity by including the interactions of *Corporate Women Ratio* and *Support Women Ratio* with *Opacity*. As reported in Table 7, *Corporate Women Ratio*Opacity* is insignificant using Tobin's Q but negative and significant using ROA. We find that at the mean level of *Corporate Women Ratio* (5.6%), taking into account the total effect of *Corporate Women Ratio* (that is considering the coefficients of both *Corporate Women Ratio* and *Corporate Women Ratio*Opacity*), women directors with senior corporate experience do not appear to be associated with a negative performance impact even in more opaque firms. This result holds using OLS estimates for both Tobin's Q and ROA. *Support Women Ratio*Opacity* is negative and significant in 3 out of 4 models. Overall, our results indicate that the background experience of women directors appears to impact the relationship between the presence of women directors and firm performance.

5. Determinants of women directors

The results presented so far indicate that the performance impact of the presence of women directors is influenced by the information environment of firms. Duchin et al. (2010) find that outside directors are more effective when the cost of acquiring information is low. They also find that firms take this into account while deciding on the proportion of outside directors. This raises a natural question in our context: Do firms consider their information environment when making a decision about selecting women directors and specifically outside women directors?

We examine this issue using OLS and LOGIT regressions and the results are presented in Table 8. The first column of Table 8 presents results from an OLS regression using women ratio as dependent variable. Controlling for other firm and board characteristics, the coefficient on the

Opacity variable is negative and significant at the 5% level, consistent with the idea that firms consider their information environment while selecting women directors. We obtain similar results using an indicator variable, *Dwomen,* as dependent variable, which takes a value of 1 when there is at least one woman director, 0 otherwise. As reported in the second column of Table 8, using a logit regression, the coefficient on *Opacity* is again negative and significant at the 1% level. These results indicate that the likelihood of women directors decreases with firm opacity. We obtain similar results after re-defining the dependent variables using outside women directors in place of women directors, as reported in columns 3 and 4. Overall, our results suggest that firms take into account their information environment while appointing women directors, which tends to reflect their valuation consequences.

6. Robustness tests

6.1. Outside Women Directors, Opacity and Firm Performance: Alternative Opacity Measures

Our results on the impact of firms' information environment use an information opacity index as described earlier. To check the robustness of our findings, we use three additional measures of corporate opacity: firm age, ratio of intangible assets and return volatility. These measures are used frequently in the literature to measure cost of obtaining information (e.g., Duchin et al., 2010). Older firms tend to be more transparent as they have been around for a long period and investors have more information about them. Firms with a greater amount of intangible assets are more likely to be opaque since the valuation of such assets by external investors is more difficult. Similarly, firms with greater stock return volatility are fundamentally more uncertain and the cost of acquiring information about such firms is potentially greater for external investors. We use OLS and firm fixed effects models to estimate these regressions using both Tobin's Q and ROA.

The results in Table 9 are consistent with our earlier finding that outside women directors are less (more) valuable in more (less) opaque firms. The interaction term *Outside Women Ratio*Firm Age* is positive and significant across all the estimations. Since older firms are more transparent, a positive coefficient on this interaction term indicates that the presence of outside women directors is more beneficial in older and more mature firms. The coefficient on the interaction term *Outside Women Ratio*Intangibles* is negative and significant in 3 out of 4 estimations. Since firms with a greater proportion of intangible assets are more opaque, a negative coefficient on this interaction term indicates that the presence of women directors is less beneficial in more opaque firms. The interaction term *Outside Women Ratio*Volatility* is negative and significant in 2 out of 4 estimations. Overall, the results from these robustness analyses are generally consistent with our earlier finding that the presence of outside women directors is less (more) beneficial in more (less) opaque firms.

6.2. Outside Women Directors and Board Independence: Incremental performance effect

Our last robustness test is to distinguish our findings from Duchin et al.'s. Recall that Duchin et al. (2010) find that independent directors are less effective when the cost of acquiring information by outsiders is high (more opaque firms). Since women ratio and board independence is positively correlated as reported in Table 2 Panel A, we attempt to verify whether our documented outside women director effect is incremental to Duchin et al.'s outside director effect. For this purpose, we include two interaction terms *Outside Women Ratio*Opacity* and *Board Independence*Opacity* in the specification. We report results in Table 10 using OLS and firm fixed effects estimations for both Tobin's Q and ROA. Consistent with Duchin et al.'s findings, the coefficient of *Board Independence*Opacity* is negative and significant in all specifications. However, the coefficient of *Outside Women Ratio*Opacity* is also negative and significant in all the specifications, indicating that

our outside women director effect is incremental to Duchin et al.'s outside director effect.[7] We also test the difference in coefficients of the interaction terms and find that *Outside Women Ratio*Opacity* has a significantly larger negative coefficient than *Board Independence*Opacity*.

7. Conclusion

In this paper, we provide a detailed analysis of the relationship between board gender diversity and firm performance taking into account the information environment of firms and the prior experience of women directors. For a sample of S&P 1500 firms from 1996 to 2005, using OLS, median, firm fixed effects and 2SLS regressions, and controlling for various firm characteristics, we find that the presence of women directors is associated with significantly higher firm performance for firms with low opacity. However, the performance impact of the presence of women directors becomes less favorable as firm's information opacity increases. These results tend to hold using both Tobin's Q and ROA as performance measures and using different measures of firm opacity. We also find that these results are driven by outside women directors, consistent with cost of information acquisition/intense monitoring based explanations.

We also find that outside women directors with senior corporate experience appear more valuable compared to outside women directors with non-corporate or junior corporate backgrounds. This is consistent with outside women directors with senior corporate experience having greater monitoring and advising capability given their background and business connections. This may also indicate that women directors with senior corporate experience are able to elicit value adding incremental monitoring efforts from other board members.

Further, we find evidence that indicates that firms take into account their information environment while appointing (outside) women directors, which tends to reflect their valuation

[7] *Outside Women Ratio*Opacity* is also negative and significant when we use *Outside Male Ratio* in place of *Board Independence*.

consequences. Specifically, we find that, after controlling for board independence, board size and firm size, more opaque firms are less likely to appoint (outside) women directors.

Overall, this paper provides additional insight on the performance impact of gender diversity, complementing the findings of Adams and Ferreira (2009), Ahern and Dittmar (2011), and Matsa and Miller (2011). Our finding that the association of women directors and firm performance depends on women directors' prior experience and the information environment of firms, supports a growing body of literature indicating that optimal board composition depends on firm and director characteristics (e.g., Balsam, Puthenpurackal and Upadhyay, 2012; Duchin et al., 2010; Coles et al., 2008; Boone et al., 2007; Linck et al., 2008; Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008).

Reference:

Adams, R.B. and D. Ferreira, 2009, "Women in boardroom and their impact on governance and firm performance", *Journal of Financial Economics*, 94(2) 291–309.

Adams, R.B. and D. Ferreira, 2007, "A Theory of Friendly Boards", *Journal of Finance*, 62 (1): 217–250.

Ahern, K., A. Dittmar. 2011. "The changing of the boards: The impact on firm valuation of mandated female board representation". *Quarterly Journal of Economics*, Forthcoming.

Almazan, A., J. Suarez, 2003. "Entrenchment and severance pay in optimal governance structures". *Journal of Finance* 58, 519–547.

Anderson, R.C., D.M. Reeb, A. Upadhyay and W. Zhao, 2011. "The economics of director heterogeneity", *Financial Management* 40, 5-38.

Balsam, S., J. Puthenpurackal, and A. Upadhyay, 2012, The Determinants and Performance Impact of Outside Board Leadership. *Working Paper* (2012).

Boone, A., L. Field, J. Karpoff, and C. Raheja, 2007, "The determinants of corporate board size and composition: An empirical analysis", *Journal of Financial Economics*, 85: 66-101.

Carter, D. A., B. J. Simkins and W. G. Simpson, 2003, "Corporate Governance, Board Diversity, and Firm Value," *Financial Review*, 38, 33-53.

Coles, J. L., N. D. Daniel, and L. Naveen, 2008. "Does one size fit all?", *Journal of Financial Economics*, 51:371-406.

Duchin, R., J.G. Matsusaka, and O. Ozbas. 2010. "When are outside directors effective?" *Journal of Financial Economics* 96, 195-214.

Faleye, O., R. Hoitash and U. Hoitash, 2011. "The Costs of Intense Board Monitoring." *Journal of Financial Economics*; 101(1): 160-181.

Farrell, K. A. and P. L. Hersch, 2005. "Additions to corporate boards: the effect of gender," *Journal of Corporate Finance* ,11, 85-106

Glaeser, E. L. and J. A. Scheinkman, 2002. Non-Market Interactions. *Working paper*, Harvard University.

Harris, M., and A. Raviv, 2008. "A Theory of Board Control and Size," *Review of Financial Studies,* 21, 1797-1832

Hermalin, B. E., and M. S. Weisbach, 1998. Endogenously chosen boards of directors and their monitoring of the CEO, *American Economic Review* 88, 96-118.

Hermalin, B.E., M.S. Weisbach, 2003. Board of directors as an endogenously determined institution. *Economic Policy Review*; 9: 1-20.

John, K. and D. Kadyrzhanova, 2010. "Spillover effects in the market for corporate control." *Working paper,* University of Maryland.

Linck J, Netter J, Yang T. 2008. "The determinants of board structure." *Journal of Financial Economics* 87: 308-328.

Matsa, D. A., A. R. Miller. 2011. "A female style in corporate leadership? Evidence from quotas". Working paper, Northwestern University, Evanston, IL.

Raheja, C.R., 2005. "Determinants of board size and composition: A theory of corporate boards". *Journal of Finance and Quantitative Analysis*; 40(2): 283-306.

Table 1
Descriptive Statistics

Firm size is the natural log of total sales. R&D intensity is the ratio of R&D investments to total assets. ROA is net income scaled by book value of total assets. Leverage is the ratio of book value long term and short-term debts to book value of total assets. Diversification is the number of business segments. Volatility is the standard deviation of monthly stock returns of prior five years. Firm age is the natural log of number of years that a firm has been reported in CRSP database. Intangible Assets is the ratio of intangible assets to book value of assets. Tobin's Q is the ratio of market value of equity and book value of debt to the book value of assets. Forecast error is the absolute value of the difference between median analyst's quarterly forecast and actual quarterly earnings scaled by the firm's EPS. Forecast dispersion is the standard deviation of earnings forecasts, normalized by the EPS. Analysts Following is the number of analysts following a firm. Opacity is sum of the decile rankings of a firm's forecast error, forecast dispersion and the inverse of residuals of analysts following obtained from regressing the number of analysts on firm size, scaled by thirty. Insider ownership is the ratio of outstanding stocks held by the directors and officers of the firm. Board size is the number of directors on board. Board independence is the percentage of unrelated outsider directors to the board size. Women ratio is the ratio of number of women directors and board size. Outside (Inside) Women Ratio is the ratio of outside (inside) women directors to board size. Corporate Women Ratio is the ratio of number of outside women directors with senior level corporate experience of either VP level or higher or have served as a director, to board size. Support Women Ratio is the ratio of number of outside women directors with low level managerial experience or with a non-corporate background such as academic, non-profit, charity etc., to board size. County Firms with a woman director is the ratio of firms with a woman director to all the firms in that county in a given year.

	Mean	Median	Maximum	Minimum	Std. Dev.	No. of Obs.
Firm size [Ln(Firm sales)]	7.341	7.186	12.323	4.465	1.464	8533
R&D intensity	0.034	0.000	0.244	0.000	0.064	8533
ROA	0.043	0.043	0.182	-0.191	0.071	8533
Leverage	0.228	0.223	0.842	0.000	0.175	8438
Diversification	2.486	2.000	16.000	1.000	1.822	8541
Volatility	0.397	0.449	1.044	0.148	0.197	8533
Firm Age	2.860	2.944	4.382	0.000	0.898	8428
Intangible Assets	0.677	0.735	0.997	0.114	0.226	8533
Tobin's Q	1.962	1.483	8.296	0.811	1.324	8533
Forecast Error	0.002	0.000	0.021	-0.012	0.005	7622
Forecast Dispersion	0.064	0.022	1.738	-1.452	0.283	7410
Analysts Following	10.316	8.000	54.000	0.000	7.964	7823
Opacity	0.558	0.567	1.000	0.100	0.179	7267
Insider Ownership	9.382	4.000	88.000	0.000	13.978	8533
Board size	9.514	9.000	32.000	3.000	2.822	8533
Board independence	0.665	0.667	1.000	0.000	0.169	8533
Women ratio	0.097	0.100	0.667	0.000	0.087	8533
Outside Women Ratio	0.081	0.100	0.667	0.000	0.086	8533
Inside Women Ratio	0.016	0.000	0.286	0.000	0.025	8533
Corporate Women Ratio	0.056	0.000	0.444	0.000	0.069	7852
Support Women Ratio	0.025	0.000	0.250	0.000	0.054	7852
County Firms with a Woman Director	0.257	0.178	0.909	0.000	0.283	8533

Table 2

Panel A: Correlation Matrix

This table provides the correlation matrix of important firm characteristics and director diversity. All the variables are defined in Table 1.

	Women Ratio	Board size	Board Ind.	Opacity	Dispersion	Error	Analyst	Tobin's Q	Firm Age	Volatility	Intangibles	Firm Size	ROA	R&D
Women Ratio	1.000													
Board size	0.234	1.000												
Board independence	0.236	0.116	1.000											
Opacity	-0.103	-0.108	-0.003	1.000										
Forecast Error	-0.021	-0.087	-0.007	0.379	1.000									
Forecast Dispersion	-0.002	0.004	-0.002	0.462	0.140	1.000								
Analysts	0.062	0.135	0.041	-0.422	-0.007	0.019	1.000							
Tobin's Q	0.006	-0.126	-0.041	0.004	-0.054	-0.053	-0.239	1.000						
Firm Age	0.181	0.384	0.206	-0.105	0.008	-0.022	0.136	-0.155	1.000					
Volatility	-0.140	-0.431	-0.062	0.176	-0.025	0.011	-0.145	0.066	-0.441	1.000				
Intangibles	-0.012	-0.206	-0.042	0.034	0.011	0.029	-0.023	0.235	-0.165	0.336	1.000			
Firm Size	0.320	0.530	0.168	-0.111	0.016	-0.129	0.034	-0.053	0.370	-0.393	-0.119	1.000		
ROA	0.013	0.056	-0.015	0.114	0.074	0.141	-0.034	0.372	0.028	-0.365	-0.087	0.149	1.000	
R&D Intensity	-0.115	-0.250	0.041	0.013	-0.034	-0.049	-0.149	0.347	-0.165	0.392	0.344	-0.289	-0.200	1.000

Table 2
Panel B: Univariate Results: Difference-in-Mean Test for firms with at least one female director and firms without a female director
All the variables are defined in Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

Variable	Firms with a Woman Director	Firms without a Woman Director	Difference-of-mean values	t-Statistic
Opacity	0.555	0.597	-0.042***	8.778
No. of Analysts	10.773	9.409	1.364***	6.580
Forecast Error	0.247	0.326	-0.079***	2.608
Forecast Dispersion	0.065	0.063	-0.002	0.247
Firm size [Ln(Firm sales)]	7.976	6.576	1.400***	37.116
Volatility	-1.013	-0.721	-0.292***	23.404
Firm Age	3.087	2.574	0.513***	22.670
Intangibles	0.676	0.728	-0.052***	8.584
Ln(Tobin's Q)	0.581	0.638	-0.057***	4.265
ROA	0.094	0.072	0.022***	7.995
Leverage	0.248	0.193	0.055***	12.156
R&D Intensity	0.023	0.043	-0.020***	15.510
Inside Ownership	7.389	11.703	-4.314***	12.357
Ln(Board Size)	2.279	2.006	0.273***	44.081
Board Independence	0.698	0.624	0.074***	18.161

Table 2
Panel C: Difference-in-Mean Test for Different Director Characteristics
* significant at 10%; ** significant at 5%; *** significant at 1%.

Characteristics	Women Directors	Male Directors	Diff.	t-stats
Age	54.84	59.404	-4.564***	38.268
Tenure	7.478	10.12	-2.642***	28.549
External Board Seats	1.043	0.87	0.173***	7.312
% Ownership	0.448	1.197	-0.749***	10.828
Corporate (% of all Women/Male Directors)	66.023	78.132	-12.109***	16.34

Table 3: Women Directors, Opacity and Firm Performance: Tobin's Q

This table reports results of women directors, opacity and firm value. All other variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators in OLS specification. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable				
	Ln(Tobin's Q)	Ln(Tobin's Q)	Ln(Tobin's Q)	Women Ratio	Ln(Tobin's Q)
	OLS	Median	Firm fixed effects	2SLS: 1st Stage	2nd Stage
County Ratio of Firms with Women Directors				0.157***	
				(8.121)	
Women/Predicted Women Ratio	0.503**	0.733***	0.176		0.270
	(2.046)	(4.116)	(1.087)		(1.016)
Women Ratio *Opacity	-0.715*	-1.116***	-0.501**		-0.823*
	(-1.801)	(-3.706)	(-2.014)		(-1.934)
Opacity	-0.020	0.056	-0.193***		-0.002
	(-0.379)	(1.470)	(-5.812)		(-0.027)
Ln(Board Size)	-0.104***	-0.038*	-0.118***	0.003	-0.107***
	(-2.659)	(-1.766)	(-4.054)	(0.424)	(-4.189)
Board Independence	-0.068	-0.092***	0.000	0.053***	-0.040
	(-1.345)	(-3.036)	(0.008)	(5.080)	(-1.118)
Insider Ownership	0.002***	0.002***	0.001	-0.000	0.002***
	(2.863)	(4.494)	(1.532)	(-1.283)	(4.808)
Firm Size	0.011	-0.001	-0.016	0.010***	0.013**
	(1.273)	(-0.120)	(-1.150)	(5.941)	(2.230)
ROA_{t-1}	2.288***	2.832***	0.624***	0.023*	2.278***
	(15.379)	(39.162)	(8.958)	(1.709)	(21.276)
Leverage	-0.408***	-0.534***	-0.630***	0.019*	-0.409***
	(-5.130)	(-17.467)	(-13.786)	(1.742)	(-8.441)
Diversification	-0.028***	-0.022***	-0.004	0.001	-0.027***
	(-6.147)	(-7.885)	(-1.071)	(1.051)	(-9.403)
Volatility	0.012	0.018	0.002	-0.014***	0.002
	(0.510)	(1.139)	(0.123)	(-2.728)	(0.096)
R&D Intensity	3.059***	3.763***	0.602**	0.080**	3.110***
	(10.985)	(35.739)	(2.545)	(2.342)	(17.328)
Intercept and Year Dummies	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Firm	Industry	Industry
NOBS	6584	6584	6584	6584	6584
Adj. R-Sqd.	0.4732	0.2679	0.2779	0.4530	0.4760

Table 4: Women Directors, Opacity and Firm Performance: ROA

This table reports results from OLS, median, firm fixed effects and 2SLS regressions. All the variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators in OLS specification. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: ROA			
	OLS	Median	FE	2-SLS (2nd Stage)
Women Ratio	0.030	0.023	-0.007	0.033
	(1.411)	(0.262)	(-0.287)	(1.030)
Women Ratio*Opacity	-0.073*	-0.042*	-0.087**	-0.104*
	(-1.680)	(-1.674)	(-2.361)	(-1.756)
Opacity	-0.035***	-0.027***	0.033***	-0.030***
	(-6.247)	(-7.797)	(6.644)	(-3.841)
Ln(Board Size)	-0.015***	-0.006***	-0.012**	-0.016***
	(-4.873)	(-2.999)	(-1.998)	(-4.779)
Board Independence	-0.002	-0.002	-0.017**	0.001
	(-0.456)	(-0.715)	(-2.119)	(0.169)
Insider Ownership	0.000**	0.000	-0.000	0.000**
	(2.232)	(1.194)	(-0.300)	(2.444)
Firm Size	0.002***	0.003***	0.031***	0.002***
	(3.089)	(7.123)	(10.470)	(2.994)
ROA_{t-1}	0.437***	0.656***	0.117***	0.439***
	(28.146)	(101.806)	(13.165)	(27.313)
Leverage	-0.094***	-0.067***	-0.167***	-0.091***
	(-17.181)	(-24.323)	(-17.487)	(-16.244)
Diversification	-0.002***	-0.001***	-0.002**	-0.002***
	(-5.940)	(-5.573)	(-2.004)	(-5.399)
Volatility	-0.031***	-0.008***	-0.016***	-0.032***
	(-11.203)	(-5.726)	(-4.472)	(-10.907)
R&D Intensity	-0.196***	-0.052***	-0.735***	-0.197***
	(-7.694)	(-5.453)	(-14.881)	(-7.453)
Intercept and Year Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Firm	Industry
NOBS	6584	6584	6584	6584
Adj. R-Sqd.	0.5125	0.3289	0.2092	0.5129

Table 5: Inside and Outside Women Directors, Opacity and Firm Performance
This table presents results from 2SLS (IV) and firm fixed effects estimations. All other variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: Ln(Tobin's Q)		
	OLS	FE	2nd Stage of 2SLS
Inside Women Ratio	0.350	0.657	-0.230
	(0.396)	(1.119)	(-0.949)
Inside Women Ratio *Opacity	-0.939	-1.202	0.259
	(-0.654)	(-1.289)	(0.395)
Outside Women Ratio	0.604**	0.201	0.774**
	(2.038)	(1.140)	(2.263)
Outside Women Ratio* Opacity	-0.900*	-0.864*	-0.983**
	(-1.856)	(-1.811)	(-1.975)
Opacity	-0.006	-0.030	-0.028
	(-0.108)	(-0.878)	(-0.453)
Ln(Board Size)	-0.168***	-0.157***	-0.165***
	(-3.710)	(-5.021)	(-3.318)
Board Independence	-0.047	0.011	-0.064
	(-0.802)	(0.263)	(-1.051)
Insider Ownership	0.002**	0.001**	0.003***
	(2.382)	(2.211)	(3.287)
Firm Size	0.036***	-0.013	0.029***
	(3.755)	(-0.854)	(2.935)
ROA_{t-1}	0.641***	0.168***	0.734***
	(2.995)	(5.353)	(3.086)
Leverage	-0.683***	-0.596***	-0.808***
	(-6.991)	(-11.864)	(-8.016)
Diversification	-0.034***	-0.007*	-0.039***
	(-6.561)	(-1.725)	(-7.351)
Volatility	-0.157***	-0.252***	-0.126***
	(-4.346)	(-8.698)	(-3.673)
R&D Intensity	3.129***	1.225**	3.623***
	(9.305)	(2.057)	(11.461)
Intercept	Yes	Yes	Yes
Fixed Effects	Industry	Firm	Firm
NOBS	6584	6584	6584
Adj. R-Sqd.	0.3730	0.1396	0.4141

Table 6: Outside Women Directors, Opacity and Firm Performance

This table presents results from OLS and firm fixed effects estimations. All other variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: Ln(Tobin's Q)		Dependent Variable: ROA	
	OLS	FE	OLS	FE
Outside Women Ratio	0.434**	0.179	0.145***	0.083**
	(2.098)	(1.109)	(3.779)	(2.222)
Outside Women Ratio* Opacity	-0.697**	-0.442*	-0.235***	-0.153***
	(-2.423)	(-1.832)	(-3.603)	(-2.613)
Opacity	-0.104**	-0.057*	-0.054***	-0.037***
	(-2.252)	(-1.829)	(-6.203)	(-5.138)
Ln(Board Size)	-0.103***	-0.086***	-0.002	0.002
	(-3.776)	(-2.881)	(-0.526)	(0.268)
Board Independence	-0.128**	-0.059	-0.014	0.000
	(-2.211)	(-0.971)	(-1.528)	(0.031)
Insider Ownership	0.002***	0.001	-0.000	-0.000
	(3.698)	(1.536)	(-1.172)	(-1.160)
Firm Size	0.026***	-0.246***	-0.000	-0.002
	(4.996)	(-15.974)	(-0.193)	(-0.620)
ROA_{t-1}	2.204***	0.660***	0.557***	0.186***
	(21.605)	(11.129)	(30.301)	(13.592)
Leverage	-0.543***	-0.413***	-0.061***	-0.107***
	(-10.437)	(-8.523)	(-8.166)	(-9.574)
Diversification	-0.026***	-0.000	-0.002***	-0.001
	(-9.097)	(-0.081)	(-4.824)	(-1.123)
Volatility	-0.096**	-0.820***	-0.080***	-0.084***
	(-2.152)	(-13.902)	(-9.833)	(-6.149)
R&D Intensity	2.125***	-2.105***	-0.163***	-0.952***
	(15.138)	(-9.353)	(-6.775)	(-18.307)
Intercept	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Firm	Industry	Firm
NOBS	6584	6584	6584	6584
Adj. R-Sqd.	0.4343	0.1628	0.6603	0.4254

Table 7: Effect of Outside Women Director Experience and Opacity

This table reports results from OLS and firm fixed effects estimations. All the variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators in OLS specification. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: Ln(Tobin's Q)		Dependent Variable: ROA	
	OLS	FE	OLS	FE
Corporate Women Ratio	0.592*	0.486**	0.179***	0.090**
	(1.773)	(2.245)	(3.733)	(2.359)
Corporate Women Ratio *Opacity	-0.520	-0.393	-0.190**	-0.111**
	(-1.292)	(-1.247)	(-2.165)	(-2.357)
Support Women Ratio	0.065	0.561**	0.085	0.025
	(0.168)	(1.977)	(1.418)	(0.513)
Support Women Ratio*Opacity	-0.103	-0.903**	-0.138*	-0.146*
	(-0.156)	(-1.968)	(-1.661)	(-1.742)
Opacity	-0.112**	-0.001**	-0.053***	-0.037***
	(-2.007)	(-2.007)	(-5.926)	(-6.051)
Ln(Board Size)	-0.104**	-0.068**	-0.002	-0.006
	(-2.476)	(-2.081)	(-0.530)	(-1.035)
Board Independence	-0.130	0.012	0.014	-0.022*
	(-1.563)	(0.184)	(1.547)	(-1.867)
Insider Ownership	0.002**	0.001*	-0.000	-0.000
	(2.407)	(1.794)	(-1.136)	(-0.925)
Firm Size	0.026***	-0.243***	-0.001	0.005
	(3.072)	(-13.737)	(-0.144)	(1.580)
ROA_{t-1}	2.206***	1.214***	0.557***	0.096***
	(15.165)	(15.446)	(27.617)	(8.463)
Leverage	-0.544***	-0.382***	-0.061***	-0.129***
	(-6.078)	(-7.028)	(-7.261)	(-13.859)
Diversification	-0.026***	-0.000	-0.002***	-0.002**
	(-5.572)	(-0.094)	(-4.420)	(-2.366)
Volatility	-0.095	-1.245***	-0.080***	-0.018***
	(-1.495)	(-17.800)	(-9.363)	(-3.295)
R&D Intensity	2.122***	-2.172***	-0.163***	-0.984***
	(9.199)	(-8.509)	(-6.474)	(-22.787)
Intercept and Year Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Firm	Industry	Firm
NOBS	6584	6584	6584	6584
Adj. R-Sqd.	0.4203	0.1106	0.6611	0.1833

Table 8: Opacity and Women Directors,

This table reports results from OLS and Logit regressions. Women Director Dummy takes a value of one if there is at least one woman director on the board, zero otherwise. Outside Women Director Dummy takes a value of one if there is at least one outside woman director on the board, zero otherwise. All other variables are defined in Table 1.

The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators. 2-tail t-statistic in parenthesis in column 1 and z-statistic in column 2. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable			
	Women Ratio	Women Director Dummy	Outside Women Ratio	Outside Women Director Dummy
Opacity	-0.014**	-0.352***	-0.013*	-0.456***
	(-1.984)	(-2.696)	(-1.851)	(-4.136)
Ln(Board Size)	0.030***	3.895***	0.026***	1.884***
	(3.014)	(13.028)	(3.174)	(18.973)
Board Independence	0.090***	2.720***	-0.108***	-1.714***
	(7.153)	(6.538)	(-6.290)	(-8.507)
Insider Ownership	-0.000	-0.001	-0.000***	-0.008***
	(-0.788)	(-0.154)	(-3.602)	(-5.208)
Firm Size	0.013***	0.478***	0.012***	0.204***
	(7.406)	(7.914)	(7.575)	(10.898)
ROA_{t-1}	0.008	0.700	0.039*	1.237***
	(0.425)	(1.003)	(1.933)	(4.875)
Leverage	0.017	-0.308	0.007	-0.506***
	(1.375)	(-0.721)	(0.516)	(-3.675)
Diversification	0.001	0.011	0.002*	0.023*
	(1.061)	(0.296)	(1.764)	(1.905)
Volatility	-0.025***	-0.970***	-0.052***	-0.919***
	(-3.041)	(-4.262)	(-3.938)	(-6.747)
R&D Intensity	0.108*	3.152**	0.012	-0.433
	(1.906)	(1.992)	(0.304)	(-1.283)
Intercept and Year Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry
NOBS	6584	6584	6584	6584
Adj. R-Sqd.	0.2985	0.3526	0.2786	0.3206

Table 9: Outside Women Directors, Opacity and Firm Performance: Other Opacity Measures
This table reports results from OLS and firm fixed effects estimations. All the variables are defined in Table 1. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: Ln(Tobin's Q)		Dependent Variable: ROA	
	OLS	FE	OLS	FE
Outside Women Ratio	0.221	0.319	-0.073	-0.153
	(0.650)	(1.374)	(-1.185)	(-1.450)
Outside Women Ratio* Firm Age	0.129*	0.214**	0.036***	0.059***
	(1.742)	(2.061)	(2.755)	(2.846)
Outside Women Ratio*Intangibles	-0.570*	-0.526*	-0.038	-0.200**
	(-1.772)	(-1.832)	(-0.742)	(-2.381)
Outside Women Ratio*Volatility	-0.786**	-0.790**	0.016	-0.139
	(-2.084)	(-1.971)	(1.032)	(1.607)
Firm Age	-0.046***	-0.070***	-0.006***	-0.009*
	(-4.613)	(-4.340)	(-3.207)	(-1.715)
Intangibles	0.268***	0.182***	0.004	0.045**
	(6.266)	(2.746)	(0.568)	(2.148)
Ln(Board Size)	-0.083***	-0.020	-0.014***	-0.005
	(-3.482)	(-0.818)	(-2.922)	(-0.691)
Board Independence	-0.097*	-0.090*	-0.005	-0.001
	(-1.720)	(-1.865)	(-0.537)	(-0.086)
Insider Ownership	0.002***	0.001**	-0.000	-0.000
	(4.688)	(2.124)	(-0.420)	(-0.431)
Firm Size	0.039***	-0.217***	0.002**	0.044***
	(8.866)	(-19.842)	(2.343)	(11.968)
ROA_{t-1}	2.188***	1.820***	0.477***	0.166***
	(25.092)	(29.135)	(22.843)	(11.925)
Leverage	-0.504***	-0.185***	-0.098***	-0.110***
	(-11.001)	(-4.782)	(-11.032)	(-9.907)
Diversification	-0.025***	0.001	-0.002***	-0.002**
	(-10.041)	(0.325)	(-3.564)	(-2.576)
Volatility	-0.044	-0.603***	-0.045***	-0.065***
	(-0.889)	(-11.564)	(-9.272)	(-4.387)
R&D Intensity	3.062***	-0.123	-0.200***	-0.873***
	(17.626)	(-0.628)	(-5.601)	(-16.619)
Intercept	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Firm	Industry	Industry
NOBS	7148	7148	7148	7148
Adj. R-Sqd.	0.4921	0.1333	0.4959	0.2981

Table 10: Opacity and Firm Performance: Incremental Effect of Outside Women Directors over Board Independence

This table reports results using OLS and firm fixed effects regressions. All the variables are defined in Table 1. The standard errors are corrected for serial correlation and heteroskedasticity using Huber-White-sandwich estimator of variance by clustering on firm-level indicators in OLS specification. 2-tail t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable: Ln(Tobin's Q)		Dependent Variable: ROA	
	OLS	FE	OLS	FE
Outside Women Ratio	0.707**	0.396**	0.130***	0.090**
	(2.471)	(2.062)	(3.244)	(2.313)
Outside Women Ratio*Opacity	-1.089***	-0.782***	-0.225***	-0.169***
	(-2.263)	(-2.603)	(-3.322)	(-2.726)
Board Independence	0.144	0.148	-0.031*	-0.046
	(0.662)	(1.154)	(-1.673)	(-1.423)
Board Independence *Opacity	-0.515*	-0.309*	-0.082**	-0.079**
	(-1.678)	(-1.737)	(-2.077)	(2.541)
Opacity	-0.191	-0.203*	-0.072*	-0.029
	(-1.404)	(-1.816)	(-1.851)	(-0.827)
Ln(Board Size)	-0.158***	-0.096***	-0.009*	-0.009
	(-5.460)	(-3.519)	(-1.913)	(-1.347)
Insider Ownership	0.002***	0.002***	-0.000	-0.000
	(4.082)	(3.928)	(-0.259)	(-0.382)
Firm Size	0.048***	0.026***	-0.000	-0.003
	(8.154)	(5.031)	(-0.522)	(-0.722)
ROA_{t-1}	0.635***	1.970***	0.567***	0.157***
	(14.356)	(18.455)	(30.202)	(15.740)
Leverage	-0.646***	-0.719***	-0.059***	-0.150***
	(-15.445)	(-19.667)	(-8.161)	(-13.687)
Diversification	-0.036***	-0.027***	-0.002***	-0.001
	(-10.175)	(-8.468)	(-4.017)	(-1.151)
Volatility	-0.161***	-1.049***	-0.096***	-0.129***
	(-7.728)	(-12.714)	(-12.848)	(-9.181)
R&D Intensity	3.333***	0.037	-0.157***	-0.601***
	(9.824)	(0.492)	(-4.266)	(-10.115)
Intercept and Year Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Firm	Industry	Firm
NOBS	6584	6584	6584	6584
Adj. R-Sqd.	0.3668	0.2326	0.6568	0.3312
F-Test ($\beta 1-\beta 2$)	-0.382**	-0.386**	-0.095**	-0.079*
$p>(\beta 1-\beta 2)$	0.046	0.043	(0.019)	(0.061)