7-6-2016

Essays on the Effect of Board Gender Diversity on Firm Risk, Performance, and Institutions' Ownership Preferences

Jodonnis Rodriguez
jrodr105@fiu.edu

DOI: 10.25148/etd.FIDC000737

FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

ESSAYS ON THE EFFECT OF BOARD GENDER DIVERSITY ON FIRM RISK, PERFORMANCE, AND INSTITUTIONS' OWNERSHIP PREFERENCES

A dissertation submitted in partial fulfillment of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

BUSINESS ADMINISTRATION

by

Jodonnis Rodriguez

2016

To: Acting Dean Jose M. Aldrich
College of Business

This dissertation, written by Jodonnis Rodriguez, and entitled Essays on the Effect of Board Gender Diversity on Firm Risk, Performance, and Institutions' Ownership Preferences, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

_____
Chun-Hao Chang

_____
Min Chen

_____
Arun J. Prakash

_____
Edward R. Lawrence, Major Professor

Date of Defense: July 6, 2016

The dissertation of Jodonnis Rodriguez is approved.

_____
Acting Dean Jose M. Aldrich
College of Business

_____
Andrés G. Gil
Vice President for Research and Economic Development
and Dean of the University Graduate School

Florida International University, 2016

DEDICATION

I dedicate this dissertation to my mother and wife. Without their unwavering support and unconditional love, the completion of this work would not have been possible.

ACKNOWLEDGMENTS

I wish to express my deepest gratitude to my dissertation chair, Dr. Edward R. Lawrence. His support, valuable feedback, and advice has been invaluable. Without his dedication to my success, this work would not have been possible. I am thankful to my committee members, Dr. Chun-Hao Chang, Dr. Min Chen, and Dr. Arun J. Prakash for their expert guidance and support. I am also thankful to the faculty and staff of the Department of Finance for their encouragement throughout my Ph.D. studies. Lastly, I am thankful to the Florida Education Fund and the University Graduate School for providing me the financial support necessary to complete my studies.

I wish to thank my wife, Indira Moreno, for her love and comfort throughout my studies. Without her, this work would not have been possible. I will forever be grateful to my mother, Lourdes Rodriguez, for always consoling me when life became difficult and for always encouraging me to never stop until I achieve everything I set my mind to.

ABSTRACT OF THE DISSERTATION

ESSAYS ON THE EFFECT OF BOARD GENDER DIVERSITY ON FIRM RISK, PERFORMANCE, AND INSTITUTIONS' OWNERSHIP PREFERENCES

by

Jodonnis Rodriguez

Florida International University, 2016

Miami, Florida

Professor Edward R. Lawrence, Major Professor

This dissertation examines the effect of gender diversity on firm risk and financial performance, and on the stock ownership preferences of institutional investors. For the firm risk and financial performance analysis, we use U.S. firms listed on the S&P 500 and NSE-listed Indian companies. The two samples provide our study with the ability to study gender diversity in a developed and emerging market with distinct economic frameworks, cultural traditions, and legal environments.

Our empirical tests show that firms with more gender diversity are less risky and have higher financial performance than firms with less gender influence. These results are consistent with the notion that the addition of female directors increases the collective intelligence of the board and, thus, leads to higher quality deliberations and decision-making. The results are robust to propensity score matching which help control for endogeneity. Additionally, the results are robust to various measures of firm risk, financial performance, legal environments, industry and time fixed effects, and clustered standard errors.

Furthermore, this dissertation examines the ownership preferences of institutional investors, a group of investors known for their ability to acquire private information and analyze publicly-disclosed information quickly. Researchers find that firms with female directors tend to disclose more firm-specific information and tend to serve on monitoring-related committees. As higher disclosure and more monitoring decreases institutional investors' incentive to collect and profit from private information, we hypothesize that they will invest less in gender diverse firms. For our empirical tests we use the data on US firms. We find that institutional investors tend to hold less shares in firms with more gender diversity. These results are robust to industry and time fixed effects, heteroscedasticity, and serial correlation.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

CHAPTER 1: THE IMPACT OF BOARD GENDER DIVERSITY ON FIRMS' RISK AND FINANCIAL PERFORMANCE

1.1. Introduction

The recent financial crisis of 2007-2008 has raised concerns about firm risk. In this essay, we investigate if firms with gender diverse boards are better shielded from risk and downturns. The extant literature shows that females are less overconfident and more risk averse than males. In addition, female directors are tougher monitors, more likely to serve on audit-related committees, and have a positive impact on financial performance in firms with weak governance. Furthermore, studies show that the collective intelligence of an all-male group increases with the addition of females (Woolley, Chabris, Pentland, Hashmi, and Malone, 2010). We explore the following three research questions: Does gender diversity affect firm risk? If so, how does diversity affect risk? Is the change in firm risk at the expense of financial performance?

In this essay, we investigate the differences in risk and financial performance between gender diverse firms and non-diverse firms.[1] Much of the literature has focused on the stock market reaction around the announcement of the addition of female directors to boards (Adams, Gray, and Nowland, 2011) and the effect of diversity on financial performance (Carter, Simkins, and Simpson, 2003; Liu, Wei, and Xie, 2014). We study how the addition of female directors to the board affect the firm's risk. We use the firms' cash holdings and option implied volatility as proxies for the firm's risk. Cash holdings as a measure of risk is based on the work of Han and Qui (2007) and Bates, Kahle, and Stulz (2009), who provide theoretical and empirical support to the notion that firms with higher

[1] From this point on, when we mention diversity we specifically refer to gender diversity.

cash holdings have higher cash flow volatility and income uncertainty. A firm's option implied volatility is a forward-looking measure of risk that estimates the expected stock return volatility over the term of the option and is a more efficient predictor of future realized volatility than historical volatility.[2] Next, we examine if changes in firm risk contribute to changes in firms' financial performance. We analyze firms' return on equity (ROE) over time to study the effect of board gender diversity on the long-term financial performance of the firm. Overall, our results suggest that firms with more gender diversity tend to be less risky and outperform firms with less diversity.

We use two measures of gender diversity: the percentage of female directors on the board and the Blau diversity index, which measures the diversity of an environment using the proportion of groups in that environment. We find that firms with more diversity have significantly lower levels of risk than firms with less diversity. More specifically, our univariate analysis indicates a 26.90% lower cash-to-assets ratio and a 15.28% lower expected volatility in gender diverse firms when compared to firms without board gender diversity. In our multivariate analysis, we compare firms with 20% female representation to firms with no diversity using the sample means of the independent variables in the estimated regression equation and compute the percentage difference in the estimates of cash holdings and expected volatility. We find that firms with 20% female representation on the board have a 19.01% lower cash-to-asset ratio and 9.35% less expected volatility than firms with no diversity. Similarly, our results indicate that firms with an equivalent

[2] For an extensive review, see Poon and Granger (2003).

Blau index rating have a 19.12% lower cash-to-asset ratio and 10.65% less expected volatility than firms with no diversity.[3]

Next, we examine whether the significant decrease in firms' risk is at the expense of their financial performance. We find that firms with more diversity have significantly higher ROE than firms with less diverse boards. In a univariate setting, we find that the ROE in gender diverse firms is 12.72% higher than the return on equity for non-diverse firms. We find a larger increase in ROE in our multivariate specification, in which we estimate that boards with 20% female representation outperform firms with no diversity by 22.11%. Similarly, firms with an equivalent Blau rating have a 28.30% higher ROE than firms with no board gender diversity. Our results for the firms' risk and financial performance remains significant after controlling for industry and time fixed effects.

An important concern for our study is the issue of endogeneity. Reasonably, it may be that firms with more gender diversity are less risky and better performers to begin with or that female directors are more likely to work for less risky companies. To address endogeneity concerns we implement propensity score matching of gender diverse firms and non-diverse firms. Our robustness tests confirm that firms with more diversity are less risky and outperform less diverse firms. We then implement a difference-in-differences (DID) approach to measure the change in firm risk and financial performance between firms that add a female director (treatment group) and firms that do not add any female directors to their board (control group). We find a significant decrease in the expected

[3] We use 20% female representation as it is a stated goal for 501(c)(3) organizations such as 2020 Women on Boards and is a close approximation to the average proportion of female directors in our sample. By equivalent Blau rating, we mean the Blau rating that corresponds to 20% female representation; $Blau = 1 - [0.20^2 + 0.80^2] = 0.32$.

volatility for firms after the addition of the first and second female director to the board when compared to boards that did not add women to the board. Although our DID coefficient is not statistically significant for cash holdings and ROE, the direction of the results indicate that the addition of a second female director is beneficial for firms. Our DID tests provide preliminary evidence of critical mass theory which suggests that the addition of a second female director has a stronger effect on firm risk and financial performance as compared to the addition of the first female director.

Overall, our empirical results provide support to the idea that gender diversity is negatively related to firm risk and positively related to a firm's financial performance. The changes in firms' risk and performance may be driven by different underlying mechanisms. First, literature on gender differences in risk preferences suggests that women are more risk averse than men. Thus, the addition of female directors may increase the risk aversion of the board and result in less risk-taking by the firm.[4] Second, the addition of female directors may improve the dynamics of the board and increase the collective intelligence, i.e. synergies, information sharing, and expertise of the group. An improvement in group dynamics may lead to longer and higher quality deliberations on a firm's optimal strategies. As a result, firms may choose optimal projects that decrease firm risk and increase financial performance. Although gender differences in risk preferences or an improvement in group dynamics can lead to risk reduction, their effects on financial performance are not the same. Per the risk-return trade-off, risk averse investors should expect lower returns relative to investors who take more risk. On the other hand, an improvement in group dynamics can

[4] However, there is evidence that women in finance behave differently from women in the general population and may be less risk averse than men. Since we examine non-financial firms, our results may be driven by gender differences in risk preferences.

lead to better informed decisions and deliberations, which may result in stronger financial performance. We find that the decrease in risk is not at the expense of financial performance, indicating board gender diversity may contribute to the improvements in the group dynamics of the board.

The implications of our study reveal the importance of gender diversity in the corporate leadership of firms. Our finding that gender diverse firms choose superior projects in the form of lower risk and better financial performance suggests that the addition of women to the board is beneficial for firms. Additionally, our paper suggests that the contributing cause of firms' changes in risk and financial performance may be driven by an improvement in the group dynamics of the board rather than gender differences in risk preferences.

The rest of the paper proceeds as follows. Section 1.2 reviews the literature, and Section 1.3 presents our hypotheses. Section 1.4 describes the data. Section 1.5 reviews the methodologies employed in the paper. Section 1.6 presents the results of our analyses. Section 1.7 concludes.

1.2. Prior Literature

In this section, we review the extant literature that is most relevant to our research goals. In particular, we focus on studies that investigate the effect of diversity on firms' financial performance. Next, we discuss empirical studies that have emphasized the relationship between diversity and firm risk. Lastly, we examine the existing literature on gender differences in risk preferences and group dynamics, which allows us to develop our research questions and emphasize our contributions to the literature.

The evidence from the effect of gender diversity on firm value and performance is inconclusive with some researchers finding an increase in firm value and performance upon addition of female directors to the firm's board whereas other researchers arrive at the opposite conclusion.

Liu, Wei, and Xie (2014) examine the effect of board diversity on performance in Chinese firms. They find that diversity has a positive impact on return on sales and return on assets, and the impact is stronger with firms that have three or more women on the board. The authors provide evidence of critical mass theory in which the effect of marginalization may be reduced or eliminated by adding more than one female to the board. Other studies have shown a positive relationship between board diversity and return on assets as well as a positive relation with Tobin's Q (Carter, Simkins, and Simpson, 2003; Erhardt, Werbel, and Shrader, 2003). Carter et al. (2003) argue that diversity, both gender and ethnic diversity, leads to greater board independence, which allows for a heterogeneous mix of ideas and creativity.

However, there is also evidence that gender diversity may not be beneficial to the financial performance of the firm. There is the possibility that the addition of one female to an all-male board may not have the desired effect on financial performance due to the fact that the female director may be marginalized if she expresses a different point of view. Some studies show that more diversity does not improve a firm's financial performance after controlling for reverse causality (Adams and Ferreira, 2009; Carter et al., 2010). Adams and Ferreira (2009) suggest that mandating board gender diversity may reduce firm value for well-governed firms. Ahern and Dittmar (2012) study the impact of Norway's mandated board gender diversity on firm value. The authors conclude that the mandate led

to a significant drop in Tobin's Q in the few years following the announcement of the law. Similarly, Matsa and Miller (2013) show that Norwegian firms affected by the mandate experienced fewer reductions in the workforce and increasing labor costs that eventually led to a reduction in profits.

The extant literature on diversity and firm risk is sparse. Adams and Ferreira (2004) and Hillman, Shropshire, and Cannella (2007) find that firms with higher stock return variability have a lower probability of female presence on the board. Adams and Ferreira (2004) use the standard deviation of monthly stock returns for the five years prior to the observation, whereas Hillman, Shropshire, and Cannella (2007) use the firm's standard deviation of daily stock returns for the fiscal year. However, in these studies risk is a proxy for the complexity of the firm. Their results suggest that firms are less likely to have female directors if the firm is too complex, especially in compensation structure.

Adams and Ragunathan (2015) study gender diverse banks around the financial crisis of 2007-2009. The authors use weekly stock return volatility, idiosyncratic risk, tail risk, and Z-score as their main measures of risk. The authors report that banks with female directors did not take less risk during the crisis and performed better relative to non-diverse banks. Berger, Kick, and Schaek (2014) examine the effect of age, gender, and education of executive directors on bank risk-taking. The authors conclude that younger executive teams and a higher proportion of female executives increase bank risk while an increase in executives with Ph.D. degrees decreases risk.

The impact of gender diversity on firms may be related to gender differences in risk preferences. There is extensive research in finance that shows significant behavioral disparity between men and women. Prior literature has shown that women tend to be more

risk averse than men (Jianakopolos and Bernasek, 1998; Sunden and Surette, 1998; Agnew, Balduzzi, and Sunden, 2003; Watson and McNaughton, 2007; Croson and Gneezy, 2009; Charness and Gneezy, 2012). In addition, research has shown that women tend to be less overconfident and more conservative than men (Lundeberg, Fox, and Puncochar, 1994; Beyer and Bowden, 1997; Barber and Odean, 2000). Huang and Kisgen (2014) investigate whether firms with female CEOs and CFOs make different financing or acquisition decisions compared to firms with male executives. The authors find that firms with female executives grow more slowly and are less likely to make acquisitions. In addition, acquisitions made by female executives have higher announcement returns than acquisitions made by male executives. The authors suggest their results are due to relative overconfidence by men in corporate decision-making. Similarly, Levi, Li, and Zhang (2014) examine the influence of director gender in a mergers and acquisitions setting. The authors conclude that less overconfident female directors are less likely to overestimate the gains from a merger or acquisition than their male counterparts. Firms with more female directors are less likely to initiate a merger or acquisition because they may value the target firm less, due to estimating lower values of future cash flows or discounting the future cash flows at a higher discount rate, than their male counterparts as a result of less overconfidence.

However, there is some evidence that gender differences in risk aversion are mitigated when controlling for education levels and/or financial expertise (Hibbert, Lawrence, and Prakash, 2013). Similarly, Hardies, Breesch, and Branson (2013) report that self-selection and socialization can eliminate the gender difference in overconfidence. Adams and Funk (2012) use a survey of directors and provide evidence that male and

female directors differ in their risk attitudes but in ways that vary from gender differences in the general population. The authors conclude that female directors are more risk-loving than male directors, and thus, board gender diversity may not lead to more risk averse decision making. Additionally, Adams and Ragunathan (2015) examine financial firms and find that banks with female directors did not take less risks around the 2007-2009 financial crisis and had better performances (as measured by Tobin's Q, ROA, and the fraction on non-performing loans) than other banks. The authors attribute their results to self-selection. They report that women who choose to have careers in finance tend to be less risk averse than women in the general population and gender differences in risk aversion "almost disappear for men and women in finance."

Gender diversity may affect firms through a different mechanism. A diverse board may help to introduce new ideas and perspectives that a non-diverse board may lack. Diversity of perspective can have a positive effect on a homogenous group. Prior literature indicates that diverse groups take longer to reach decisions, have higher quality deliberations, and have more effective communication than groups lacking diversity (Stephenson, 2004; Huse and Solberg, 2006). Furthermore, Woolley, Chabris, Pentland, Hashmi, and Malone (2010) provide evidence of a group intelligence factor. The authors report that the addition of females to a group increases the collective intelligence of the group along with the social sensitivity of individual members and the variance of the number of speaking turns. Given that boards with gender diversity make higher quality decisions and communicate more effectively, improvements in the dynamics of the group may have positive effects on firm risk and financial performance.

1.3. Hypothesis Development

The addition of female directors to the board may alter the collective risk aversion of the group due to gender differences in risk preferences. The decision-making process of a board may be sensitive to the changes in risk preferences after the addition of female board members and, thus, may alter the decisions of the firm. For example, a board with female directors may have a lower acceptance rate of risky projects than boards without female directors. If women are more risk averse and less overconfident than men, then they may evaluate risky projects using higher discount rates or with lower expected future cash flows. In addition, women may perceive the risky projects to have a lower probability of success than men.

Increasing diversity may lead to an improvement in the dynamics of the board and helps to introduce new ideas and perspectives that a non-diverse board lacks. Given that boards with diversity make higher quality decisions and communicate more effectively, improvements in the dynamics of the group may alter the risk profile of firms with more gender diversity. Furthermore, if market participants are aware of the gender differences in risk preferences or are aware of improving dynamics in the corporate leadership, then perhaps they may perceive firms with more diversity to be less risky. For example, market participants may acknowledge that firms with higher quality boards are more likely to reject risky projects that could be detrimental to firm value. As a result, if a firm is less likely to accept risky projects that could decrease firm value, then their risk is more likely to decrease. Thus, we expect lower risk for gender diverse firms as compared to firms without female directors.

We formally state our first hypothesis as:

First Hypothesis: A firm's risk will be lower for firms with board gender diversity.

$$H_o: Risk_i^1 - Risk_i^0 \geq 0$$

$$H_{A:} Risk_i^1 - Risk_i^0 < 0$$

where the superscript of 1 denotes firms with female directors and 0 denotes firms without female directors.

Per the risk-return trade-off theory, firms that take lower risks should expect lower returns. Thus, if gender differences in risk preferences are the cause of changes in firm risk, then the addition of female directors will also cause a decrease in financial performance. For instance, imagine a firm that takes on no risky projects and invests all of its free cash flow in assets earning the risk-free rate. Such a firm has eliminated its risk at the expense of the possibility of earning a higher rate of return on its free cash flow.

On the other hand, per the literature on group dynamics, the addition of female directors leads to increases in collective intelligence, the quality of deliberations, and the amount of time dedicated to developing optimal strategies. As a result, project selection in gender diverse firms may be superior relative to non-diverse firms with respect to firm risk and financial performance. If improving group dynamics is the cause of a decrease in firm risk, then we posit that such firms will also have higher rates of return. In this case, firms take on a more optimal and acceptable level of risk, which will lead to higher rates of return. Thus, the higher acceptance rate of optimal projects will contribute to better financial performance.

We formally state our second hypothesis as:

Second Hypothesis: Financial performance will be higher for firms with board gender diversity.

$$H_o: Performance_i^1 - Performance_i^0 \leq 0$$

$$H_{A:} Performance_i^1 - Performance_i^0 > 0$$

1.4. Data and Sample Overview

We use annual data on S&P 500 companies to examine our hypotheses. We collect available data on the composition of firms' board of directors from the GMI Ratings library in Wharton Research Data Services (WRDS). More specifically, GMI Ratings provides corporate governance data, including the number of women serving on the board of directors, the total number of directors, and the number of independent directors for S&P 500 companies. The GMI Ratings data is increasingly available from 2001-2013 for many S&P 500 companies. In addition, we collect our firm-level control variables from the Compustat annual file and stock return data from CRSP. The intersection of data from Compustat, CRSP, and GMI ratings gives us an unbalanced panel of 419 firms and 3,617 firm-year observations. The exclusion of finance/insurance companies (NAICS 52), utility companies (NAICS 22) and missing data further reduce our available sample size in each of the analyses. Similar to Bates et al. (2009), we winsorize the explanatory variables for large outliers. Research and development expenses (R&D) and capital expenditures (Capex) are winsorized at the 1% level on both tails. In addition, free cash flow (CashFlow) is winsorized at the bottom 1% tail while market-to-book (MB) is winsorized at the top 1% tail. Finally, leverage (Lev) is restricted to be between 0 and 1. Appendix A contains a more detailed description of the variables in our study.

1.5. Methodology

We employ two measures of diversity for our model specifications. First, we use the fraction of female directors on the board, which is computed as the number of female directors divided by the total number of directors. This linear measure of diversity fails to parsimoniously capture the effect of diversity as the proportion of female directors on the board increases.[5] Hence, to capture diversity, we construct the Blau (1977) diversity index for each firm in each year.

$$Blau = 1 - \sum_{i=1}^{n} P_i^2$$

The Blau diversity index measures the diversity of a system using the proportion, P_i, of groups in a given system. For example, in a system with two groups (n=2; male and female), a perfectly diverse board (50%-50% composition) would have a maximum Blau index rating of 0.50, and a board with no diversity would have a minimum Blau rating of 0. In addition, a board with 30% females has the same Blau rating as a board with 30% males.

One approach to measure a firm's forward looking risk is by examining the extent of their cash holdings as a proxy of cash flow volatility. Opler, Pinkowitz, Stulz, and Williamson (1999) show that firms with higher industry cash flow volatility hold more in liquid assets. Han and Qui (2007) and Riddick and Whited (2009) provide further support to the notion that more income uncertainty and higher income variability lead firms to hold

[5] *Perfem*, which represents the percent of female directors on a firm's board, incorrectly interprets an all-female board as perfectly diverse, which is not the case because an all-female board is the other extreme example of a homogenous board. See Appendix B for more information on the analytical and graphical analysis of the two diversity measures.

more cash. Bates et al. (2009) find that cash levels, on average, have more than doubled from 1980 to 2006 and point out that firms have sufficient cash to retire all of their debt. The authors conclude that the cash increase is related to a precautionary demand for cash, is not driven by agency conflicts, and is a result of a firm's cash flow becoming riskier. In this setting, we interpret cash holdings as a measure of risk because it is dependent on management's outlook of the firm. For example, we posit that if management expects volatile future earnings, then it will decide to keep more cash on hand to smooth out earnings volatility. If the addition of women to the board results in the reduction of the firm's risk, then we should observe lower cash holdings for gender diverse firms as compared to firms without female directors.

Option implied volatility is another forward-looking risk measure of firm risk that market participants believe will be over the term of the option.[6] A firm's expected volatility, when measured as implied volatility, indicates market participants' beliefs about future risk. Implied volatility is the firm's risk that parties involved believe will be determined by changes in the firm's option prices.

Several studies have shown that implied volatility is a good and more efficient predictor of future realized volatility as compared to historical volatility (Fleming, Ostdiek, and Whaley, 1995; Fleming, 1998; Christensen and Prabhala, 1998; Blair, Poon, and

[6] Compustat provides a measure of implied volatility computed from stock options granted to directors and executives during the firm's fiscal year. Implied volatility is computed using the market price of the traded options on the day it is granted to the directors and executives using either a lattice model or the Black-Scholes closed-form model. The term of the option is at least as large as the vesting period of the stock options. This is different from Execucomp's measure of expected volatility, which uses the standard deviation of monthly returns from the previous five years.

Taylor, 2001; Ederington and Guan, 2002; Szakmary, Ors, Kim, and Davidson III, 2003). For an extensive review on the subject, see Poon and Granger (2003).

For additional robustness, we compare several measures for firm risk for gender diverse and non-diverse firms. These measures include beta, total risk, idiosyncratic volatility, downside risk, and future risk. Wang (2012) provides two measures of future risk by computing the standard deviation of monthly returns over the next 12 months (SD12) and the standard deviation of monthly returns over the next 24 months (SD24). For example, for fiscal year 2001, we compute SD12 as the standard deviation of monthly returns in 2002 for each firm. Similarly, we compute SD24 as the standard deviation of monthly returns in 2002 and 2003 for each firm. We compute this for each fiscal year in the sample.[7]

The total risk of a stock's return consists of systematic risk and idiosyncratic volatility. To compute these measures of risk, we implement yearly rolling regressions of firms' excess stock returns on the excess return on the market over the previous five years as shown below:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t} \quad (1)$$

where $r_{i,t}$ is the monthly excess stock return for firm i at time t and $r_{m,t}$ is the monthly excess return of the market portfolio.[8] We estimate Equation (1) using ordinary least squares (OLS) to estimate each firm's beta and the variance of the residuals. We denote

[7] We cannot compute SD24 for fiscal year 2013 (as of December 2015) because monthly returns for fiscal year 2015 are not yet available on CRSP.

[8] We also have computed the same regression model using excess daily returns. The results are similar and available upon request.

the variance of the residuals as $\sigma_{\varepsilon,t}^2$, the variance of the excess market return as $\sigma_{m,t}^2$ and the total risk of the firm $\sigma_{i,t}^2$ is the sum of the two former variances:

$$\sigma_{i,t}^2 = \beta_i^2 \sigma_{m,t}^2 + \sigma_{e,t}^2 \quad (2)$$

We compute this historical measure risk for the two groups of firms, those that have at least one female director and others with no female directors. We use data from the past 60 months to compute the measures of risk; for example, for fiscal year 2006, we regress monthly excess stock returns on monthly excess market returns for each firm using returns from 2001 through 2005. The risk measures are computed for firms that had at least one female director on the board from 2001 through 2005 and for firms that had no female directors throughout the same period. We repeat this procedure for each year in the sample. Since the board composition data begins in 2001, we cannot compute the historical measures of risk because we are unable to determine board gender representation prior to 2001 and, thus, unable to satisfy our requirement. As a result, the historical risk measures are calculated from 2006 through 2013.

Downside risk measures firms' risk of negative returns. We compute firms' downside risk using the semi-standard deviation of monthly stock returns over the previous five years. We assign a return of zero as the target rate. Thus, downside risk is measuring the standard deviation of negative monthly returns over the previous five years.

$$Down\ Risk = \left[\mathrm{E}[(X_i)]^2 \mathrm{I}_{\{X_i<0\}}\right]^{\frac{1}{2}}$$

where $\mathrm{I}_{\{X_i<0\}}$ is an indicator variable equal to 1 if the return for firm *i* is negative and 0 otherwise.

We perform a univariate analysis for the risk and return measures for the two groups: firms with and firms without female directors. We compare the difference in the mean cash holdings and expected volatility between both groups. Then, we perform regression analysis in which we include a measure of board diversity while controlling for the factors that may explain cash holdings and expected volatility. We run the following regression using our measures of firm risk, cash to total assets (LIQ) and option implied volatility (OptVol).

$$Risk_{i,t} = \beta_1 Diversity_{i,t} + \beta_{2-10} Controls_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t} \qquad (3)$$

The variable of interest, Diversity, is one of the measures of board gender diversity: the proportion of female directors on the board or the Blau diversity index. We run the regression in equation 3 for both measures of diversity. Using Bates at al. (2009), we control for *MB*, firm size (Size), *CashFlow*, *Capex*, *Lev*, and *R&D*. In addition, we include two governance controls that are related to firm risk: the size of the board of directors (BoardSize) and the proportion of outside directors (OutDirectors). *MB* is a proxy for investment opportunities. If a firm has a high *MB* ratio, then it typically has a strong investment opportunity set. Firms with higher *MB* values tend to have higher return prospects in the future. Thus, we expect firms with higher market-to-book values to be less risky. *Size* is the logarithm of the book value of total assets. Larger firms tend to be less risky. Firms with higher levels of *CashFlow* can generate revenue faster and, hence, are less risky.

Capex is used to purchase productive assets that can be used as collateral or lead to increases in productivity. As such, the latter could increase a firm's ability to borrow debt and, thus, reduce its demand for cash. A firm with weak growth prospects will invest less

in capital expenditures. Thus, we expect firms that invest more in capital expenditures are less risky. *Lev* is total debt to total assets. If the firm has a high level of debt, then we expected the firm to use its cash to retire some of its debt obligations, which leads to a negative relationship between *LIQ* and *Lev*. On the other hand, less risky firms have the ability to shift their capital structure towards debt. Thus, we have no ex-ante expectations for the relationship between risk and leverage. Similar to *MB, R&D* can serve as a proxy for future investment opportunities, and, hence we expect firms that invest more in research and development to be less risky. We control for industry fixed effects, γ_i, and time fixed effects, λ_t, to control for differences in unobservable variables across industries and time.

Similar to our analyses for firm risk, we perform a univariate analysis comparing the mean difference in financial performance between diverse and non-diverse firms. Next, we study the relationship between return on equity and diversity with the following regression specification.

$$ROE_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-7} * Controls_{i,t} + \gamma_i + \lambda_t + \varepsilon_i \qquad (4)$$

The control variables are accounting ratios that help explain return on equity. Boyd, Boland, Dhuyvetter, and Barton (2007) study the determinants of ROE and find that liquidity, leverage, profitability, and efficiency variables help explain ROE. A high current ratio, a measure of a firm's investment in short-term assets, indicates a firm has sufficient liquidity. However, overinvestment in short-term assets may harm financial performance. Hence, we have no ex-ante expectations between current ratio and financial performance. Moreover, higher levels of debt may hinder financial performance if too much revenue is used to service the firm's debt. However, if a firm uses to debt to finance its productive assets, then increased debt may benefit the firm.

As a result, we have no ex-ante expectations on the relationship between leverage and financial performance. Furthermore, a higher net profit margin is positively related to higher net income, so we expect a positive relationship between net profit margin and financial performance. A higher asset turnover indicates a firm is producing more revenue from each dollar of sales that it generates. Thus, we expect more efficient firms to have higher financial performance. We also control for economies of scale by using the firm size and expect larger firms to have stronger financial performance.

To help address selection bias and endogeneity, we employ a propensity-score matched sample framework. Similar to Levi et al. (2014), we generate our probability scores through a yearly logit regression. Our dependent variable is a binary variable indicating the presence of female directors on the board, and the explanatory variables are firm size, return on assets, and leverage. We match the firms with female directors to firms without female directors based on the smallest difference in propensity scores.

Lastly, we employ a difference-in-differences (DID) regression approach in two different scenarios. In one analysis, the treatment group consists of sample firms that added their first female director, and the control group consists of firms that did not add any female directors. In the second analysis, the treatment group consists of sample firms that added a second woman to the board[9], and the control group consists of firms that did not add any female directors during the sample period. We compute the difference between firms' cash holdings, expected volatility, and ROE at time T-1 and T+1, where T is the year in which the second female director was added to the board. We run a balanced

[9] We require the treatment group to have one female director at time *T-1*, add a second female director at time *T*, and remain with two female directors at time *T+1*. We require the control group to remain without female directors from time *T-1* to *T+1*. Appendix B highlights the DID regression model.

regression by matching on sector and on the minimum difference in firm size as measured by total assets. We examine the incremental effect of adding a first and second woman for the following reasons. First, prior evidence suggests that adding a single female may not have much of an effect due to potential marginalization. Second, most of the firms in our sample have at least one woman on the board, and we improve the statistical power of our analysis by studying this larger sample of additions.

1.6. Empirical Results

We report summary statistics in Tables 1.1 and 1.2. Table 1.1 indicates that gender diversity on the boards of U.S. firms has been steadily increasing since 2001. The average percent of female directors on a board has risen from 11.63% in 2001 to 17.54% in 2013. Given that board gender diversity is not mandated in the United States, the numbers indicate that firms may have been seeking to improve the functionality of boards. This may be a result of stronger demand for improved corporate governance after several major accounting scandals or due to diversity interest groups pushing firms to add more women to their boards. In Table 1.2, we provide another perspective on the increasing diversity trends in our sample. The proportion of sample firms with no diversity has decreased from a high of 18.57% in 2002 to a low of 7.62% in 2013. Additionally, the proportion of firms with more than one female director has increased from a low of 31.65% in 2001 to a high of 62.58% in 2013. In Table 1.3, we provide summary statistics for all of the variables in our study. The cash to total assets ratio, *LIQ*, and option volatility are higher for firms without women on the board. Additionally, we notice that gender diverse firms and non-diverse firms are similar in size, *Lev*, *CashFlow*, *Capex*, *R&D* expenses, and profitability. In Table 1.4 we provide the univariate statistics of firms conditional on the presence of

female directors. Our univariate analysis indicates a significant difference in risk and financial performance between firms with and without female directors. Firms with gender diverse boards have 26.90% less cash holdings, 15.28% lower expected volatility, and 11.29% higher ROE.

In Table 1.5 we report the regression results for equation (1). We use GMM to estimate Newey-West test-statistics to control for possible heteroskedasticity and serial correlation in the model. We find the coefficient on *Perfem* to be negative and statistically significant at less than 1% level with a p-value of 0.0001. The results are robust to our second measure of diversity, the Blau diversity index, with a p-value of 0.0155. Additionally, our results remain significant when we control for industry and time fixed effects. Our results show that boards with more gender diversity hold significantly less cash after controlling for factors that may influence cash holdings. Furthermore, to the extent that firms with higher cash holdings are more risky, we conclude that firms with more diversity are less risky than firms with less diversity. These results are consistent with our first hypothesis. In a multivariate setting, on average, a firm with a 20% female representation on the board results in a 19.01% to 19.12% decrease in cash holdings compared to non-diverse firms, depending on the measure of diversity.[10] Given that gender quotas are high in some parts of the world, the potential for an improvement in the risk profile of a given firm may be higher to the extent that mandated quotas do not confound the risk reduction potential.

[10] A 20% to 80% female-to-male board composition results in a Blau index rating of 0.32. The decrease in cash holdings was computed using the estimated coefficients from Table 3 and inputting the average sample values of each of the independent variables into the estimated regression model. We use 20% female representation because this is a

In addition, firms with more diversity may keep lower levels of cash because of a higher rate of rejection of risky projects. If less risky projects are accepted (either due to gender differences in risk preferences or improvements in group dynamics), then the need to keep cash on hand to fund future investment opportunities may be less important for firms with diversity. Furthermore, firms with more diversity may spend more on programs that do not explicitly add value to the firm. Instead, firms with more gender diversity may add implicit value by creating and investing in programs that improve employee productivity and morale. Matsa and Miller (2013) show that Norwegian firms affected by the board gender quota have higher labor costs and lower workforce reductions. Thus, it may be that firms with more gender diversity choose to spend more of their cash holdings on workforce stability and morale-boosting programs.

In Table 1.6 we report the expected volatility regression results robust to heteroskedasticity and serial correlation. Our results indicate a negative and significant relationship between gender diversity and a firm's expected volatility. We obtain similar results with the Blau index as a diversity measure. The regression results indicate that a firm with 20% female representation, on average, has 9.35% to 10.65% less expected volatility than a firm with no female directors.[11] Table 1.6 also shows a consistent negative relationship between expected volatility and market-to-book, firm size, board size, and the proportion of independent directors. The p-values for these four control variables are significant at the 1% level (p-value < 0.0001). Firms with better investment possibilities and larger firms tend to be associated with lower levels of risk. Furthermore, the model

[11] A few interest groups, such as 2020 Women on Boards, has a stated goal of 20% female directors by 2020 (www.2020wob.com).

indicates a negative and significant relationship between a firm's financial performance and expected volatility. These results are consistent with prior arguments that firms with stronger earnings performance are more stable and perceived as less risky. Interestingly, the relationship between financial leverage and expected volatility is not significant. This may be a result of confounding factors. That is to say, firms with higher leverage may have a higher probability of default; however, firms with higher leverage also may have more financial stability, which can explain why they have access to more debt.

These results provide a different perspective on gender diversity and a firm's risk characteristics. The expected volatility levels in firms are related to the market participants' perceptions of a firm's risk. Thus, our results provide evidence that perhaps market participants acknowledge some improvement in the risk profile of the firm with increasing diversity. In addition, perhaps there exists a perception of improved corporate governance with increasing diversity. Firms with better governance may be perceived as less risky than firms with poor governance policies and infrastructure. More importantly, the results are also economically significant because they indicate that more gender diversity has a large, downward effect on firm risk.

In Table 1.7, we report the results of the relationship between diversity and firm financial performance, controlling for liquidity, profitability, leverage, and efficiency. We report that firms with more diversity tend to outperform firms with less diversity. The results are robust to both diversity measures with p-values less than 0.0001. Additionally, we find that firms with more money tied in short-term assets underperformed. This is consistent with the notion that long-term assets are the productive assets used to generate cash flows streams and that short-term assets do not generate large enough returns to justify

large holdings in such assets. We also show that financial performance is positively related to leverage, profitability, and efficiency. Our regression model estimates that boards with 20% female representation outperform firms with no diversity by approximately 22.11% to 28.30%.

To address potential selection bias and endogeneity concerns, we use a propensity score matched sample controlling for firm size, ROA, leverage, and cash holdings. The results in Table 1.8 indicate that firms with more diversity have significantly less cash holdings and lower expected volatility. Furthermore, the coefficients on gender diversity are negative and statistically significant at the 1% level. The results indicate that more gender diversity results in lower levels of firm risk after controlling for key firm characteristics. In Table 1.9, we report our propensity score matched sample estimates for financial performance. Our results report a consistently positive and significant relationship between the proportion of female directors and ROE.

In Table 1.10, we report the results from our DID analysis. We provide support that the addition of female directors to the board leads to a decrease in cash holdings of 1.31%. The change in cash holdings for the treatment group is -0.33%, and the change in cash holdings for the control group is 0.99%. Similarly, the expected volatility of firms that added a second woman to the board increased by 16.03% less than firms that did not add women to the board. This result is significant at the 1% level ($p = 0.0034$). More specifically, the expected volatility of firms that added a second female director increased by 5.05% while it increased by 21.07% for firms that did not add any women to the board. Lastly, our results indicate that firms that added a second woman to the board outperformed firms that did not add women to the board by 1.65%. Although the significance of our DID

coefficient is not statistically significant in the case of cash holdings and ROE, we believe the direction of the results indicate that the addition of females to the board is beneficial for firms. In Table 1.11, we report the changes in firm risk and financial performance after the addition of the first woman to the board. We find that cash holdings for firms with their first female addition increased 1.08 percentage points higher relative to non-diverse firms. *OptVol* was 17.42% lower for firms that added their first female director. In addition, ROE is about 0.41% higher for gender diverse firms as compared to non-diverse firms. The addition of a second female director appears to have a stronger effect on firm risk and financial performance than the addition of the first female director.

Moreover, in Table 1.12 we report the correlation between our measures of risk. Consistent with prior theoretical and empirical studies, we find cash holdings as a percentage of total assets to be positively correlated with *OptVol* and various measures of equity risk. The results indicate that cash holdings have a correlation of less than 0.30 while *OptVol* has at least a correlation of 0.56 with the other measures of risk in the study. Given its relatively low correlation, cash holdings as a measure of risk provides a different perspective on firm risk. For further robustness, we use traditional measures of equity risk as alternatives to cash holdings and option implied volatility. In Table 1.13 we report the findings for beta, idiosyncratic volatility, downside risk, future 1-year stock return volatility, and future 2-year stock return volatility. Our findings using these alternative measures of risk are consistent with our findings using cash holdings and *OptVol*. The coefficient on our diversity measure is negative and significant at the 1% level for the historical measures of equity risk and negative and significant at the 5% level for forward-looking measures of equity risk.

1.7. Conclusion

In this essay, we use directorship data on nonfinancial S&P 500 firms to study the effect of gender diversity on firms' risk and financial performance. We report that board gender diversity is associated with less firm risk. Additionally, our results suggest that the decrease in firm risk is not at the expense of financial performance. We use firms' cash holdings and option implied volatility as measures of risk and ROE as a measure of firm performance. Specifically, we find that firms with gender diverse boards have roughly 19% less risk and at least 22% higher ROE than non-diverse firms. Our results are robust to several endogeneity tests and various measures of risk. Our DID tests indicate that the addition of a female director leads to a statistically and economically significant decrease in a firm's option volatility. The results may be driven by the impact of the addition of female directors due to either gender differences in risk preferences or an improvement in the collective intelligence of the board. Both theories would lead to a decrease in firm risk; however, their impact on financial performance would differ from one another. We attribute our results to an improvement in the group dynamics of the board rather than gender differences in risk preferences.

Table 1.1. Board Gender Diversity of S&P 500 Firms

This table reports the measures of board gender diversity over time. *Perfem* is the average percent of female directors on the board of S&P 500 companies. *Blau* reports the average Blau index rating of S&P 500 firms for each year in the sample. The Blau rating ranges from 0 (no diversity) to 0.50 (maximum diversity).

YEAR	Perfem	Blau
2001	11.63%	0.1922
2002	11.81%	0.1933
2003	12.81%	0.2067
2004	13.54%	0.2189
2005	13.71%	0.2224
2006	14.46%	0.2325
2007	14.46%	0.2323
2008	14.77%	0.2363
2009	14.79%	0.2360
2010	15.59%	0.2469
2011	15.69%	0.2482
2012	16.42%	0.2569
2013	17.54%	0.2720

Table 1.2. Proportion of S&P 500 Firms Grouped By Number of Female Directors

This table reports proportion of sample firms with 0, 1, and more than 1 female director on the board for each year in the sample. The columns *0,1,* and *>1* report the proportion of S&P 500 firms with 0, 1, and more than 1 female director on the board. *Total* is the sum of the row total.

	# Female Directors			
YEAR	0	1	>1	Total
2001	16.51%	51.83%	31.65%	100.00%
2002	18.57%	47.26%	34.18%	100.00%
2003	18.52%	41.98%	39.51%	100.00%
2004	14.12%	43.53%	42.35%	100.00%
2005	13.31%	42.34%	44.35%	100.00%
2006	10.45%	42.91%	46.64%	100.00%
2007	11.69%	39.11%	49.19%	100.00%
2008	11.96%	35.51%	52.54%	100.00%
2009	13.13%	35.94%	50.94%	100.00%
2010	18.27%	30.65%	51.08%	100.00%
2011	11.25%	33.43%	55.32%	100.00%
2012	10.90%	28.97%	60.12%	100.00%
2013	7.62%	29.80%	62.58%	100.00%

Table 1.3. Summary Statistics, 2001-2013

The descriptive statistics of the sample are presented in two groups: firms with no gender diversity (Female = 0) and firms with gender diversity (Female = 1). *N* is the number of firm-year observations. *Mean* is the average for the firm-year observations. *Std Dev* is the standard deviation of the variable. *Min* and *Max* report the minimum and maximum values, respectively of the variable. Variable definitions are provided in Appendix A

	Female = 0					Female =1				
	N	Mean	St Dev	Min	Max	N	Mean	St Dev	Min	Max
Dependent Variables										
LIQ	394	0.18	0.18	0	0.86	2,619	0.13	0.14	0	0.80
OptVol	266	0.39	0.11	0.18	0.96	1,857	0.33	0.11	0.11	0.97
ROE	405	0.08	0.06	-0.04	0.21	2,647	0.09	0.062	-0.04	0.21
Independent Variables										
MB	405	1.93	1.32	0.30	7.50	2,675	1.76	1.25	0.28	13.05
Size	480	8.70	0.92	6.23	11.06	3,135	9.30	1.18	6.23	13.59
CASHFLOW	393	0.10	0.07	-0.29	0.30	2,751	0.10	0.06	-0.34	0.45
Lev	471	0.20	0.16	0	0.99	3,109	0.22	0.15	0	1
R&D	287	0.06	0.06	0	0.33	2,267	0.04	0.05	0	0.68
Capex	480	0.06	0.07	0	0.46	3,098	0.05	0.04	0	0.35

Table 1.3 (continued).

	Female = 0					Female =1				
	N	Mean	St Dev	Min	Max	N	Mean	St Dev	Min	Max
ROA	480	0.05	0.11	-1.01	0.37	3,113	0.07	0.08	-0.66	0.50
CurrentRatio	310	349.52	647.68	2.28	1894.36	2,514	165.05	422.61	2.28	1894.36
EqMulti	405	1.18	0.23	0.98	1.83	2,664	1.25	0.23	0.98	1.83
NetProfit	316	0.15	0.12	-0.04	0.37	2,237	0.13	0.10	-0.04	0.37
AssetTO	349	0.72	0.44	0.29	2.45	2,377	0.97	0.58	0.29	2.45
TIE	417	14.49	21.86	-1.20	76.07	2,874	13.11	18.20	-1.20	76.07

Table 1.4. Univariate Analysis of Risk and Performance Measures

The univariate statistics of the sample are presented in two groups: firms with no gender diversity (Female = 0) and firms with gender diversity (Female = 1). *N* is the number of firm-year observations. *Mean* is the average of the variables. *Std Dev* is the standard deviation of the variables. Variable definitions are provided in Appendix A.

	Female = 0			Female = 1			Difference in Means	
Var	N	Mean	Std Dev	N	Mean	Std Dev	Diff	P-value
LIQ	394	0.1762	0.1835	2619	0.1288	0.1345	-0.0474[a]	<0.0001
OptVol	266	0.3913	0.1110	1857	0.3315	10.9453	-0.0598 [a]	<0.0001
ROE	405	0.0770	0.0635	2647	0.0868	0.0620	0.0098 [a]	0.0033

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.5. Determinants of Firms' Cash Holdings

The first two columns report the results of the cash holdings (LIQ) model using the fraction of female directors (Perfem) and the Blau diversity index. We report the Newey-West t-stat associated p-values. The results of the first two columns includes an intercept term. The last two columns report the same model but controlling for industry and year fixed effects. These regressions do not include an intercept term.

$$LIQ_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-9} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	LIQ			
Intercept	0.38 [a]	0.38 [a]		
	(<0.0001)	(<0.0001)		
Perfem	-0.11 [a]	---	-0.16 [a]	---
	(0.01)		(<0.0001)	
Blau	---	-0.09 [b]	---	-0.10 [a]
		(0.0155)		(<0.0001)
MB	0.03 [a]	0.03 [a]	0.04 [a]	0.04 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	0.003	0.003	0.001[a]	0.002
	(0.3592)	(0.3465)	(0.6788)	(0.4773)
CASHFLOW	0.02	0.02	-0.05	-0.07
	(0.8413)	(0.8012)	(0.4186)	(0.3099)
Lev	-0.14 [a]	-0.14 [a]		-0.12 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
R&D	0.99 [a]	0.99 [a]	0.99 [a]	0.94 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	-0.86 [a]	-0.86 [a]	-0.67 [a]	-0.61 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
BoardSize	-0.11[a]	-0.11 [a]	-0.11 [a]	-0.10 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
OutDirectors	-0.02	-0.02	-0.02	-0.02
	(0.3170)	(0.341)	(0.3788)	(0.3952)
Industry F.E.	No	No	Yes	Yes
Year F.E	No	No	Yes	Yes
Adj. R^2	45.06%	45.12%	49.10%	51.77%
N	1,901	1,901	1,901	1,901

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.6. Determinants of Firms' Expected Volatility

The first two columns report the results of the expected volatility (OptVol) model using the fraction of female directors (Perfem) and the Blau diversity index. We report the Newey-West t-stat associated p-values. The last two columns report the results controlling for industry and year fixed effects.

$$OptVol_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-9} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	OptVol			
Intercept	81.00 [a]	81.24 [a]		
	(<0.0001)	(<0.0001)		
Perfem	-9.70 [b]	---	-11.21 [a]	---
	(0.0199)		(0.0003)	
Blau	---	-7.11 [b]	---	-4.21 [c]
		(0.0293)		(0.0774)
MB	-2.32 [a]	-2.34 [a]	-2.40 [a]	-1.81 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	-1.57 [a]	-1.58 [a]	-1.77[a]	-1.88 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
CASHFLOW	-15.47	-15.62	30.08 [a]	-36.23 [a]
	(0.1841)	(0.1808)	(<0.0001)	(<0.0001)
Lev	-0.91	-0.88	-5.26 [a]	-3.02
	(0.7569)	(0.7659)	(0.0086)	(0.1309)
R&D	55.56 [a]	55.79 [a]	67.74 [a]	57.00 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	39.85 [a]	40.03 [a]	52.07 [a]	60.92 [a]
	(0.0029)	(0.0028)	(<0.0001)	(<0.0001)
BoardSize	-10.08[a]	-10.02 [a]	-9.06 [a]	-7.32 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
OutDirectors	-7.31 [a]	-7.31 [a]	-5.79 [a]	-4.65 [b]
	(0.0029)	(0.0029)	(0.0071)	(0.0289)
Industry F.E.	No	No	Yes	Yes
Year F.E	No	No	Yes	Yes
Adj. R^2	21.04%	20.99%	37.08%	44.42%
N	1,332	1,332	1,332	1,332

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.7. Does Gender Diversity Affect ROE?

The first two columns report the results of the financial performance (ROE) model using the fraction of female directors (Perfem) and the Blau diversity index. We report the Newey-West t-stat associated p-values. The last two columns report the results after controlling for industry and time fixed effects.

$$ROE_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-7} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	ROE			
Intercept	-0.09 [a]	-0.09 [a]		
	(<0.0001)	(<0.0001)		
Perfem	0.05 [a]	---	0.05 [a]	---
	(<0.0001)		(<0.0001)	
Blau	---	0.04 [a]	---	0.03 [a]
		(<0.0001)		(<0.0001)
CurrentRatio	-3.58 [c]	-3.43	-3.03 [c]	-3.81 [b]
	(0.0865)	(0.1047)	(0.0838)	(0.0354)
EqMulti	0.08 [a]	0.08 [a]	0.08 [a]	0.08 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
NetProfit%	0.51 [a]	0.51 [a]	0.51 [a]	0.52 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Asset TO	0.05 [a]	0.05 [a]	0.05 [a]	0.05 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
TIE	0.001 [a]	0.001 [b]	5.01E-4 [a]	0.0005 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(0.0001)
Size	-0.01 [a]	-0.01 [a]	-0.004 [a]	-0.004 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Industry F.E.	No	No	Yes	Yes
Year F.E.	No	No	Yes	Yes
Adj. R^2	74.16%	74.16%	76.54%	77.87%
N	1,719	1,719	1,719	1,719

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.8. Propensity Score Matched Sample Results of Firms' Cash Holdings & Expected Volatility

LIQ columns and *OptVol* columns report the results of the cash holdings and option implied volatility models using the propensity score matched sample and controlling for industry and year fixed effects. The sample is matched using probability scores from the logistic regression using firm size, return on assets, and leverage as covariates. P-values are in parentheses.

$$Risk_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-9} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	LIQ		OptVol	
Perfem	-0.19 [b]	---	-0.07 [c]	---
	(0.0110)		(0.0946)	
Blau	---	-0.14 [a]	---	-0.05
		(0.0058)		
MB	0.05 [a]	0.05 [a]	-0.02 [b]	-0.02 [b]
	(<0.0001)	(<0.0001)	(0.0005)	(0.0204)
Size	-0.02 [a]	-0.01 [c]	-0.03 [a]	-0.03 [a]
	(0.0558)	(0.0665)	(0.0005)	(0.0006)
CASHFLOW	-0.25 [c]	-0.24	-0.29 [b]	-0.28 [b]
	(0.0964)	(0.1059)	(0.0468)	(0.0483)
Lev	-0.16 [a]	-0.16 [a]	-0.13 [a]	-0.13 [a]
	(0.0023)	(0.0022)	(0.0053)	(0.0052)
R&D	1.04 [a]	1.04 [a]	0.63 [a]	0.63 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	-1.02 [a]	-1.02 [a]	0.82 [a]	0.82 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Industry F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Adj. R^2	47.74%	47.89%	21.43%	21.45%
N	430	430	414	414

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

.

Table 1.9. Propensity Score Matched Sample Results of Firms' Return on Equity

The *ROE* columns report the results of the financial performance model using the propensity score matched sample and controlling for industry and year fixed effects. The sample is matched using probability scores from the logistic regression using firm size and leverage as covariates. P-values are in parentheses.

$$ROE_{i,t} = \beta_1 * Diversity_{i,t} + \beta_{2-7} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	ROE	
Perfem	0.05 [a]	---
	(0.0055)	
Blau	---	0.02 [b]
		(0.0350)
CurrentRatio	-0.41	-0.43
	(0.1899)	(0.1712)
EqMulti	0.07 [a]	0.07 [a]
	(<0.0001)	(<0.0001)
NetProfit%	0.48 [a]	0.48 [a]
	(<0.0001)	(<0.0001)
AssetTO	0.05 [a]	0.05 [a]
	(<0.0001)	(<0.0001)
TIE	0.001 [a]	0.001 [a]
	(<0.0001)	(<0.0001)
Size	-0.01 [a]	-0.01 [a]
	(<0.0001)	(<0.0001)
Industry F.E.	Yes	Yes
Year F.E.	Yes	Yes
Adj. R^2	79.59%	79.38%
N	430	430

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.10. Difference-In-Differences: Addition of Second Female Director

The three columns report the difference-in-differences (DID) regression results for the change in cash holdings, change in expected volatility, and change in ROE. Female is a binary variable equal to 1 when a board adds a second woman to the board (treatment group) and 0 when there is no woman on the board (control group). Period is equal to 1 if the observation is in the post-addition period; 0 otherwise. Δ_1 refers to the change in the variable of interest for firms that added a second female director. Δ_0 is the change in the variable of interest for firms that did not add ant female directors. P-values are in parentheses.

$$Variable_i = \beta_0 + \beta_1 Treatment_i + \beta_2 Period_t + \beta_3 Treatment * Period_i + \varepsilon_i$$

	LIQ	OptVol	ROE
Intercept	0.0099	21.0743	0.1333
	(0.4190)	(<0.0001)	(0.9236)
β_3	-0.0131	-16.0253 [a]	1.6488
	(0.4466)	(0.0034)	(0.4025)
Δ_1	-0.0033	5.0491	1.7821
Δ_0	0.0099	21.0744	0.1333
N	74	64	74

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.11. Difference-In-Differences: Addition of First Female Director

This table reports the difference-in-differences regression results for the change in cash holdings, change in expected volatility, and change in ROE. Female is a binary variable equal to 1 when a board adds a woman to the board (treatment group) and 0 when there is no woman on the board (control group). Period is equal to 1 if the observation is in the post-addition period; 0 otherwise. Δ_1 refers to the change in the variable of interest for firms that added a second female director. Δ_0 is the change in the variable of interest for firms that did not add ant female directors P-values are in parentheses.

$$Variable_i = \beta_0 + \beta_1 Treatment_i + \beta_2 Period_t + \beta_3 Treatment * Period_i + \varepsilon_i$$

	LIQ	OptVol	ROE
Intercept	0.0157	30.1230	1.1044
	(0.3232)	(<0.0001)	(0.8962)
β_3	0.0108	-17.4180 [b]	0.4067
	(0.6296)	(0.0595)	(0.3128)
Δ_1	0.0265	12.7050	1.5111
Δ_0	0.0157	30.1230	1.1044
N	50	40	50

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 1.12. Correlation Between Cash Holdings and Other Measures of Risk

This table reports the correlation between our measures of risk, firm liquidity (LIQ), option implied volatility (OptVol), stock return volatility (TotalRisk), firm-specific volatility (Idiosyncratic Vol), beta, and downside risk (Down_Risk).

	LIQ	OptVol	Total Risk	Idio_Vol	Beta	Down_Risk
LIQ	1.00	0.2566 <.0001	0.2753 <.0001	0.2825 <.0001	0.2392 <.0001	0.1964 <.0001
OptVol		1.00	0.7129 <.0001	0.7119 <.0001	0.5657 <.0001	0.6664 <.0001
Total Risk			1.00	0.93975 <.0001	0.8020 <.0001	0.8853 <.0001
Idio_Vol				1.00	0.6245 <.0001	0.7970 <.0001
Beta					1.00	0.7385 <.0001
Down_Risk						1.00

Table 1.13. Regression Analysis with Alternative Risk Measures

The table reports the panel regressions of beta, idiosyncratic volatility, downside risk, future stock return volatility over the next 12 and 24 months on the fraction of female directors (Perfem) and all the control variables. All models control for industry and year fixed effects. P-values are in parentheses.

$$Risk_{i,t} = \beta_1 * Perfem_{i,t} + \beta_{2-9} * Control\ Variables_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	Beta	IdioVol	Downside	SD12	SD24
Perfem	-1.14 [a]	-0.05 [a]	-0.03 [a]	-0.02 [b]	-0.03 [a]
	(<0.0001)	(<0.0001)	(0.0005)	(0.0348)	(0.0182)
MB	-0.13 [a]	-0.01 [a]	-0.01 [a]	-0.004 [a]	-0.004 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	-0.05 [b]	-0.003 [a]	-0.002 [a]	-0.002 [a]	-0.003 [a]
	(0.0206)	(0.0011)	(<0.0001)	(0.0078)	(0.0022)
CASHFLOW	-1.15 [c]	-0.03	-0.01	-0.17 [a]	-0.16 [a]
	(0.0676)	(0.3350)	(0.6523)	(<0.0001)	(<0.0001)
Lev	-0.61	-0.01	-0.02 [a]	0.01	0.01
	(<0.0001)	(0.2061)	(0.0011)	(0.4039)	(0.3943)
R&D	3.77 [a]	0.23 [a]	0.11 [a]	0.19 [a]	0.20 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	0.63	0.14 [a]	0.04	0.21 [a]	0.21 [a]
	(0.4365)	(0.0002)	(0.1056)	(<0.0001)	(<0.0001)
BoardSize	-0.26 [b]	-0.02 [a]	-0.01 [a]	-0.04 [a]	-0.03 [a]
	(0.0392)	(0.0018)	(0.0042)	(<0.0001)	(<0.0001)
OutDirectors	-0.02	-0.01	-0.01	-0.003	-0.01
	(0.9026)	(0.1193)	(0.2398)	(0.6731)	(0.1885)
Industry F.E.	Yes	Yes	Yes	Yes	Yes
Time F.E	Yes	Yes	Yes	Yes	Yes
Adj. R^2	27.11%	31.65%	38.00%	44.50%	44.85%
N	707	707	707	1,554	1,446

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

CHAPTER 2: DO INSTITUTIONAL INVESTORS AVOID WOMEN?

2.1. Introduction

Financial literature confirms that institutional investors are informed traders. The informed trading is due to the collection of private information and/or the ability to analyze publicly disclosed information more quickly. In either case, institutional investors will benefit if they invest in firms that disclose poor quality and/or less quantity of information. Recent work by Puckett and Yan (2011) finds evidence in support of institutional investors being informed traders and find that they prefer trading in stocks in which the public information environment is more limited, greater informational asymmetries exist, or where limits to arbitrage are higher.

In another field of academic research, the extant literature shows that firms with gender diverse boards disclose more information and women are more likely to serve on monitoring-related committees (Adams and Ferreira, 2009). Additionally, research has shown that the stock prices of firms with gender diverse boards reflect more information as a result of a higher amount of public disclosure (Gul, Srinidhi, & Ng, 2011). Gul, Hutchinson, and Lai (2013) suggest that boardroom gender diversity increases the accuracy of financial reporting which improves analysts' earnings expectations.

Given the evidence on the investment behavior of institutional investors where they prefer investing in firms with poor quality disclosure and that gender diverse firms disclose better quality and higher quantity of information, we expect institutional investors to prefer investing in firms with less gender diversity. In this paper, we study the effect of boardroom gender diversity on the level of institutional holdings. Our empirical work suggests that firms with more gender diversity tend to have lower levels of institutional ownership.

We use two measures of boardroom gender diversity: the percentage of female directors on the board and the Blau diversity index.[12] We find that firms with more gender diversity have significantly lower levels of institutional holdings than firms with less diversity. More specifically our univariate analysis indicates that institutional investors hold 4.15% more shares in non-diverse firms. In our multivariate analysis we use the estimated regression model to compare the difference in institutional ownership between diverse and non-diverse firms. Using the proportion of female directors as a measure of gender diversity, we find that institutional investors hold 8.82% less shares in firms with boardroom gender diversity.[13] Similarly, using the Blau diversity index, we find that institutional investors hold 8.27% less shares in firms with gender diversity.

A critical concern for our empirical analysis is endogeneity. For example, on the one hand we know gender diverse firms disclose more and higher quality information, which decreases information asymmetry. As a result, we hypothesize and provide evidence that institutional investors have less holdings in gender diverse firms. On the other hand, it may be possible that female directors prefer to work for firms with fewer institutional investors because such investors may use their relatively large ownership stakes to demand changes to the firm's corporate governance policy, such as altering the composition of the board of directors. We address our endogeneity concerns by implementing several robustness tests. First, we generate a propensity score matched sample using financial

[12] The proportion of female directors on the board is a better measure than an indicator variable because it measures the influence of gender diversity. For example, two boards have one female director each but consist of a different number of directors. The smaller-sized board will be more influenced by the female director than the larger board. The Blau index further captures nonlinear effects that diversity may have on the firm.

[13] We use the estimated model in Table 6 and compare firms with 20% and 0% female representation using the median values of the control variables.

performance to generate probability scores and match the firms by the smallest difference in probability scores. We find that institutional ownership is significantly lower for firms with gender diversity. We then implement a difference-in-differences (DID) analysis in which we compare the changes in institutional ownership for firms which did not have any female directors (control group) with firms that added female directors to the board (treatment group). We find that institutional ownership decreases for the control group and treatment group by 0.84% and 4.17%, respectively. Overall, institutional ownership decreased by 3.33% more for firms that added a female director as compared to firms that did not add a female director.

Current literature also suggests that institutional investors have a monitoring role on the firm, i.e. the larger the institutional following the more information about the firm available in the market. Hence, more institutional following increases the number of informed traders competing amongst each other for informational advantages and increases the availability of information. As a robustness check, we study whether institutional following affects the inverse relationship between gender diversity and informed trading. We find that institutional investors prefer to invest less in gender diverse firms with more institutional following which may be due to higher information disclosure in gender diverse firms and increased monitoring, both of which increase firm-specific information. Higher gender diversity in firms with greater institutional following negatively impacts institutional holdings.

Moreover, we examine the effect of gender diversity on institutional holdings for various types of institutions such as banks, insurance companies, mutual funds, and hedge funds. We find these types of institutions invest less in gender diverse firms, which is

consistent with our prior findings. This is also consistent with the notion that these types of institutions have superior informational advantages over uninformed traders.

The implications of our study reveals the important role that gender diversity has in the composition of informed and uninformed traders in firms' stock prices. Gender diversity through public disclosure and institutional investors through trading on their analytical expertise and private information both increase the informational content of stock prices. Our results suggest that gender diversity may be a factor in improving the informational content of asset prices and, thus, on a larger scale suggests that board gender diversity may improve the informational efficiency of financial markets. Lastly, our results suggest that gender diversity is an important determinant in institutions' investment decisions as we find that institutions systematically invest less in gender diverse firms.

The rest of this paper proceeds as follows. Section 2.2 reviews the literature and presents our hypothesis. Section 2.3 describes the data. Section 2.4 reviews our model. Section 2.5 presents the results of our empirical study. Section 2.6 concludes.

2.2. Prior literature and Hypothesis Development

The extant literature provides evidence that gender diverse boards improve the quality of information disclosure by firms. Adams and Ferreira (2009) report that women are more likely to participate in audit and monitoring-relating committees and are more stringent monitors of management. Moreover, Barber and Odean (2001) suggest that female directors are more risk averse and less overconfident than male directors which could cause female directors to increase the standards of management's financial reporting. Thus, if gender diversity improves corporate governance through more effective

monitoring of firms' management, then gender diversity is expected to be positively related to benchmarks that proxy for firm-specific information.

Srinidhi, Gul, and Tsui (2011) study the effect of boardroom gender diversity on earnings quality using accruals and earnings surprises as measures of earnings quality and control for several board characteristics. The authors report that gender diverse firms are positively related to higher earnings quality. Gul, Srinidhi, and Ng (2011) show that the stock prices of firms with gender-diverse boards reflect more firm-specific information and the relationship is more salient for firms with weak governance. Additionally, the authors find that gender diversity increases the informational content of stock prices through increased public disclosures. Gul, Hutchinson, and Lai (2013) report a positive (negative) relationship between analysts' earnings estimates (dispersion) and suggest that boardroom gender diversity increases the accuracy of financial reporting, which allows analysts to provide increasingly refined earnings expectations.

In general, prior literature finds that gender diversity in a firm's board increases transparency through more and better quality disclosure of firm-specific information as a result of increased monitoring and behavioral differences in risk aversion and overconfidence.

Information asymmetry arises when investors have varying levels of private information about the firm's fundamental value. Traders with the superior information sets take advantage of less informed traders.[14] Kyle (1985) shows that informed trading varies

[14] Traders with superior information sets are referred to as "informed traders." Traders with inferior information sets are referred to as "uninformed traders" or "noise traders." Additionally, "liquidity traders" trade on the need to rebalance their investments (liquidity-need) or speculation. Thus, liquidity traders sometimes trade like noise traders; however, their motivations are not necessarily the same.

according to the proportion of uninformed traders in the market. Brown, Hillegeist, and Lo (2004) find that the proportion of informed traders decreases relative to the proportion of uninformed traders when a firm voluntarily discloses information. Additionally, Brown and Hillegeist (2007) examine the mechanisms through which disclosure quality reduces information asymmetry and find that information asymmetry, measured as the probability of informed trading (PIN), is negatively related to various measures of disclosure quality. The authors conclude that the negative relationship between disclosure quality and information asymmetry is due to the reduction in investors' incentives to collect private information.[15]

In short, the existing literature supports the idea that disclosure quality is negatively related to information asymmetry because it decreases informed traders' incentives to collect private information and decreases the relative proportion of informed trading.

There is extensive prior literature on who is an informed trader. Boehmer and Kelley (2009) show that greater institutional ownership is associated with significantly greater informational efficiency. They show that stocks with larger increases in holdings experience greater increases in efficiency, and those with large reductions in holdings experience declines in efficiency. Many studies suggest that institutional investors have superior information sets because of their ability to attain such information sets cheaply. O'Neill and Swisher (2003) write, "Institutional investors are often considered informed traders because of their lower average costs to acquire information. Consequently,

[15] The probability of informed trading (PIN) is measured as: $PIN = \frac{\alpha\mu}{\alpha\mu+2\varepsilon}$ where α is the frequency of private information events, μ is the intensity of informed trading, and ε is the intensity of uninformed trading.

institutions can be both more efficient in processing information and more effective as traders and monitors than can smaller, diffuse retail investors." Puckett and Yan (2011) find strong evidence that institutional investors earn significant abnormal returns on their trades within the trading quarter, indicating that they are informed traders. They conjecture that profitable trading opportunities are more likely to arise in stocks where the public information environment is more limited, greater information asymmetries exist, or limits to arbitrage are higher. Their results are consistent with institutions being able to exploit temporary mispricing in situations where information asymmetry and limits to arbitrage are high.

Vayanos (1999) develops theoretical results indicating that institutional investors trade based on their private information. Chakravarty (2001) investigates the stealth-trading hypothesis, which argues that informed investors conceal their private information in medium-sized trades. He finds that most of the cumulative price change in stock prices is associated with medium-sized trades initiated by institutions. Ali, Klasa, and Li (2008) use institutional ownership as a proxy for the proportion of better informed traders. The authors find that institutions have incentives to develop private, pre-disclosure information and trade on it. They conclude that institutional ownership is a fine proxy for the proportion of informed traders at earnings announcements. Ajinkya, Bhojraj and Sengupta (2005) investigate the relation of the board of directors and institutional ownership with the properties of management earnings forecasts. They find that firms with more outside directors and greater institutional ownership are more likely to issue a forecast and are inclined to forecast more frequently. In addition, these forecasts tend to be more specific, accurate, and less optimistically biased.

Discussion in section 2.1 highlights the association between gender diversity and disclosure quality through increased monitoring effectiveness. In section 2.2, we discuss that increased disclosure quality is negatively associated with information asymmetry. The decrease in information asymmetry lowers the proportion of informed trading and decreases the incentive for acquiring private information.

Institutional investors are more sophisticated traders who take advantage of their superior information set through trading. We posit that if gender diversity increases information disclosure quality and if higher disclosure quality decreases information asymmetry, then gender diverse firms will have less institutional ownership because such informed traders will not be able to take advantage of the information environment of gender diverse firms.

Hypothesis: Higher gender diversity has a negative effect on institutional ownership.

$$H_o: Inst.Holdings_i^1 - Inst.Holdings_i^0 \geq 0$$

$$H_{A:} Inst.Holdings_i^1 - Inst.Holdings_i^0 < 0$$

where the superscript of 1 denotes firms with more gender diversity and 0 denotes firms with less gender diversity.

2.3. Data and Sample Overview

We collect the data on board of directors' composition from GMI Ratings available on Wharton Research Data Services (WRDS). The board composition data is increasingly available from 2001-2013 for many S&P 500 companies. We collect firm-specific data for the control variables from Compustat and daily stock return data for sample firms from CRSP. We use I/B/E/S for the number of analysts for each firm and keep only those firms in our sample that have at least one analyst recommendation.

The SEC requires ownership data and holdings to be publicly disclosed using Form 13F under Section 13(f) of the 1934 Securities Exchange Act, which includes the largest number of institutional investors. These aptly named 13F institutions have at least $100 million in investments. We collect the institutional ownership data from the SEC 13(f) filings. To classify the institutional ownership data by institution type we use the classification made by Agarwal, Jiang, Tang, and Yang (2013). Agarwal et al. (2013) manually reclassify the five institution types reported in Thompson Reuters 13F database into 10 distinct institution types, which are listed in Appendix A.[16]

The intersection of all five data sources[17] and data requirements reduce the size of our sample to 410 firms and 3,540 firm-year observations. The exclusion of finance (NAICS 52) and utility companies (NAICS 22) further reduces the sample in the regression models. Table 2.1 reports the firm-year average of institutional ownership and institutional following. The average institutional ownership of a firm is between 62.32% of shares outstanding in 2001 and 68.81% of shares outstanding in 2013. Similarly, the average number of institutions that own shares in a firm range from 364 in 2001 to 524 institutions in 2013. Table 2.1 also shows that about half of the institutional holdings is held by no more than 16 institutions, on average. In Table 2.2, we report the firm-year average of institutional ownership for different levels of gender diversity. We show that firms with no female directors have institutional ownership levels of 70.15%. Similarly, firms whose boards consist of 30% to 40% females have institutional ownership levels of 61.57%.

[16] We thank Dr. Vikas Agarwal for sharing the institutional classification data.

[17] WRDS, Compustat, CRSP, 13F, and data from Agarwal, Jiang, Tang, and Yang (2013)

2.4. Methodology

For our univariate analysis of institutional ownership we divide the sample into two groups, firms with no female directors and firms with at least one female director.

Then, we test our institutional ownership model, which includes measures of board diversity while controlling for firm-specific drivers of information asymmetry. We test the following model to relate boardroom gender diversity to institutional ownership,

$$\begin{aligned} Inst.Holdings_{i,t} = {} & \beta_1 Diversity_{it} + \beta_2 BoardSize_{it} + \beta_3 Div_{it} \\ & + \beta_4 IdioRisk_{it} + \beta_5 FirmSize_{it} + \beta_6 MB_{it} + \beta_7 Lev_{it} \\ & + \beta_8 Illiq_{it} + \beta_9 Recs_{it} + y_i + \lambda_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

We use two measures of diversity in our institutional ownership model, Perfem and Blau. Perfem is the number of female directors divided by the number of directors. This linear measure of diversity fails to parsimoniously capture the effect of diversity with increasing gender diversity. Hence, we construct the Blau (1977) diversity index for each firm-year as follows:

$$Blau = 1 - \sum_{i=1}^{n} P_i^2$$

The Blau diversity index measures the diversity of a group using the proportion, P_i, of subgroups in the group.[18] We expect our diversity measures to be negatively associated with institutional ownership given that gender diversity increases disclosure quality, which decreases information asymmetry. As a result, informed traders such as institutional investors cannot take complete advantage of their superior information set in gender diverse firms.

[18] In this case, the group (board of directors) has two subgroups (male and female). Thus, a perfectly diverse board would have a maximum Blau index score of 0.50 and a non-diverse board would have a Blau index score of 0. Lastly, boards with 30% females have the same Blau index score as a board with 30% males because the diversity level is the same. This is the major advantage of using the Blau index over perfem.

The previous literature associates a number of variables with firms' level of institutional ownership. Upadhyay and Sriram (2011) find that board size is positively associated with the firm's information environment using different proxies of information transparency. Additionally, the authors suggest that investors perceive firms with larger boards to have a richer information environment, which leads to a lower cost of capital for the firm. We measure board size (BSize) as the natural logarithm of the total number of directors on the board. Since board size is positively related to a firm's information environment and institutions prefer higher levels of information asymmetry, we expect lower institutional ownership for firms with larger boards. Miller and Modigliani (1961) suggest that managers use dividend payout policy to signal information about the firm's future earnings. Amihud and Li (2006) examine the declining information content of dividend announcements and find that a reason for the decline in information content is explained by the increase in institutional ownership over time. This suggests that because institutional investors are sophisticated and more informed, they are able to embed their private information into stock prices, which contributes to the declining information content of dividend payout policy. We use an indicator variable (Div) equal to one if the firm announces a dividend in the fiscal year and zero if the firm did not announce a dividend. If dividends contain information about the future earnings of a firm, then we expect firms that make dividend announcements to have less institutional ownership.

Durnev, Morck, Yeung, and Zarowin (2003) compute idiosyncratic volatility by regressing weekly returns on market and industry returns and conclude that higher firm-specific stock return volatility signals more information-rich stock prices and more efficient stock markets. We measure idiosyncratic volatility (IdioRisk) as the standard

deviation of the residuals from regressing daily stock returns on daily S&P 500 returns.[19] We expect lower institutional ownership for firms with higher firm-specific stock return variation because the stock prices of such firms contain more information and, thus, are more efficiently priced. Furthermore, previous studies proxy information asymmetry with firm size and argue that larger firms are more visible and, therefore, have less information asymmetry (Chari, Jagannathan, & Ofer, 1988; Lo & MacKinlay 1990; Llorente, Michaely, Saar, & Wang, 2002). We expect firm size (Size) to be negatively related with institutional ownership, i.e. larger firms have more public following, and thus, informed traders are less attracted to such visible firms. McLaughlin, Saffieddine, and Vasudevan (1998) use a firm's market-to-book (MktBook) as a proxy for information asymmetry and suggest that growth opportunities and overvaluation are likely to be related with information asymmetries. We control for a firm's MktBook ratio in our institutional holdings model and expect institutional investors to own a larger stake in firms with higher MktBook ratios to profit from their private information. Tong and Ning (2004) study a panel of S&P 500 firms and find that capital structure influences institutional investors' decisions to invest in firms. Michaely, Popadak, and Vincent (2014) find that increases in institutional ownership accounts for the deleveraging of U.S. corporations since 1992. We control for firm leverage (Lev), measured as the ratio of long-term debt to total assets, in the institutional ownership model.

Additionally, we control for firm stock illiquidity (Illiq) using a variant of Amihud's (2002) measure employed by Hasbrouck (2009). This measure is computed as

[19] We estimate $r_{idt} = \beta_{0,it} + \beta_{1,it} r_{mdt} + \varepsilon_{idt}$ using daily firm and S&P 500 returns for the fiscal year *t*. After estimating β_1, we compute firm-specific risk by subtracting systematic risk from total variance using the following decomposition of total variance: $\sigma_{it}^2 = \beta_i^2 \sigma_{mt}^2 + \sigma_{\varepsilon t}^2$.

the firm's yearly average of the square root of absolute return divided by dollar volume.[20] Higher volume decreases illiquidity, which attracts informed traders because they are better able to mask their trades and execute them without much price impact. Thus, we expect higher institutional holdings for firms with lower illiquidity. Lastly, we control for analyst following (Recs) using the average number of analysts that follow a firm in a given year. A higher analyst following contributes to a richer public information set, which makes it more difficult for informed institutions to gain an advantage over uninformed traders. Thus, we expect lower institutional ownership for firms with higher analyst following.

2.5. Empirical Results

We report firm-year summary statistics in Table 2.1. The table shows that the average level of institutional ownership has slightly increased from 62.32% in 2001 to 68.81% in 2013. Similarly, the average number of institutions investing in each firm has increased from 364 in 2001 to 524 institutions in 2013. The table also reports the average number of institutions that own at least 1% of all shares outstanding and the average fraction of shares outstanding held by these top institutions. The latter is roughly time invariant. Table 2.2 reports average institutional ownership levels by diversity tranches. We report a decreasing trend in institutional ownership as gender diversity increases. In Table 2.3 we report the descriptive statistics of diverse and non-diverse firms as indicated by a binary variable equal to 1 if there is at least one woman on the board and 0 otherwise. The mean and median amounts of institutional holdings are higher for firms without any female directors. For example, in non-diverse firms institutions own approximately 71%

[20] $Illiq_{i,t} = \sqrt{\frac{|Ret_{i,d,t}|}{Vol_{i,d,t}}}$ for firm *i* in year *t* using daily returns, *d*

of the shares outstanding while in diverse firms institutions own approximately 66% of shares outstanding.

In Table 2.4 we provide our univariate analysis comparing the differences in institutional ownership by the presence of female directors on the board. We report that firms with female directors have significantly lower institutional ownership levels. The results also hold when we exclude tracking institutions.[21] Both univariate results are statistically significant at the 1% level. Table 2.5 reports the differences in mean institutional ownership between firms with gender diversity and without diversity sorted into quintiles by institutional following. Firms in Q5 have the highest number of institutions investing in the company. Conversely, firms in Q1 have the least number of institutions with ownership stakes in the company. We report that gender diverse firms with more institutional following have significantly less institutional ownership than firms without female directors. At the lowest quintile, gender diverse firms have higher levels of institutional ownership. The results suggest that firms with more institutional following are likely to be more well-known and more closely followed by traders and analysts. This increased public scrutiny may contribute to a richer information set, which would contribute to lower institutional ownership levels in gender diverse firms. On the other hand, less institutional following results in less public information, which may attract higher levels of institutional ownership.

[21] We define tracking institutions as those institutions that invest in all sample firms in a given year. For example, if there are 250 firms in 2001 and an institution invests in all 250 firms, then we designate it a tracking institution and remove it from the analysis because these institutions are not making specific investment decisions or incorporating unique trading strategies. They are simply tracking the index.

In Table 2.6 we examine the multivariate relationship between gender diversity and institutional ownership. When we use all institutional-level data in the regression, we find that both diversity measures are negative and significant at the 1% level with a p-value less than 0.0001. Further analysis shows that the model does not hold when analyzing the institutional ownership levels of tracking institutions. Since tracking institutions do not distinguish between their investment choices, they are not trading based on some acquired information set. Thus, it is important to exclude such institutions from the empirical analysis. We find, the results excluding tracking institutions to be similar to the results when using all institutions. Both diversity measures are negative and significant at the 1% level when excluding tracking institutions. The coefficients of the information-related control variables indicate a negative relationship between a firm's information environment and institutional ownership. For example, larger firms have lower institutional ownership. Similarly, firms with higher idiosyncratic volatility, higher analyst following, and larger boards have lower institutional ownership levels on average.

In Tables 2.7 and 2.8 we examine whether institution following impacts the relationship between gender diversity and institutional ownership. We report a negative and significant relationship between gender diversity and institutional ownership for the firms in the quintile with the highest institutional followings (Q5, Q4, and Q3). For firms with lower institutional following (Q1 and Q2), neither diversity measure is statistically significant. These results are consistent with the univariate results reported in Table 4. Higher gender diversity in firms with greater institutional following negatively impacts institutional holdings. However, gender diversity does not seem to impact institutional holdings for the least followed firms.

Next, we test whether the inverse relationship between gender diversity and institutional ownership varies by institution-type. We restrict our analysis to the first five types of institutions as these institutions make up approximately 90% to 95% of all institutions. In Tables 2.9 and 2.10 the results suggest that banks, insurance companies, and mutual funds invest less in firms with more board gender diversity. Although not statistically significant, hedge funds and other asset management firms also invest less in more gender diverse firms. Since the results are generated using end-of-year data it is possible that window dressing may be adversely impacting our results for hedge funds and asset management firms. Nonetheless, the results are consistent with our hypothesis that institutional investors own less shares in firms with richer information sets.

To address possible selection bias and endogeneity concerns, we apply a propensity score matched sample approach controlling for financial performance and match control firms to treatment firms by the smallest difference in firm size and year. Additionally, we control for industry and year fixed effects. The results in Table 2.11 report that the coefficient on Perfem and Blau is negative and significant at the 5% and 10% level, respectively. In Table 2.12, we report the results from our DID study. We report that non-diverse firms (control group) had a decrease in institutional ownership of 84 basis points between pre- and post-treatment periods. Firms that added a woman to the board (treatment group) had a decrease in institutional ownership of 417 basis points. The decrease institutional ownership levels for the treatment group is statistically significant at the 1% level. Lastly, the DID between the two groups is a decrease of 333 basis points in institutional ownership.

2.6. Conclusion

In this essay, we examine the relationship between board gender diversity and institutional ownership levels of non-financial S&P 500 firms. We report that board gender diversity is inversely related to the proportion of shares outstanding held by institutions. Moreover, we find that the inverse relationship between gender diversity and institutional ownership is stronger for firms with higher levels of institutional following. Additionally, we use institutional ownership data to classify institutions by type such as banks, mutual funds, and hedge funds. We find that banks, insurance companies, and mutual funds invest less in gender diverse firms. Forhedge funds and asset management firms we do not find any statistically significant influence of gender diversity but these results may be due to window dressing. Our results are robust to several endogeneity tests. The propensity score matched sample and difference-in-differences analysis indicate that higher levels for gender diversity leads to a statistically and economically significant level of institutional ownership in firms.

Table 2.1: Summary Statistics of Institutional Holdings

Inst. Holdings is the cross-sectional average of the fraction of total shares outstanding held by 13F institutions. *Avg. No. Inst.* is the average number of 13F institutions with investments in a company. *Top. Inst.* is the average number of institutions that own at least 1% of a company. *Top Holdings* is the cross-sectional average of the fraction of total shares outstanding held by the top institutions.

Year	Inst. Holdings	Avg. No. Inst.	Top Inst. (>1%)	Top Holdings (>1%)
2001	62.32%	364	13	34.60%
2002	64.27%	377	14	37.35%
2003	65.50%	404	13	35.68%
2004	67.36%	421	14	38.19%
2005	66.97%	434	14	39.72%
2006	69.04%	446	15	42.45%
2007	71.55%	483	15	41.51%
2008	69.17%	439	14	41.37%
2009	67.71%	437	15	41.68%
2010	71.63%	451	16	45.74%
2011	69.73%	455	15	45.62%
2012	69.24%	445	15	44.13%
2013	68.81%	524	13	37.51%

Table 2.2: Average Institutional Holdings By Diversity Tranches

% Female Directors is the proportion of female directors on the board. *Firm-Years* is the Number of firm-year observations in each diversity tranche. *Avg. Inst. Holdings* is the average fraction of shares outstanding held institutions in each diversity tranche. *No. Inst.* is the number of 13F institutions in each diversity tranche.

% Female Directors	Firms	Firm-Years	Avg. Inst. Holdings	No. Inst.
0%	128	448	70.15%	3,899
0.1% to 10%	205	751	67.88%	4,219
10.01% to 20%	317	1564	68.60%	4,472
20.01% to 30%	158	546	67.58%	4,211
30.01% to 40%	53	151	61.57%	3,529
40.01% to 50%	11	23	59.10%	2,498
>50%	1	4	78.06%	622

Table 2.3. Descriptive Statistics, 2001-2013

The descriptive statistics of the sample are presented in two groups: firms with no gender diversity (Female = 0) and firms with gender diversity (Female = 1). *N* is the number for firm-year observations. *Mean* is the average of the firm-year observations for each variable. *Med* is the median observation. *Std Dev* is the standard deviation of the variable of interest. *Min* and *Max* are the minimum and maximum value of the variable. Variable definitions are provided in Appendix B.

	Female = 0						Female =1					
	N	Mean	Med	St Dev	Min	Max	N	Mean	Med	St Dev	Min	Max
Dependent Variables												
Inst. Holdings	448	0.68	0.71	0.14	0.07	0.91	3,039	0.65	0.66	0.12	0.22	0.92
Independent Variables												
BoardSize	448	2.12	2.08	0.21	1.61	2.77	3,067	2.36	2.40	0.19	1.61	2.94
Mktbook	398	1.92	1.46	1.33	0.30	7.50	2,624	1.76	1.40	1.25	0.28	13.05
Leverage	464	0.20	0.19	0.16	0	0.99	3,044	0.22	0.21	0.15	0	1.56
Div	471	0.61	1	0.49	0	1	3,035	0.77	1	0.42	0	1
Idiosyncratic	473	0.02	0.02	0.01	0.001	0.08	3,067	0.02	0.01	0.01	0.005	0.10
Illiq	473	0.02	0.01	0.02	0.002	0.17	3,067	0.02	0.01	0.08	0.001	1.46

Table 2.3 (Continued). Descriptive Statistics, 2001-2013

	Female = 0						Female =1					
	N	Mean	Med	St Dev	Min	Max	N	Mean	Med	St Dev	Min	Max
Recs	473	19.00	18.08	7.95	1	43.92	3,067	17.83	16.75	7.88	1	54.92
Size	473	8.69	8.66	0.92	6.23	11.06	3,067	9.29	9.19	1.17	6.22	13.59

Table 2.4: Univariate Analysis: Proportion of Firm Float Held by Institutional Investors

N is the number of firm-year observations. μ_0 (μ_1) is the average proportion of shares outstanding in non-diverse (diverse) firms held by institutions. *Std Dev* is the standard deviation of the fraction of shares held by institutions. *Min* and *Max* is the minimum and maximum proportion of shares outstanding held by institutions. *All Inst. Ex. Trackers* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year.

	N	μ_0	Std Dev	Min	Max	N	μ_1	Std Dev	Min	Max	$\mu_1 - \mu_0$
All Institutions	448	0.6799	0.1361	0.0663	0.9179	3039	0.6528	0.1202	0.2183	0.9234	-0.0271 [a]
All Inst. Ex. Trackers	448	0.4116	0.1283	0.0318	0.8241	3039	0.3966	0.1234	0.0601	0.8775	-0.0180 [a]

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.5: Univariate Analysis: Institutional Following

Firms are sorted by institutional following; defined as the number of institutions investing in a firm in a given year. *Q1* corresponds to the quintile that includes firms with the smallest institutional following. Conversely, *Q5* is the quintile that includes firms with the highest institutional following. μ_0 (μ_1) is the average proportion of shares outstanding in non-diverse (diverse) firms held by institutions. *All Inst. Ex. Trackers* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year.

	All Institutions			All Institutions Ex. Trackers		
	μ_0 (Female =0)	μ_1 (Female = 1)	$\mu_1 - \mu_0$	μ_0 (Female =0)	μ_1 (Female = 1)	$\mu_1 - \mu_0$
Q1 – Lowest	0.6597	0.7044	0.0447 [a]	0.2947	0.3315	0.0368 [a]
Q2	0.7047	0.7171	0.0124	0.3040	0.3224	0.0184 [b]
Q3	0.7438	0.7015	-0.0423 [a]	0.3455	0.3166	-0.0289 [a]
Q4	0.7142	0.6807	-0.0336 [a]	0.3232	0.3018	-0.0214 [b]
Q5 – Highest	0.6545	0.6013	-0.0532 [b]	0.2984	0.2517	-0.0467 [a]

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.6: Does Gender Diversity Explain Institutional Holdings?

Perfem is the proportion of female directors on the board. *Blau* is a diversity index. *BoardSize* is the natural logarithm of the number of directors on the board. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Illiq* is the modified Amihud illiquidity measure. *Recs* is the average number of analyst recommendations for the firm. *Size* is the natural log of a firm's total assets. *All Inst. Ex. Trackers* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year.

$$Inst.Holdings_{i,t} = \beta_1 Diversity_{i,t} + \beta X_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	All Institutions		Tracking Institutions		All Ex. Tracking Institutions	
Perfem	-0.1234 [a]	---	0.0086	-	-0.0796 [a]	---
	(<0.0001)		(0.6724)		(<0.0001)	
Blau	---	-0.0747 [a]	---	0.0108	---	-0.0444 [a]
		(<0.0001)		(0.4825)		(0.0032)
BoardSize	-0.0389 [a]	-0.0390 [a]	-0.0277 [a]	-0.0284 [a]	-0.0237 [b]	-0.0241 [b]
	(0.0006)	(0.0007)	(0.0057)	(0.0049)	(0.0135)	(0.0126)
MktBook	-0.0851	-0.0903	-0.0001	-0.0001	-0.0001	-0.0001
	(0.5393)	(0.5154)	(0.7930)	(0.7906)	(0.5573)	(0.5351)
Leverage	0.0312 [b]	0.0305 [b]	0.0670 [a]	0.0669 [a]	0.0010	0.0005
	(0.0280)	(0.0318)	(<0.0001)	(<0.0001)	(0.9337)	(0.9690)
Div	-0.0262 [a]	-0.0271 [a]	0.0005	0.0004	-0.0212 [a]	-0.0219 [a]
	(<0.0001)	(<0.0001)	(0.9134)	(0.9155)	(<0.0001)	(<0.0001)
Idiosyncratic	-0.4095	-0.4206	-0.0373	-0.0289	-0.7903 [a]	-0.7953 [a]
	(0.1892)	(0.1784)	(0.8697)	(0.8988)	(0.0026)	(0.0025)
Illiq	-0.0762 [a]	-0.0747 [a]	-0.0380	-0.0380	-0.0203	-0.0193
	(0.0040)	(0.0048)	(0.1064)	(0.1065)	(0.3605)	(0.3868)
Recs	-0.0012 [a]	-0.0012 [a]	0.0014 [a]	0.0014 [a]	-0.0013 [a]	-0.0013 [a]
	(<0.0001)	(0.0002)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	-0.0273 [a]	-0.0274 [a]	-0.0056 [a]	-0.0057 [a]	-0.0233 [a]	-0.0233 [a]
	(<0.0001)	(<0.0001)	(0.0032)	(0.0031)	(<0.0001)	(<0.0001)
IndustryF.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	24.13%	23.88%	2.09%	2.11%	23.26%	23.01%
N	2,994	2,994	2,994	2,994	2,994	2,994

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.7: Does Institutional Following Impact the Effect of Diversity on Institutional Ownership?

Perfem is the proportion of female directors on the board. *BoardSize* is the natural logarithm of the number of directors on the board. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Illiq* is the modified Amihud illiquidity measure. *Recs* is the average number of analyst recommendations for the firm. *Size* is the natural log of a firm's total assets.

$$Inst.Holdings_{i,t} = \beta_0 + \beta_1 Perfem_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Q1	Q2	Q3	Q4	Q5
Intercept	0.8044 [a]	1.0748 [a]	0.6845 [a]	0.5989 [a]	1.3531 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Perfem	-0.0774	-0.0060	-0.1226 [b]	-0.1599 [a]	-0.1706 [a]
	(0.1806)	(0.9177)	(0.0417)	(0.0020)	(0.0023)
BoardSize	-0.0494 [c]	-0.0792 [a]	-0.0463	-0.0075	0.0069
	(0.0626)	(0.0051)	(0.1288)	(0.7753)	(0.7948)
MktBook	-0.0144 [b]	-0.0093 [a]	-0.0006	-0.0001	-0.0274 [a]
	(0.0264)	(0.0002)	(0.7884)	(0.8319)	(<0.0001)
Leverage	-0.0119	0.0909 [a]	-0.0492	-0.0680 [c]	-0.0389
	(0.6999)	(0.0079)	(0.2155)	(0.0520)	(0.3162)
Div	-0.0165	-0.0270 [b]	-0.0326 [a]	-0.0479 [a]	0.0134
	(0.1662)	(0.0209)	(0.0100)	(0.0002)	(0.4222)
Idiosyncratic	-1.7728 [a]	-0.5427	0.2075	-1.4172 [b]	0.1622
	(0.0013)	(0.3354)	(0.9693)	(0.0483)	(0.8613)
Illiq	-0.0878	0.0031	-0.0177	0.1708	-9.5129 [a]
	(0.2187)	(0.9311)	(0.7906)	(0.6402)	(0.0032)
Recs	-0.0030 [a]	-0.0031 [a]	-0.0006	-0.0020	-0.0015 [b]
	(0.0002)	(<0.0001)	(0.4733)	(0.0063)	(0.0148)
Size	-0.0195 [b]	-0.0465 [a]	-0.0105	-0.0079	-0.0799 [a]
	(0.0420)	(<0.0001)	(0.2411)	(0.2364)	(<0.0001)
Adj. R^2	5.60%	11.05%	4.51%	5.86%	20.48%
N	589	576	598	625	606

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.8: Does Institutional Following Impact the Effect of Diversity on Institutional Ownership? Excluding Tracking Institutions.

Blau is a diversity index. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Abnormal Return* is the geometric mean of a firm's daily excess return above its expected return using the market model in the a given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Size* is the natural log of a firm's total assets. *Institutional Holdings* is computed without tracking institutions or institutions that invest in solely one firm in a given year.

$$Inst.Holdings_{i,t} = \beta_0 + \beta_1 Blau_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Q1	Q2	Q3	Q4	Q5
Intercept	0.8119 [a]	1.0787 [a]	0.6842 [a]	0.6046 [a]	1.3481 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Blau	-0.0241	0.0269	-0.0772 [c]	-0.1381 [a]	-0.1298 [a]
	(0.5667)	(0.5167)	(0.0873)	(0.0005)	(0.0039)
BoardSize	-0.0540 [b]	-0.0860 [a]	-0.0475	0.0114	0.0077
	(0.0429)	(0.0026)	(0.1233)	(0.6696)	(0.7712)
MktBook	-0.0144 [b]	-0.0094 [a]	-0.0006	-0.0001	-0.0271 [a]
	(0.0261)	(0.0002)	(0.7781)	(0.8265)	(<0.0001)
Leverage	-0.0113	0.0884 [a]	-0.0509	-0.0677 [c]	-0.0378
	(0.7142)	(0.0097)	(0.2006)	(0.0518)	(0.3319)
Div	-0.0168	-0.0268 [b]	-0.0333 [a]	-0.0489 [a]	0.0128
	(0.1578)	(0.0220)	(0.0085)	(0.0002)	(0.4452)
Idiosyncratic	-1.7673 [a]	-0.5274	0.0024	-1.4829 [b]	3.5939 [c]
	(0.0014)	(0.3493)	(0.9974)	(0.0386)	(0.0655)
Illiq	-0.0855	0.0035	-0.0153	0.1776	-9.3082 [a]
	(0.2313)	(0.9215)	(0.8186)	(0.6263)	(0.0039)
Recs	-0.0029 [a]	-0.0030 [a]	-0.0006	-0.0020 [a]	-0.0014 [b]
	(0.0003)	(<0.0001)	(0.4743)	(0.0047)	(0.0172)
Size	-0.0199 [b]	-0.0460 [a]	-0.0099	-0.0082	-0.0793 [a]
	(0.0381)	(<0.0001)	(0.2656)	(0.2195)	(<0.0001)
Adj. R^2	5.36%	11.11%	4.31%	6.26%	20.34%
N	589	576	598	625	606

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.9: Does Diversity Affect Institution-Type Ownership Differently?

Perfem is the proportion of female directors on the board. *BoardSize* is the natural logarithm of the number of directors on the board. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Illiq* is the modified Amihud illiquidity measure. *Recs* is the average number of analyst recommendations for the firm. *Size* is the natural log of a firm's total assets. *Inst. Holdings* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year. The subscript *z* is an indicator for the type of institutions. *Inst. Holdings* is computed by type of institution when *z* is indicated.

.

$$Inst.Holdings_{i,t,z} = \beta_0 + \beta_1 Perfem_{i,t,z} + \beta X_{i,t,z} + \varepsilon_{i,t,z}$$

	Type 1	Type 2	Type 3	Type 4	Type 5
Intercept	0.0380 [a]	0.0255 [a]	0.1508 [a]	0.1756 [a]	0.3235 [a]
	(0.0002)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Perfem	-0.0224 [b]	-0.0112 [a]	-0.0533 [a]	-0.0121	-0.0085
	(0.0154)	(0.0058)	(<0.0001)	(0.3137)	(0.5363)
BoardSize	0.0009	-0.0027	0.0105 [c]	-0.0167 [a]	-0.0202 [a]
	(0.8469)	(0.1704)	(0.0821)	(0.0045)	(0.0026)
MktBook	0.0001	0.00001	-0.0001	0.0001	-0.0001
	(0.6526)	(0.4895)	(0.4421)	(0.8474)	(0.4599)
Leverage	-0.0209 [a]	-0.0040 [c]	-0.0307 [a]	0.0505 [a]	-0.0208 [a]
	(0.0001)	(0.0965)	(<0.0001)	(<0.0001)	(0.0097)
Div	0.0015	0.0010	0.0041	-0.0313 [a]	0.0013
	(0.4676)	(0.2757)	(0.1526)	(<0.0001)	(0.6789)
Idiosyncratic	-0.2888 [a]	-0.2059 [a]	-0.0937	0.3159 [b]	-0.7055 [a]
	(0.0050)	(<0.0001)	(0.4944)	(0.0182)	(<0.0001)
Illiq	-0.0025	0.0136 [a]	-0.0455 [a]	0.0068	-0.0030
	(0.8149)	(0.0039)	(0.0014)	(0.6223	(0.8506)
Recs	-0.0005 [a]	-0.0002 [a]	-0.0005 [a]	-0.0007 [a]	0.0003 [b]
	(<0.0001)	(<0.0001)	(0.0008)	(<0.0001)	(0.0572)
Size	0.0019 [b]	-0.0003	-0.0070 [a]	-0.0034 [a]	-0.0125 [a]
	(0.0267)	(0.4779)	(<0.0001)	(0.0038)	(<0.0001)
Adj. R^2	1.21%	1.94%	3.77%	10.15%	6.04%
N	2,994	2,992	2,994	2,994	2,994

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.10: Does Diversity Affect Institution-Type Ownership Differently? Excluding Tracking Institutions.

Blau is a diversity index. *BoardSize* is the natural logarithm of the number of directors on the board. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Illiq* is the modified Amihud illiquidity measure. *Recs* is the average number of analyst recommendations for the firm. *Size* is the natural log of a firm's total assets. *Inst. Holdings* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year. The subscript *z* is an indicator for the type of institutions. *Inst. Holdings* is computed by type of institution when *z* is indicated.

$$Inst.Holdings_{i,t,z} = \beta_0 + \beta_1 Blau_{i,t,z} + \beta X_{i,t,z} + \varepsilon_{i,t,z}$$

	Type 1	Type 2	Type 3	Type 4	Type 5
Intercept	0.0380 [a]	0.0255 [a]	0.1506 [a]	0.1758 [a]	0.3239 [a]
	(0.0002)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Blau	-0.0148 [b]	-0.0080 [a]	-0.0390 [a]	-0.0057	-0.0007
	(0.0331)	(0.0092)	(<0.0001)	(0.5281)	(0.9436)
BoardSize	0.0010	-0.0026	0.0113 [c]	-0.0170 [a]	-0.0207 [a]
	(0.8249)	(0.1949)	(0.0634)	(0.0043)	(0.0021)
MktBook	0.0001	0.0001	-0.0001	0.0001	-0.0001
	(0.6610)	(0.4960)	(0.4338)	(0.8542)	(0.4537)
Leverage	-0.0210 [a]	-0.0040 [c]	-0.0308 [a]	0.0504 [a]	-0.0210 [a]
	(0.0001)	(0.0932)	(<0.0001)	(<0.0001)	(0.0090)
Div	0.0014	0.0010	0.0038	-0.0314 [a]	0.0012
	(0.4973)	(0.2976)	(0.1741)	(<0.0001)	(0.6994)
Idiosyncratic	-0.2890 [a]	-0.2069 [a]	-0.1004	0.3195 [b]	-0.6977 [a]
	(0.0050)	(<0.0001)	(0.4645)	(0.0171)	(<0.0001)
Illiq	-0.0023	0.0137 [a]	-0.0451 [a]	0.0070	-0.0028
	(0.8297)	(0.0037)	(0.0015)	(0.6146)	(0.8589)
Recs	-0.0005 [a]	-0.0002 [a]	-0.0005 [a]	-0.0007 [a]	0.0003 [c]
	(<0.0001)	(<0.0001)	(0.0008)	(<0.0001)	(0.0552)
Size	0.0019 [b]	0.0003	-0.0070 [a]	-0.0033 [a]	-0.0125 [a]
	(0.0272)	(0.4783)	(<0.0001)	(0.0036)	(<0.0001)
Adj. R^2	1.17%	1.92%	3.74%	10.13%	6.03%
N	2,994	2,992	2,994	2,994	2,994

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 2.11: Robustness Test: Propensity Score Matched Sample

Perfem is the proportion of female directors on the board. *MktBook* is a firm's market-to-book ratio. *Leverage* is a firm's debt-to-total assets ratio. *Div* is an indicator variable equal to one if the firm paid out a dividend in a given year. *Abnormal Return* is the geometric mean of a firm's daily excess return above its expected return using the market model in the given year. *Idiosyncratic* is a firm's diversifiable risk computed using the market model. *Size* is the natural log of a firm's total assets. *All Inst. Ex. Trackers* excludes institutions that invest in every firm in the sample in a given year and institutions that invest in only one firm in a given year.

$$Inst.Holdings_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Ex. Tracking Institutions	
Intercept	0.8751 [a]	0.8772 [a]
	(<0.0001)	(<0.0001)
Perfem	-0.1085 [b]	-
	(0.0375)	
Blau	-	-0.0652 [c]
		(0.0668)
BoardSize	-0.0504 [b]	-0.0501 [b]
	(0.0383)	(0.0432)
MktBook	-0.0080 [b]	-0.0081 [b]
	(0.0244)	(0.0228)
Leverage	-0.0023	-0.0028
	(0.9412)	(0.9299)
Div	-0.0137	-0.0142
	(0.2181)	(0.2057)
Idiosyncratic	-2.8748 [a]	-2.8893 [a]
	(<0.0001)	(<0.0001)
Illiq	-0.0394	-0.0393
	(0.5535)	(0.5543)
Recs	-0.0007	-0.0007
	(0.3020)	(0.3065)
Size	-0.0283 [a]	-0.0286 [a]
	(<0.0001)	(<0.0001)
Adj. R^2	9.97%	9.85%
N	736	736

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively

Table 2.12: Difference-in-Differences using Addition of Female Directors

N is the number of matched pairs in the sample. Δ_0 (Δ_1) is the difference in institutional ownership for non-diverse (diverse) firms from time T to time T+1 where *T+1* denotes the year a firm added its *first* woman to the board. Δ_1 - Δ_0 is the difference in the differences. The control group consists of firms that did not add women to the board and the treatment group consists of firms that added a woman to the board. Firms in both groups were matched based on the smallest difference in firm size. *Treatment* is an indicator variable equal to 1 if the firm is in the treatment group; 0 otherwise. *Period* is an indicator variable equal to 1 if the observation is in the post-treatment period.

$$Inst.Holdings_i = \alpha_0 + \beta_1 Treatment_i + \beta_2 Period_t + \beta_3 Treatment * Period_i + \varepsilon_i$$

	N	Δ_0	Δ_1	Δ_1 - Δ_0
Inst. Holdings%	60	-0.0084	-0.0417 [a]	-0.0333 [c]

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

CHAPTER 3: THE EFFECT OF GENDER DIVERSITY ON FIRM RISK IN EMERGING MARKETS: THE CASE OF INDIA

3.1. Introduction

There is agreement amongst researchers that women tend to be more risk averse and less overconfident than men (Sunden & Surette, 1998; Barber & Odean, 2000). Another stream of literature suggests that the inclusion of women in groups leads to an improvement in the dynamics of the group, thus, increasing the collective performance. Woolley, Chabris, Pentland, Hashmi, and Malone (2010) show that the collective intelligence of a group is driven by the social sensitivity of the individual members and the proportion of female directors in the group. The differences in gender characteristics and changes in group dynamics suggest that the inclusion of women on a board should affect the firm's risk and its profitability. Per the risk-return trade-off theory, a decrease in firm risk driven by gender differences in risk preferences will reduce the financial performance of the firm. The improvement in group dynamics contributes to better deliberations and higher quality decision-making. Hence, decreases in firm risk driven by improvements in group dynamics will increase the financial performance of the firm.

In this essay, we investigate the effect of board gender diversity on firm risk and financial performance in publicly listed Indian firms. Additionally, we examine whether the changes in firm risk and financial performance are a result of differences in gender characteristics or improvements in the dynamics of the board. Prior literature explores the effect of gender diversity in developed markets such as the United States, Europe, Singapore, and Australia. This study is among the first to investigate the effect of board gender diversity in an emerging market. Emerging markets, such as India, are different

from developed markets in their economic infrastructure, cultural traditions, and legal environments. The differences in patriarchal traditions are expected to have an effect on the role women have in society. This essay highlights the effect of gender diversity and group dynamics in a country that is distinctly different than the countries studied in the literature.

We find that board gender diversity is inversely related to firm risk and is proportional to financial performance. The results are robust to several measures of risk such as firm's cash liquidity, stock return variability and future risk, different measures of financial performance such as return on equity (ROE) and return on assets (ROA), and different measures of gender diversity such as the proportion of female directors on the board (Perfem) and the Blau diversity index, which measures diversity in a group using the squared proportions of each sub-group in the group. Our main results indicate that the addition of female directors leads to a reduction in firm risk and an improvement in financial performance. Together, these findings suggest that increases in the collective intelligence of the group, due to increasing diversity, is the main cause of the changes in firm risk and financial performance.

Han and Qui (2007) and Bates, Kahle, and Stulz (2009) provide the theoretical and empirical support for the use of our primary risk variable cash holdings as a fraction of total assets (LIQ). The authors provide evidence that firms with higher cash holdings tend to have higher cash flow volatility and income uncertainty. Our univariate analysis indicates that firms with female directors hold 9.83% less cash than non-diverse firms. In our multivariate model, we find that firms with 10% female representation on the board of Indian firms hold 24.26% less cash with Perfem as diversity measure and 27.63% less cash

with Blau as diversity measures.[22] We also find a negative and statistically significant relationship between gender diversity and stock return variability.

In order to identify how gender diversity affects firm risk we examine financial performance. In our univariate analysis we find that gender diverse firms outperform non-diverse firms by 5.01% and 4.42% using ROE and ROA, respectively, as our measures of financial performance. In the multivariate analysis we find that firms with 10% female representation outperform non-diverse firms by 2.17% (1.98%) using ROE, depending on the *Perfem* (*Blau*) diversity measure. Similarly, we find that diverse firms outperform non-diverse firms by 6.71% (8.05%) using ROA, depending on the *Perfem* (*Blau*) diversity measure.

In our study we focus on endogeneity and implement several robustness tests. First, our primary results are reported using Newey-West t-stat associated p-values to control for heterogeneity and serial correlation. Second, we test our risk and financial performance while controlling for industry and time fixed effects. Additionally, we use clustered standard errors to generate more conservative and exact t-stats. Moreover, our results are robust to propensity score matching using firm size, leverage, and return on assets to generate probability scores for the risk model and firm size and leverage to generate probability scores for the financial performance model.

Our study contributes to the literature by examining the effect of board gender diversity on firm risk and financial performance in India which allow us to study our

[22] We use the estimated coefficients in Table 5 and the median value of the independent variables to compute the difference in cash holdings between diverse and non-diverse firms. For Perfem (Blau) we use 0.00 and 0.10 (0.00 and 0.18) in our estimated model to compute estimated cash holdings for firms with no female directors and 10% female representation on the board. A Blau rating of 0.18 is equivalent to a Perfem of 10%.

hypothesis in a different social, cultural, and economic context. The study is unique in that it studies how gender diversity affects non-financial firms. This is important because studies show some evidence that the effects of gender diversity are mitigated for women in the financial industry. Additionally, we add to literature by providing evidence that improvements in group dynamics is the mechanism responsible for the risk reduction in firms after the addition of female directors.

The rest of this paper proceeds as follows. Section 3.2 reviews the literature and presents our hypothesis. Section 3.3 describes the data. Section 3.4 reviews our methodology. Section 3.5 presents the results of our empirical study. Section 3.6 concludes.

3.2. Prior Literature and Hypothesis Development

In this section, we review the extant literature that is most relevant to our research goals. In particular, we focus on studies that investigate the effect of diversity on firms' financial performance and firm value. Next, we discuss empirical studies that have emphasized the relationship between diversity and firm risk. Lastly, we introduce literature on the ways gender diversity may impact firm risk and financial performance, which allows us to develop our research questions and emphasize our contributions to the literature.

Academic studies have provided evidence of a positive relationship between diversity and ROA and Tobin's Q (Carter, Simkins, & Simpson, 2003; Erhardt, Werbel, & Shrader, 2003). Liu, Wei, and Xie (2014) study the impact of gender diversity on the performance of Chinese firms. The authors find that gender diversity has a positive effect on return on sales and ROA. Additionally, the authors show that the effect is larger in firms that have more than two female directors on the board.

Furthermore, there are also academic studies that do not find a significant relationship between diversity and financial performance and suggest that endogeneity and self-selection may impact the results of diversity studies. Adams and Ferreira (2009) show their results do not hold after controlling for endogeneity. The authors argue that gender quotas may unintentionally reduce firm value for well governed firms, especially if firms are adding less qualified and less experienced directors to the board. Matsa and Miller (2013) study the impact of gender quotas in Norway. The authors find that Norwegian firms experienced fewer workforce reductions and increasing labor costs,which led to a decrease in profits after the gender quota law was passed. Ahern and Dittmar (2012) examine the impact of Norway's gender quota on firm value. The authors find that Norwegian firms lost value, as measured by Tobin's Q, in the years following the announcement of the gender quota.

The extant literature on diversity and firm risk is sparse. Adams and Ferreira (2004) and Hillman, Shropshire, and Cannella (2007) find that firms with higher stock return variability have a lower probability of female presence on the board. The authors measure stock return variability in daily and monthly frequencies. They conclude that firms are less likely to have female directors if the firm is too complex, especially in compensation structure.

More recently, Adams and Ragunathan (2015) study gender diversity in financial institutions around the financial crisis of 2007-2009. The authors use weekly stock return volatility, idiosyncratic risk, tail risk, and Z-score as their main measures of risk. They find that banks with female directors did not take less risk during the crisis and performed better relative to non-diverse banks. They report that women who choose to have careers in

finance tend to be less risk averse than women in the general population and gender differences in risk aversion "almost disappear for men and women in finance." Berger, Kick, and Schaek (2014) examine the effect of age, gender, and education of executive directors on risk-taking by financial institutions. The authors find that younger executive teams and a higher proportion of female executives increase bank risk while an increase in executives with Ph.D. degrees decreases risk.

Gender diversity may impact firm risk and financial performance in different ways. One way diversity may impact firm risk and financial performance is due to gender differences in risk preferences. Prior literature has shown that women are more risk-averse and less overconfident than men (Sunden & Surrette, 1998; Croson & Gneezy, 2009; Barber & Odean, 2000). Thus, behavioral gender differences may explain the differences in risk aversion between men and women. Moreover, Huang and Kisgen (2014) study the financing and acquisition decisions of firms with female CEOs and CFOs. The authors find that firms with female executives have slower growth and are less likely to acquire other firms. Interestingly, acquisitions made by firms with female executives have higher announcement day returns than firms led by male executives. The authors suggest their results are due to the relative overconfidence by men in corporate decision-making. Similarly, Levi, Li, and Zhang (2014) examine the influence of director gender in a mergers and acquisitions setting. The authors conclude that less overconfident female directors are less likely to overestimate the gains from a merger or acquisition than their male counterparts. Firms with more female directors are less likely to initiate a merger or acquisition because they may value the target firm less, due to estimating lower values of

future cash flows or discounting future cash flows at a higher discount rate, than their male counterparts as a result of less overconfidence.

There is some evidence that gender differences in risk preferences are mitigated when controlling for education levels and/or financial expertise (Hibbert, Lawrence, & Prakash, 2013). Similarly, Hardies, Breesch, and Branson (2013) report that self-selection and socialization can eliminate the gender difference in overconfidence. Adams and Funk (2012) use a survey of directors and provide evidence that male and female directors differ in their risk attitudes but in ways that vary from gender differences in the general population. The authors conclude that female directors are more risk-loving than male directors, and thus, board gender diversity may not lead to more risk averse decision making.

Gender diversity may affect firms through a different mechanism. A diverse board may help to introduce new ideas and perspectives that a non-diverse board may lack. Diversity of perspective can have a positive effect on a homogenous group by introducing new ideas and innovations that may improve the effectiveness of a group. Prior literature indicates that diverse groups take longer to reach decisions, have higher quality deliberations, and have more effective communication than groups lacking diversity (Stephenson, 2004; Huse & Solberg, 2006). Furthermore, Woolley, Chabris, Pentland, Hashmi, and Malone (2010) provide evidence of a group intelligence factor.[23] The authors report that the addition of females to a group increases the collective intelligence of the

[23] Collective intelligence is shared intelligence as a result of collaboration, collective effort, and individual competition. It is a characteristic between people of a group and the ways in which they process information. Woolley et al. (2010) show that a collective intelligence factor, *c*, exists and is more than the sum of group members' IQs.

group in addition to the variance of the number of speaking opportunities and individual's average social sensitivity. As a result, the addition of females to a group increases the collective intelligence and, thus, the performance of the group.

Discussion in section 3.2 highlights the relationship between gender diversity and risk aversion. The addition of female directors to the board may alter the risk-taking behavior of the board as a result of gender differences in risk preferences. This may be due to well-defined differences in risk aversion or increasing sensitivity to changes in risk preferences in the decision-making process of the board. Female directors may evaluate future investment opportunities differently through assigning higher discount rates, estimating lower expected cash flows, or assigning lower probabilities of success to the projects in the firm's opportunity set. If female directors are taking less risk because of their risk aversion, then per the risk-return tradeoff theory such firms should expect lower returns because they are investing their funds in safer investment vehicles. Consider the case in which a firm invests all of its free cash flow in a risk-free asset. The firm eliminates all of its risk at the expense of generating a higher rate of return for its shareholders. Hence, we posit that if gender differences in risk preferences affects the board, then we expect to see a decrease in firm risk and a decrease in financial performance.

Furthermore, increasing diversity may lead to an improvement in the dynamics of the board and helps to introduce new ideas and perspectives that a non-diverse board lacks following our discussion. Given that boards with diversity make higher quality decisions and communicate more effectively, improvements in the dynamics of a diverse group may decrease firm risk. As a result, project selection in gender diverse firms may be superior relative to non-diverse firms with respect to firm risk and financial performance. If

improving group dynamics is the cause of a decrease in firm risk, then we posit that such firms will also have higher rates of return because of the increase in collective intelligence and the quality of deliberations. In this case, boards are willing to accept a more optimal level of risk, but still less risk than a non-diverse board, because the improvement in group dynamics will contribute to more accurate forecasts of expected cash flows, probability of success, and the appropriate risk-adjusted discount rate. Thus, if improvements in group dynamics is the underlying mechanism altering firm characteristics, then we expect a decrease in firm risk and an increase in financial performance.

In summary, to determine which underlying mechanism causes changes in firm risk, we must also test the relationship between gender diversity and financial performance. We posit that both gender differences in risk preferences and improvements in group dynamics will lead to a decrease in firm risk. However, we posit that each factor's effect on financial performance will be difference. Gender differences in risk preferences predicts lower financial performance while increases in collective intelligence should improve financial performance. As a result, we are able to determine which mechanism is responsible for changes in firm risk.

First Hypothesis: Firm risk will be lower for firms with more board gender diversity.

$$H_o: Risk_i^1 - Risk_i^0 \geq 0$$

$$H_{A:} Risk_i^1 - Risk_i^0 < 0$$

Second Hypothesis: Financial performance will be higher for firms with board gender diversity.

$$H_o: Performance_i^1 - Performance_i^0 \leq 0$$

$$H_{A:}\, Performance_i^1 - Performance_i^0 > 0$$

The superscript of 1 denotes firms with more gender diversity and 0 denotes firms with less gender diversity.

3.3. Data and Sample Overview

The primary data source for our empirical study is the *Prowess* database maintained by the Centre for Monitoring the Indian Economy (CMIE).[24] The dataset includes information on more than 9,000 companies, which are listed on stock exchanges or consist of unlisted public limited companies having sales exceeding 200 million rupees. As a result, the sample is biased toward large Indian firms since *Prowess* does not include the smallest firms. This database is increasingly used to study topics affecting Indian industries. For example, *Prowess* is employed by Gopalan, Nanda, and Seru (2007) and Khanna and Palepu (2000) to examine the effect of foreign ownership and business group affiliation on the performance of Indian firms. Ghosh (2006) investigates manufacturing firms to examine links between financial performance and the board of directors. Gopalan and Gormley (2013) use Prowess to examine the importance of public equity markets in emerging markets.

In our study, we collect annual firm-level data on stock prices, group and section (industry) classification, and financial statement for all available Indian firms from 2005

[24] We thank Dr. Mehul Raithatha for providing the CMIE data we use in this empirical study.

through 2015.[25] We exclude financial and utility companies from our sample. Our sample includes financial data on more than 1,100 firms and 13,482 firm-year observations. Table 3.1 reports the number of firms, the average proportion of female directors (Perfem), and the average Blau diversity index measure (Blau) for each year in the sample. Table 3.2 shows the proportion of Indian firms with zero, one, and more than one female director from 2005 through 2015. In 2005, the majority of publicly traded Indian firms, approximately 78.55%, had no women on the board. By 2015, only 8.35% of sample firms had zero women on the board as compared to 81.04% of firms that had at least one female director and 10.61% of firms with two or more female directors. We present descriptive statistics for our sample in Table 3.3. On average, firms with female directors hold less cash and have higher growth potential per the market-to-book ratio. Moreover, gender diverse firms are more levered and invest less in current assets than non-diverse firms. Lastly, on average, gender diverse firms in India use their assets less efficiently than firms with no female directors.

3.4. Methodology

In our univariate analysis of risk and financial performance we divided the sample into two groups, firms with zero female directors and firms with at least one female director to compare the differences in risk and financial performance for both groups.

[25] All publicly traded firms in India have a fiscal year beginning in April of year *t* and ending in March of year *t+1*. As a result, financial data for 2016 is not available as of May 2016.

We test the effect of gender diversity on firm risk and control for various firm-level and board characteristics.

$$\begin{aligned} Risk_{i,t} = {} & \beta_0 + \beta_1 Diversity_{i,t} + \beta_2 BoardSize_{i,t} + \beta_3 Ind\_Directors_{i,t} \\ & + \beta_4 FirmSize_{i,t} + \beta_5 Mktbook_{i,t} + \beta_6 Cashflow_{i,t} \\ & + \beta_7 Lev_{i,t} + \beta_8 Capex_{i,t} + \beta_9 R\&D_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

We use two measures of board gender diversity in our model. We compute the proportion of female directors on the board (Perfem) and we construct the Blau (1977) diversity index for each firm-year observation as follows.

$$Blau = 1 - \sum_{i=1}^{n} P_i^2$$

The Blau diversity index measures the diversity of a group by summing the squares of the proportion of each subgroup (male and female) in the group (board of directors). Following our hypothesis, we expect gender diversity to be negatively related to our measures of firm risk given that females tend to be more risk-averse than men and that the addition of women to a group increases the collective intelligence of the group. If all directors have the same gender, then the Blau diversity index of the group is 0. The maximum Blau diversity index of a group depends on the number of subgroups in the group. As the number of subgroups approaches an infinitely large number, the Blau diversity index approaches 1. In our study, we have two subgroups (male and female) and, thus, n = 2 in the Blau equation, which implies a maximum Blau diversity index of 0.50.

Prior literature associates a number of factors that affect cash holdings (LIQ), our proxy of firm risk. Bates, Kahle, and Stulz (2009) examine U.S. cash holdings and find that the large rise in cash holdings is a result of a precautionary demand for cash as a result of firms' cash flows becoming riskier over time. Like Bates et al. (2009) we control for

market-to-book (Mktbook), firm size (Firm size), cash flow (Cashflow), capital expenditures (Capex), leverage (Lev), and research and development expenses (R&D). In addition, we include two corporate governance controls that are related to firm risk: the size of the board of directors (BoardSize) and the proportion of outside directors (OutDirectors).

Mktbook is a proxy for investment opportunities. If a firm has a high Mktbook value, then it typically has a strong investment opportunity set. Firms with stronger investment opportunities are safer and less risky because such firms are likely to produce competitive returns on investment. Thus, we expect a negative relationship between Mktbook and cash holdings, our proxy for risk. Firm size is computed as the logarithm of the book value of total assets. Larger firms tend to hold less cash per the transaction motive, which states that firms hold cash to meet their daily disbursement activities. Larger firms benefit from economies of scale, and thus, the transaction motive argues that larger firms hold less cash.

Cashflow is computed as earnings after taxes, interest, and dividends but before depreciation. Firms with higher levels of Cashflow can accumulate more cash at a faster pace. Thus, we expect firms that generate high levels of Cashflow to be less risky. However, firms that do not invest their accumulated cash holdings tend to be more risky as a lack of investments may be due to the firm having no growth potential.

Capex is used to purchase productive assets that can be held as collateral or lead to increases in productivity. As such, a lack of investment opportunities may cause little investment in productive assets, which limits the firm's ability to expand production and growth. Thus, we expect that firms with higher capital expenditures will have less cash

holdings and be less risky. Lev is total debt divided by total assets. If the firm has a high level of debt, then we expect the firm to be more risky. However, at the same time, firms that have the ability (and financial stability) to accumulate higher levels of debt tend to be less risky. As a result, we have no ex-ante expectations on the relationship between leverage and risk. Additionally, R&D, like Mktbook can serve as a proxy for future investment opportunities because they are expenditures a firm makes to expand its growth potential. Thus, firms that spend more on R&D will have less cash and less risk.

Wang (2012) studies the relationship between board size and firm risk-taking. The author finds that smaller boards are associated with higher future risk, which supports the notion that board size is inversely related to firm risk-taking. We include BoardSize in our model to control for the corporate governance of the firm. We expect larger boards to be less risky and hold less cash. Lastly, academic studies have reported links between director independence and firm risk. Many studies suggest that a higher proportion of independent directors is associated with less firm risk (Ni & Purda, 2012). Thus, we expect a negative relationship between OutDirectors and firm risk.

We perform a univariate analysis by comparing the mean difference in financial performance, measures as ROE and ROA, between diverse and non-diverse firms. Additionally, we study the relationship between return on equity and diversity with the following regression specification.

$$\begin{aligned} Performance_{i,t} = {} & \beta_0 + \beta_1 Diversity_{i,t} + \beta_2 CurrentRatio_{i,t} + \\ & \beta_3 EqMulti_{i,t} + \beta_4 NetProfit_{i,t} + \beta_5 AssetTO_{i,t} + \\ & \beta_6 TIE_{i,t} + \beta_7 FirmSize_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

Boyd, Boland, Dhuyvetter, and Barton (2007) study the determinants of financial performance and find that liquidity, leverage, profitability, and efficiency variables help explain ROE. Firms with low current ratios may have short-term issues financing their obligations. However, firms with high current ratios, although they have sufficient liquidity, may be underinvesting in productive assets, which may harm financial performance and growth. Hence, we have no ex-ante expectations on the relationship between CurrentRatio and financial performance. Additionally, firms that use more debt in their capital structure will have higher EqMulti ratios. Increasing debt may lower financial performance if more revenue is needed to service the debt and if the assets financed with the debt do not produce revenue as intended. Conversely, if the debt-finance productive assets perform well, then increased debt may improve the financial performance of the firm. As a result, we have no ex-ante expectations for the relationship between EqMulti and financial performance.

Next, we control for net profit margin as higher net income leads to higher ROE and return on sales. Thus, we expect a positive relationship between NetProfit and financial performance. Asset turnover controls for the efficiency of the firm. A higher asset turnover indicates a firm is producing more revenue for each dollar in assets it operates with. Thus, we expect more efficient firms to have higher financial performance. Firms with stronger financial performance are better able to service their debt. We expect firms with higher interest coverage ratios to have better financial performance. We also control for economies of scale by including firm size in our model. Larger firms may benefit from the cost savings associated with producing at a larger scale than smaller firms, which increases

net income. As a result, we expect firm size to be positively relative to financial performance.

To help address selection bias and endogeneity, we employ a propensity-score matched sample framework. Following Levi, Li, and Zhang (2014), we generate our probability scores through yearly logit regressions. Our dependent variable is a binary variable indicating the presence of female directors on the board, and the explanatory variables are firm size, leverage, and ROA for the risk model and solely the former two variables for the financial performance model.

Lastly, we run additional tests for the firm risk and financial performance models. The primary empirical setting reports Newey-West t-stat associated p-values, which control for heteroscedasticity and serial correlation. Additionally, in other regression variations we control for industry and time fixed effects as well as clustered standard errors, which control for unobservable factors we may have excluded in the model. Furthermore, we use alternative measures of risk including stock return variability and two measures of future risk, stock return variability for the next 12 and 24 months following Wang (2012).

3.5. Empirical Results

In Table 3.4 we present the results of our univariate analysis in which we compare the differences in risk and financial performance for diverse and non-diverse firms. Our proxy of risk, *LIQ*, is significantly lower for gender diverse firms as diverse firms tend to hold 9.83% less cash than non-diverse firms.[26] There is statistical difference in financial

[26] We compute the percentage difference between the means as the ratio of the absolute difference between the two means and their average.

$$\%Difference = \frac{|Difference|}{Average\ of\ Two\ Means} * 100$$

performance between diverse and non-diverse firms although ROA is higher for firms with female directors.

In Table 3.5 we present the empirical results from our model in equation 1. We run different variations of the model to increase sample size and statistical power. Perfem is negative and statistically significant at the 1% level for both variations of the model. Additionally, Blau is negative and statistically significant for both regressions. The estimated coefficients for Capex and R&D are consistently negative, which is consistent with the idea that firms that invest more in R&D and Capex are less risky. Similarly, BoardSize and OutDirectors are negative, highlighting the notion that larger boards and more independent directors lower firm risk. In Table 3.6 we report the results of the financial performance model. The coefficients of Perfem and Blau are positive but not significant when measuring financial performance using ROE. However, the coefficients for both our diversity measures are positive and statistically significant at the 5% level using ROA as the measure of financial performance. Consistent with our ex-ante expectations, profitability, efficiency, solvency, and firm size are positively and significantly related to financial performance in both our models. Although we had no ex-ante expectations for CurrentRatio and EqMulti, we find that short-term liquidity positively affects financial performance and leverage positively affects ROA. Overall, we find that firms with more board gender diversity tend to be less risky and perform better than firms with no female directors on the board.

In Table 3.7 we report the results of the risk model, controlling for time and industry fixed effects and clustered standard errors. In the fixed model, we find both diversity measures are negative and significant at the 5% level. Moreover, we report clustered

standard errors, in which we cluster by industry, and report that both diversity measures are negative and significant at the 1% level. Interestingly, only Capex and OutDirectors are negative and significant in both models, which is consistent with the idea that higher investments by the firm and more independent directors contribute to decreasing firm risk. Similarly, in Table 3.8 we report the financial performance regression results controlling for time and fixed effects. We report that gender diversity is positively and significantly related to financial performance at the 1% level. Also, we find that profitability, efficiency, firm size, leverage, and interest coverage are positively and significantly related to financial performance for ROE and ROA.

In Table 3.9 we report the results of the propensity score matched sample using variations of the risk model. In each regression, gender diversity is inversely related to firm risk. In addition, we find evidence indicating that boards with more independent directors are less risky. Consistent with prior findings, we find Capex to be negatively associated with firm risk. The coefficients on FirmSize and Mktbook are positively related to firm risk, which is inconsistent with our prediction. However, risk does not appear to be sensitive to changes in firm size and growth opportunities. In Table 3.10 we report the financial performance regression results for the propensity score matched sample. We find that both diversity measures are positively and significantly related to the financial performance of the firm. Similar to prior findings, profitability, efficiency, firm size, and liquidity positively affect financial performance.

In Table 3.11 we report the results of the risk model using our alternative measures of risk and using clustered standard errors. We find that Perfem and Blau are negatively and significantly related to the stock return variability of Indian firms. That is to say that

firms with female directors tend to have less stock return variability. However, our two measures of future risk are negative but not significant in our model. Unlike our other findings, Mktbook and FirmSize are inversely related to our alternative measures of risk, indicating that larger firms with more growth potential are less risky.

3.6. Conclusion

In this essay we examine the relationship between board gender diversity and firm risk and financial performance in publicly listed Indian firms. Previous literature suggests that board gender diversity may impact risk and financial performance. The addition of female directors may decrease risk due to gender differences in risk preferences, i.e. women are more risk averse than men or due to an increase in the collective intelligence of the board. Moreover, lower risk taking due to higher risk aversion will result in lower returns for the firm while increases in the collective intelligence of the group will improve decision-making and forecasts of future project cash flows. We report that board gender diversity is inversely related to firm risk using various measures of risk, such as stock return variability and future stock variability, and positively related to the financial performance of the board, as measured by ROE and ROA. Thus, we provide evidence that changes in the risk and financial performance of the firm are due to the improvement in the dynamics and collective intelligence of boards with gender diversity.

Our results are robust to several endogeneity tests and alternative measures of risk and financial performance. Additionally, we test our risk and financial performance model using a propensity score matched sample, controlling for time and industry fixed effects, using clustered standard errors, and Newey-West t-stat associated p-values. Overall, we

provide evidence that the addition of female directors decreases firm risk and improves financial performance.

Table 3.1. Board Gender Diversity of NSE-Listed Firms

This table reports the measures of board diversity over time. *N* is the number of firms. Perfem is the average percent of female directors on the board of NSE-listed companies. *Blau* reports the average Blau index rating of NSE-listed firms for each year in the sample. The Blau rating ranges from 0, representing no diversity, to 0.50, maximum diversity.

Year	N	PerFem	Blau
2005	1,114	3.01%	0.0490
2006	1,170	3.22%	0.0514
2007	1,201	3.47%	0.0569
2008	1,215	3.51%	0.0598
2009	1,234	3.46%	0.0588
2010	1,253	3.71%	0.0620
2011	1,269	3.65%	0.0625
2012	1,281	3.82%	0.0653
2013	1,279	3.98%	0.0679
2014	1,269	4.29%	0.0735
2015	1,197	10.56%	0.1837

Table 3.2. Proportion of Indian Firms Grouped By Number of Female Directors

This table reports proportion of sample firms with 0, 1, and more than 1 female director on the board. *0*, *1*, and *>1* represent the proportion of firms with zero, one, and more than one female director. *N* is the number of sample firms.

		# Female Directors			
Year	N	0	1	>1	Total
2005	1,114	78.55%	17.86%	3.59%	100.00%
2006	1,170	75.81%	19.40%	4.79%	100.00%
2007	1,201	73.11%	21.15%	5.75%	100.00%
2008	1,215	71.77%	21.98%	6.26%	100.00%
2009	1,234	72.12%	21.47%	6.40%	100.00%
2010	1,253	70.15%	23.38%	6.46%	100.00%
2011	1,269	69.42%	24.43%	6.15%	100.00%
2012	1,281	68.15%	25.21%	6.64%	100.00%
2013	1,279	67.24%	25.57%	7.19%	100.00%
2014	1,269	64.38%	28.21%	7.41%	100.00%
2015	1,197	8.35%	81.04%	10.61%	100.00%

Table 3.3. Descriptive Statistics, 2005-2015

The descriptive statistics of the sample are presented in two groups: firms with no gender diversity (Female = 0) and firms with gender diversity (Female = 1). *N* is the number for firm-year observations. *Mean* is the average of the firm-year observations. *Med* is the median observation. *Std Dev* is the standard deviation of firm-year observations for each variable. *Min* and *Max* are the minimum and maximum value of the variable. Variable definitions are provided in Appendix A.

	Female = 0						Female =1					
	N	Mean	Med	St Dev	Min	Max	N	Mean	Med	St Dev	Min	Max
Dependent Variables												
Liq	8,789	0.07	0.03	0.10	0.001	0.60	4,668	0.06	0.03	0.09	0.001	0.60
ROE	8,744	0.11	0.12	0.28	-1.35	1.17	4,665	0.11	0.11	0.26	-1.35	1.17
ROA	8,100	0.04	0.04	0.08	-0.28	0.27	4,338	0.04	0.04	0.07	-0.28	0.27
Independent Variables												
Mktbook	6,947	1.55	0.89	2.18	-0.92	14.60	4,129	1.97	1.03	2.67	-0.92	14.60
Firm_Size	8,812	22.19	22.18	1.87	11.51	28.93	4,670	22.66	22.54	1.77	12.61	29.01
CashFlow	5,369	0.09	0.08	0.08	-1.96	0.90	3,087	0.09	0.08	0.07	-1.29	0.76
Lev	8,812	0.61	0.59	0.82	0	66	4,670	0.57	0.56	0.58	0	32.82
R&D	3,224	0.01	0.003	0.039	0	1	1,896	0.01	0.003	0.05	0	1.20
Capex	8,536	0.32	0.26	0.47	0	33.31	4,587	0.30	0.25	0.28	0.002	6.11

Table 3.3 (Continued). Descriptive Statistics, 2005-2015

	Female = 0						Female =1					
	N	Mean	Med	St Dev	Min	Max	N	Mean	Med	St Dev	Min	Max
CurrentRatio	8,737	2.76	1.68	3.88	0.08	37.17	4,663	2.57	1.45	4.04	0.08	37.17
EqMulti	8,097	2.07	1.59	1.68	0.60	14.99	4,338	2.19	1.63	1.90	0.60	14.99
NetProfit	4,621	0.08	0.05	1.05	-2.98	24.47	4,621	0.06	0.05	0.91	-2.98	24.47
AssetTO	8,034	0.93	0.82	0.62	0.001	3.22	4,314	0.85	0.72	0.61	0.001	3.22
TIE	8,246	44.43	2.82	193.86	-26.48	1538	4,456	54.06	2.93	220.47	-26.48	1538

Table 3.4. Univariate Analysis of Risk and Performance Measures

The univariate statistics of the sample are presented in two groups: firms with no gender diversity (Female = 0) and firms with gender diversity (Female = 1). *N* is the number of firm-year observations. *Mean* is the sample average of the variable of interest. *Std Dev* is the standard deviation. Variable definitions are provided in Appendix A.

	Female = 0			Female = 1			Difference in Means	
Var	N	Mean	Std Dev	N	Mean	Std Dev	Difference	P-value
Liq	8,789	0.0651	0.10	4,668	0.059	0.09	-0.0061[a]	0.0003
ROE	8,744	0.1117	0.28	4,665	0.1061	0.26	-0.0056	0.2580
ROA	8,100	0.0411	0.08	4,338	0.0430	0.07	0.0019	0.1639

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.5. Does Gender Diversity Affect Firm Risk?

This table reports the results from our model of firm risk (LIQ) using Perfem and Blau as alternative measures of diversity. The first and third column report the results using a limited version of the model while the second and fourth column report he results using the full model. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$LIQ_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	LIQ			
Intercept	0.0190	0.0705 [c]	0.0183	0.0694 [c]
	(0.5023)	(0.0698)	(0.5202)	(0.0740)
Perfem	-0.0536 [a]	-0.0959 [a]	---	---
	(0.0073)	(0.0009)		
Blau	---	---	-0.0314 [b]	-0.0585 [a]
			(0.0108)	(0.0007)
Board_Size	-0.0146	0.0115	-0.0144	0.0118
	(0.1022)	(0.2299)	(0.1067)	(0.2162)
OutDirectors	-0.0461 [a]	-0.0696 [a]	-0.0460 [a]	-0.0695 [a]
	(0.0002)	(<0.0001)	(0.0002)	(<0.0001)
Firm_Size	0.0051 [a]	0.0030 [c]	0.0051 [a]	0.0030 [c]
	(0.0010)	(0.0604)	(0.0010)	(0.0584)
Mktbook	0.0053 [a]	0.0055 [a]	0.0053 [a]	0.0055 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
CashFlow	0.0576 [b]	0.0264	0.0576 [b]	0.0261
	(0.0197)	(0.3976)	(0.0197)	(0.4034)
Lev	-0.0614 [a]	-0.1168 [a]	-0.0614 [a]	-0.1168 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	---	-0.0655 [a]	---	-0.0657 [a]
		(<0.0001)		(<0.0001)
R&D*(1,000,000)	---	-1.72	---	-1.73
		(0.2493)		(0.2466)
Adj. R^2	6.79%	13.95%	6.78%	13.98%
N	6,911	3,484	6,911	3,484

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.6. Do Indian Firms Perform Better With More Diversity on the Board?
This table reports the results from our model of performance (Return on Equity and Return on Assets) using Perfem and Blau as alternative measures of diversity. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$Performance_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Return on Equity		Return on Assets	
Intercept	-0.0971 [a]	-0.0966 [a]	-0.1234 [a]	-0.1230 [a]
	(0.0161)	(0.0164)	(<0.0001)	(<0.0001)
Perfem	0.0193	---	0.0210 [b]	---
	(0.5661)		(0.0160)	
Blau	---	0.0112	---	0.0144 [b]
		(0.6250)		(0.0147)
CurrentRatio	0.0027 [a]	0.0027 [a]	0.0018 [a]	0.0018 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
EqMulti	-0.0007 [a]	-0.0007	0.0073 [a]	0.0073 [a]
	(0.6535)	(0.6545)	(<0.0001)	(<0.0001)
NetProfit	0.0272 [a]	0.2718 [a]	0.0185 [a]	0.0185 [a]
	(0.0002)	(0.0002)	(<0.0001)	(<0.0001)
Asset TO	0.0856 [a]	0.0856 [a]	0.0406 [a]	0.0406 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
TIE	0.0002 [a]	0.0002 [b]	0.0001 [a]	0.0001 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	0.0050 [a]	0.0050 [a]	0.0047 [a]	0.0047 [a]
	(0.0021)	(0.0021)	(<0.0001)	(<0.0001)
ADJ. R^2	5.54%	5.54%	24.45%	24.45%
N	10,949	10,949	10,949	10,949

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.7. Robustness: Industry and Time Fixed Effects and Industry-Level Clustering

This table reports the results from our model of firm risk (LIQ) using Perfem and Blau as alternative measures of diversity. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$LIQ_{i,t} = \beta_1 Diversity_{i,t} + \beta X_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	Fixed Effects		Clustered Standard Errors	
Intercept			0.0705	0.0694
			(0.3974)	(0.4037)
Perfem	-0.0567 [b]	---	-0.0959 [a]	---
	(0.0142)		(0.0004)	
Blau	---	-0.0346 [b]	---	-0.0585 [a]
		(0.0122)		(0.0003)
Board_Size	0.0070	0.0072	0.0115	0.0118
	(0.2000)	(0.1867)	(0.5235)	(0.5111)
OutDirectors	-0.0675 [a]	-0.0675 [a]	-0.0696 [b]	-0.0694 [b]
	(<0.0001)	(<0.0001)	(0.0143)	(0.0143)
Firm_Size	0.0014	0.0014	0.0030	0.0030
	(0.2085)	(0.2061)	(0.2322)	(0.2285)
Mktbook	0.0065 [a]	0.0065 [a]	0.0055 [a]	0.0055 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
CashFlow	-0.0130	-0.0130	0.0264	0.0261
	(0.5542)	(0.5539)	(0.2916)	(0.2961)
Lev	-0.1174 [a]	-0.1183 [a]	-0.1168 [a]	-0.1168 [a]
	(<0.0001)	(<0.0001)	(0.0001)	(0.0001)
Capex	-0.0611 [a]	-0.0612 [a]	-0.0655 [a]	-0.0657 [a]
	(<0.0001)	(<0.0001)	(0.0021)	(0021)
R&D*(1,000,000)	0.9341	-0.9406	-1.70	-1.70
	(0.4015)	(0.3983)	(0.3432)	(0.3411)
Industry FE	Yes	Yes	No	No
Time FE	Yes	Yes	No	No
R^2	18.57%	18.58%	14.17%	13.98%
N	3,484	3,484	3,484	3,484

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.8. Robustness: Performance Fixed Effects

This table reports the results from our model of performance (Return on Equity and Return on Assets) using Perfem and Blau as alternative measures of diversity. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$Performance_{i,t} = \beta_1 Diversity_{i,t} + \beta X_{i,t} + \gamma_i + \lambda_t + \varepsilon_{i,t}$$

	Return on Equity		Return on Assets	
Perfem	0.1052 [a]	---	0.0530 [a]	---
	(0.0059)		(<0.0001)	
Blau	---	0.0779 [a]	---	0.0398 [a]
		(0.0016)		(<0.0001)
CurrentRatio	-0.0006	-0.0006	0.0007 [a]	0.0007 [a]
	(0.5136)	(0.5081)	(0.0009)	(0.0010)
EqMulti	0.0032 [c]	0.0032 [c]	0.0087 [a]	0.0087 [a]
	(0.0850)	(0.0855)	(<0.0001)	(<0.0001)
NetProfit	0.0241 [a]	0.0241 [a]	0.0174 [a]	0.0174 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Asset TO	0.0806 [a]	0.0806 [a]	0.0401 [a]	0.0401 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
TIE	0.0002 [a]	0.0002 [b]	0.0001 [a]	0.0001 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	0.0099 [a]	0.0098 [a]	0.0062 [a]	0.0062 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Industry F.E.	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
ADJ. R^2	9.60%	9.62%	30.35%	30.42%
N	10,949	10,949	10,949	10,949

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.9. Propensity Score Matched Sample: Firm Liquidity

This table reports the results from our model of firm risk (LIQ) using Perfem and Blau as alternative measures of diversity. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$LIQ_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	LIQ			
Intercept	0.0411 [b]	0.0952 [a]	0.0399 [c]	0.0941 [a]
	(0.0509)	(0.0023)	(0.0577)	(0.0026)
Perfem	-0.0512 [a]	-0.0826 [a]	---	---
	(0.0053)	(0.0033)		
Blau	---	---	-0.0292 [a]	-0.0512 [a]
			(0.0093)	(0.0023)
Board_Size	-0.0087 [c]	0.0069	-0.0084 [c]	0.0073
	(0.0761)	(0.3510)	(0.0870)	(0.3259)
OutDirectors	-0.0515 [a]	-0.0855 [a]	-0.0513 [a]	-0.0855 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Firm_Size	0.0047 [a]	0.0029 [b]	0.0047 [a]	0.0030 [b]
	(<0.0001)	(0.0372)	(<0.0001)	(0.0361)
Mktbook	0.0057 [a]	0.0060 [a]	0.0057 [a]	0.0060 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
CashFlow	0.0001	-0.0487 [a]	0.0003	-0.0484 [a]
	(0.9958)	(0.0060)	(0.9828)	(0.0062)
Lev	-0.0934 [a]	-0.1322 [a]	-0.0933 [a]	-0.1319 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	---	-0.0244 [a]	---	-0.00244 [a]
		(0.0094)		(0.0095)
R&D*(1,000,000)	---	-0.7620	---	-0.0769
		(0.6795)		(0.6766)
Adj. R^2	10.01%	14.78%	9.99%	14.81%
N	3,937	2,027	3,937	2,027

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.10. Propensity Score Matched Sample: Financial Performance

This table reports the results from our model of performance (Return on Equity and Return on Assets) using Perfem and Blau as alternative measures of diversity. The p-values reported in parentheses are the Newey-West t-stat associated p-values. Variable definitions are provided in Appendix A.

$$Performance_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Return on Equity		Return on Assets	
Intercept	-0.1810 [a]	-0.1796 [a]	-0.1216 [a]	-0.1214 [a]
	(0.0005)	(0.0005)	(<0.0001)	(<0.0001)
Perfem	0.1140 [a]	---	0.0462 [a]	---
	(0.0088)		(<0.0001)	
Blau	---	0.0810 [a]	---	0.0344 [a]
		(0.0051)		(<0.0001)
CurrentRatio	0.0023 [b]	0.0023 [b]	0.0015 [a]	0.0015 [a]
	(0.0331)	(0.0318)	(<0.0001)	(<0.0001)
EqMulti	0.0002	0.0001	0.0063 [a]	0.0063 [a]
	(0.9406)	(0.9551)	(<0.0001)	(<0.0001)
NetProfit	0.0235 [a]	0.0235 [a]	0.0143 [a]	0.0143 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Asset TO	0.0873 [a]	0.0874 [a]	0.0399 [a]	0.0340 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
TIE	0.0002 [a]	0.0002 [b]	0.0001 [a]	0.0001 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Size	0.0085 [a]	0.0084 [a]	0.0048 [a]	0.0048 [a]
	(<0.0001)	(0.0021)	(<0.0001)	(<0.0001)
ADJ. R^2	5.91%	5.93%	22.84%	22.90%
N	5,495	5,495	5,495	5,495

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

Table 3.11. Regression Analysis with Alternative Risk Measures

This table reports the panel regression of total stock return variability, using the previous 5 years of monthly stock returns for each firm, on the fraction of female directors (Perfem) and control variables. Additionally, the table reports the results from the regression using future stock return volatility over the next 12 months, and future stock return volatility over the next 24 months. We report p-values associated with the industry clustered standard errors. P-values are in parentheses. Variable definitions are provided in Appendix A.

$$Risk_{i,t} = \beta_0 + \beta_1 Diversity_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}$$

	Total Risk		SD12		SD24	
Intercept	0.2845 [a]	0.2842 [a]	0.2698 [a]	0.2697 [a]	0.2907 [a]	0.2907 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Perfem	-0.0258 [b]	---	-0.0053	---	-0.0038	---
	(0.0451)		(0.5457)		(0.6522)	
Blau	---	-0.0165 [b]	---	-0.0034	---	-0.0026
		(0.0382)		(0.5417)		(0.6243)
Board_Size	0.0003	0.0004	-0.0066 [a]	-0.0066 [a]	-0.0041	-0.0040
	(0.9113)	(0.8821)	(0.0033)	(0.0031)	(0.1581)	(0.1558)
OutDirectors	0.0075	0.0076	-0.0083	-0.0083	-0.0048	-0.0048
	(0.2209)	(0.2165)	(0.2212)	(0.2230)	(0.3877)	(0.3900)
Firm_Size	-0.0073 [a]	-0.0073 [a]	-0.0064 [a]	-0.0064 [a]	-0.0075 [a]	-0.0075 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Mktbook	-0.0039 [a]	-0.0039 [a]	-0.0045 [a]	-0.0045 [a]	-0.0041 [a]	-0.0041 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
CashFlow	0.0266 [b]	0.0265 [b]	-0.0311 [a]	-0.0311 [a]	-0.0334 [a]	-0.0034 [a]
	(0.0176)	(0.0178)	(0.0068)	(0.0069)	(0.0026)	(0.0026)
Lev	0.0831 [a]	0.0831	0.0800 [a]	0.0801 [a]	0.0849 [a]	0.0849 [a]
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Capex	-0.0204 [c]	-0.0205 [c]	-0.0061	-0.0061	-0.0085	-0.0085
	(0.0991)	(0.0985)	(0.5193)	(0.5190)	(0.4206)	(0.4203)
R&D*(1,000,000)	-2.1000 [a]	-2.1000 [a]	-0.5000	-0.5000	-0.3000	-0.3000
	(0.0002)	(0.0002)	(0.2036)	(0.2037)	(0.4135)	(0.4131)
R^2	18.99%	19.00%	14.87%	14.88%	19.17%	19.18%
N	3,474	3,474	3,484	3,484	3,484	3,484

Note: a, b, and c denote significance at the 1%, 5%, and 10% level, respectively.

REFERENCES

Adams, R. B., Ferreira, D. (2004). Gender diversity in the boardroom. Unpublished working paper. No.58/2004 (Finance), European Corporate Governance Institute (ECGI).

Adams, R. B., Ferreria, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* 94, 291-309.

Adams, R.B., Funk, P. (2012). Beyond the glass ceiling: does gender matter? *Management Science* 58, 219-235.

Adams, R.B., Ragunathan,V. (2015). Lehman sisters. Unpublished FIRN Working Paper. Available at SSRN: http://ssrn.com/abstract=2380036.

Agarwal, V., Jiang, W., Tang, Y., Yang, B. (2013). Uncovering hedge fund skill from the portfolio holdings they hide. *The Journal of Finance* 68, 739-783.

Agnew, J., Balduzzi, P., Sunden, A. (2003). Portfolio choice and trading in a large 401(k) plan. *The American Economic Review* 93, 193-215.

Ahern, K.R., Dittmar, A.K. (2012). The changing of the boards: the impact on firm valuation of mandated female board representation. *Quarterly Journal of Economics* 127, 137-197.

Ajinkya, B., Bhojraj, S., Sengupta, P. (2005). The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of Accounting Research* 43, 343-376.

Ali, A., Klasa, S., Li, O.Z. (2008). Institutional stakeholdings and better-informed traders at earnings announcements. *Journal of Accounting and Economics* 46, 47-61.

Amihud, Y., Li, K. (2006). The declining information content of dividend announcements and the effects of institutional holdings. *Journal of Financial and Quantitative Analysis* 41, 637-660.

Barber, B. M., Odean, T. (2001). Boys will be boys: gender, overconfidence and common stock investments. *Quarterly Journal of Economics* 116, 261-292.

Bates, T.W., Kahle, K.M., Stulz, R.M. (2009). Why do U.S. firms hold so much more cash than they used to? *The Journal of Finance* 64, 1985-2021.

Berger, A.N., Kick, T., Schaeck, K. (2014). Executive board composition and bank risk taking. *Journal of Corporate Finance* 28, 48-65.

Beyer, S., Bowden, E.M. (1997). Gender differences in self-perceptions: convergent evidence from three measures of accuracy and bias. *Personality and Social Psychology Bulletin* 23, 157-172.

Blair, B.J., Poon, S., Taylor, S.J. (2001). Modelling S&P 100 volatility: the information content of stock returns. *Journal of Banking and Finance* 25, 1665-1679.

Blau, P.M. (1977). A Macrosociological theory of social structure. *The American Journal of Sociology* 83, 26-54.

Boehmer, E., Kelley, E. (2009). Institutional investors and the informational efficiency of stock prices. *Review of Financial Studies* 22, 3563-3594.

Boyd, S., Boland, M., Dhuyvetter, K., Barton, D. (2007). Determinants of return on equity in U.S. local farm supply and grain marketing cooperatives. *Journal of Agricultural and Applied Economics* 39, 201-210.

Brown, S., Hillegeist S.A. (2007) How disclosure quality affects the level of information asymmetry. *Review of Accounting Studies* 12, 443-477.

Carter, D.A., D'Souza, F., Simkins, B.J., Simpson, W.G. (2010). The gender and ethnic diversity of U.S. boards and board committees and firm financial performance. *Corporate Governance: An International Review* 18, 396-414.

Carter, D.A., Simkins, B.J., Simpson, W.G. (2003). Corporate governance, board diversity, and firm value. *The Financial Review* 38, 33-53.

Chakravarty, S. (2001). Stealth-trading: which traders' trades moves stock prices?. *Journal of Financial Economics* 61, 289-307.

Chari, V.V., Jagannathan, R., Ofer, A.R. (1988), Seasonalities in security returns: the case of earnings announcements. *Journal of Financial Economics* 21, 101-121.

Charness, G., Gneezy, U. (2012). Strong evidence for the gender differences in risk taking. *Journal of Economic Behavior & Organization* 83, 50-58.

Christensen, B.J., Prabhala, N.R. (1998). The relation between implied and realized volatility. *Journal of Financial Economics* 50, 125-150.

Croson, R., Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic Literature* 47, 448-474.

Durnev, A., Morck, R., Yeung, B., Zarowin, P. (2003). Does greater firm-specific return variation mean more or less informed stock pricing? *Journal of Accounting Research* 41, 797-836.

Ederington, L. H., Guan, W. (2002). Is implied volatility an informationally efficient and effective predictor of future volatility? *Journal of Risk* 4, 29-46.

Erhardt, N.L., Werbel, J.D., Shrader, C.B. (2003). Board of director diversity and firm financial performance. *Corporate Governance: An International Review* 11, 102-111.

Fama, E.F., French, K.R. (1992). The cross-section of expected stock returns. *The Journal of Finance* 47, 427-465.

Fleming, J. (1998). The quality of market volatility forecasts implied by S&P 100 index option prices. *Journal of Empirical Finance* 5, 317-345.

Fleming, J., Ostdiek, B., Whaley, R.E. (1995). Predicting stock market volatility: a new measure. *Journal of Futures Markets* 15, 265-302.

Ghosh, S. (2006). Do board characteristics affect corporate performance? Firm-level evidence for India. *Applied Economics Letters* 13, 435-443.

Gompers, P.A., Metrick, A. (2001). Institutional investors and equity prices. *Quarterly Journal of Economics* 116, 229-259.

Gopalan, R., Gormley T.A. (2013). Do public equity markets matter in emerging economics? Evidence from India. *Review of Finance* 17, 1571-1615.

Gopalan, R., Nanda, V., Seru, A. (2007). Affiliated firms and financial support: evidence from Indian business groups. *Journal of Financial Economics* 86, 759-795.

Gul, F.A., Hutchinson, M., Lai, K.M.Y. (2013). Gender-diverse boards and properties of analyst earnings forecasts. *Accounting Horizons* 27, 511-538.

Gul, F.A., Srinidhi, B., Ng, A.C. (2011). Does board gender diversity improves the informativeness of stock prices? *Journal of Accounting and Economics* 51, 314-338.

Han, S., Qui, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance* 13, 43-57.

Hardies, K., Breesch, D., Branson, J. (2013). Gender differences in overconfidence and risk taking: do self-selection and socialization matter? *Economics Letters* 118, 442-444.

Hibbert, A.M., Lawrence, E.R., Prakash, A.J. (2013). Does knowledge of finance mitigate gender difference in financial risk aversion? *Global Finance Journal* 24, 140-152.

Hillman, A.J., Shropshire, C., Cannella Jr., A.A. (2007). Organizational predictors of women on corporate boards. *The Academy of Management Journal* 50, 941-952.

Huang, J., Kisgen, D.J. (2014). Gender and Corporate Finance: Are Male Executives Overconfident Relative to Female Executives? *Journal of Financial Economics* 108, 822-839.

Huse, M., Solberg, A. (2006). How Scandinavian woman make and can make contributions on corporate boards. *Women in Management Review* 21, 113-130.

Jianakoplos, N.A., Bernasek, A. (1998). Are Women More Risk Averse? *Economic Inquiry* 36, 620-630.

Khanna, T., Palepu, K. (2000). Is group membership profitable in emerging markets. An analysis of diversified Indian business groups. *Journal of Finance* 55, 867-891.

Kyle, A.S. (1985). Continuous auctions and insider trading. *Econometrica* 53, 1315-1336.

Levi, M., Li, K., Zhang, F. (2014). Director gender and mergers and acquisitions. *Journal of Corporate Finance* 28, 185-200.

Liu, Y., Wei, Z., Xie, F. (2014). Do women directors improve firm performance in China? *Journal of Corporate Finance* 28, 169-184.

Llorente, G., Michaely, R., Saar, G., Wang, J. (2002) Dynamic volume-return relation of individual stocks. *The Review of Financial Studies* 15, 1005-1047.

Lo, A.W., MacKinlay, A.C. (1990) An econometric analysis of nonsynchronous trading. *Journal of Econometrics* 45, 181-211.

Lundeberg, M.A., Fox, P.W., Puncochar, J. (1994). Highly confident but wrong: gender differences and similarities in confidence judgments. *Journal of Educational Psychology* 86, 114-121.

Matsa, D.A., Miller, A.R. (2013). A female style in corporate leadership? Evidence from quotas. *American Economic Journal: Applied Economics* 5, 136-169.

McLaughlin, R., Safieddine, A., Vasudevan, G.K. (1998). The information content of corporate offerings of seasoned securities: an empirical analysis. *Financial Management* 27, 31-45.

Michaely, R., Popadak, J.A., Vincent, C.J. The deleveraging of U.S. firms and institutional investors' role (June 5, 2015). Available at SSRN: http://ssrn.com/abstract=1941902.

Miller, M. H., Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *The Journal of Business* 34, 411-433.
Ni, Y., Purda, L.D. (March 25, 2012). Does monitoring by independent directors reduce firm risk? Available at SSRN: http://ssrn.com/abstract=1986289.

O'Neill, M., Swisher, J. (2003). Institutional investors and information asymmetry: an event study of self-tender offers. *The Financial Review* 38, 197-211.

Opler, T., Pinkowitz, L., Stulz, R., Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Political Economy* 105, 1061-1079.

Poon, S., Granger, C.W.J. (2003). Forecasting volatility in financial markets: a review. *Journal of Economic Literature* 41, 478-539.

Puckett, A., Yan, X. (2011). The interim trading skills of institutional investors. *The Journal of Finance* 66, 601-633.

Riddick, L.A., Whited, T.M. (2009). The corporate propensity to save. *The Journal of Finance* 64, 1729-1766.

Sridharan, S.A. (2015). Volatility forecasting using financial statement information. In Press. *The Accounting Review*.

Srinidhi, B., Gul, F.A., Tsui, J.S.L. (2011). Female directors and earnings quality. *Contemporary Accounting Research* 28, 1610-1644.

Stephenson, C. (2004). Leveraging diversity to maximum advantage: the business case for appointing more women to boards. *Ivey Business Journal* (September-October), 4-9.

Sunden, A.E., Surette, B.J. (1998). Gender differences in the allocation of assets in retirement savings plans. *The American Economic Review* 88, 207-211.

Szakmary, A., Ors., E., Kim, J.K., Davidson III, W.N. (2003). The predictive power of implied volatility: evidence from 35 futures markets. *Journal of Banking & Finance* 27, 2151-2175.

Tong, S., Ning, Y. (2004). Does capital structure affect institutional investor choices?. *Journal of Investing* 13, 53-66.

Upadhyay, A., Sriram, R. (2011). Board size, corporate information environment and cost of capital. *Journal of Business Finance & Accounting* 38, 1238-1261.

Vayanos, D. (1999). Strategic trading and welfare in a dynamic market. *Review of Economic Studies* 66, 219-254.

Wang, C. (2012). Board size and firm risk-taking. *Review of Quantitative Finance and Accounting* 38, 519-542.

Watson, J., McNaughton, M. (2007). Gender differences in risk aversion and expected retirement benefits. *Financial Analysts Journal* 63, 52-62.

Woolley, A.W., Chabris, C.F., Pentland, A., Hashmi, N., Malone, T.W. (2010). Evidence for a collective intelligence factor in the performance of human groups. *Science* 330, 686-688.

Yan, X., Zhang, Z. (2009). Institutional investors and equity returns: are short-term institutions better informed? *The Review of Financial Studies* 22, 893-92

APPENDIX

APPENDIX A

ANALYTICAL AND GRAPHICAL ANALYSIS OF DIVERSITY FUNCTIONS

Define $f \equiv$ *proportion of female directors* and $m \equiv$ *proportion of male directors*. Then, our diversity measures can be written as functions of *f*.

$$Perfem(f) = f \tag{1}$$

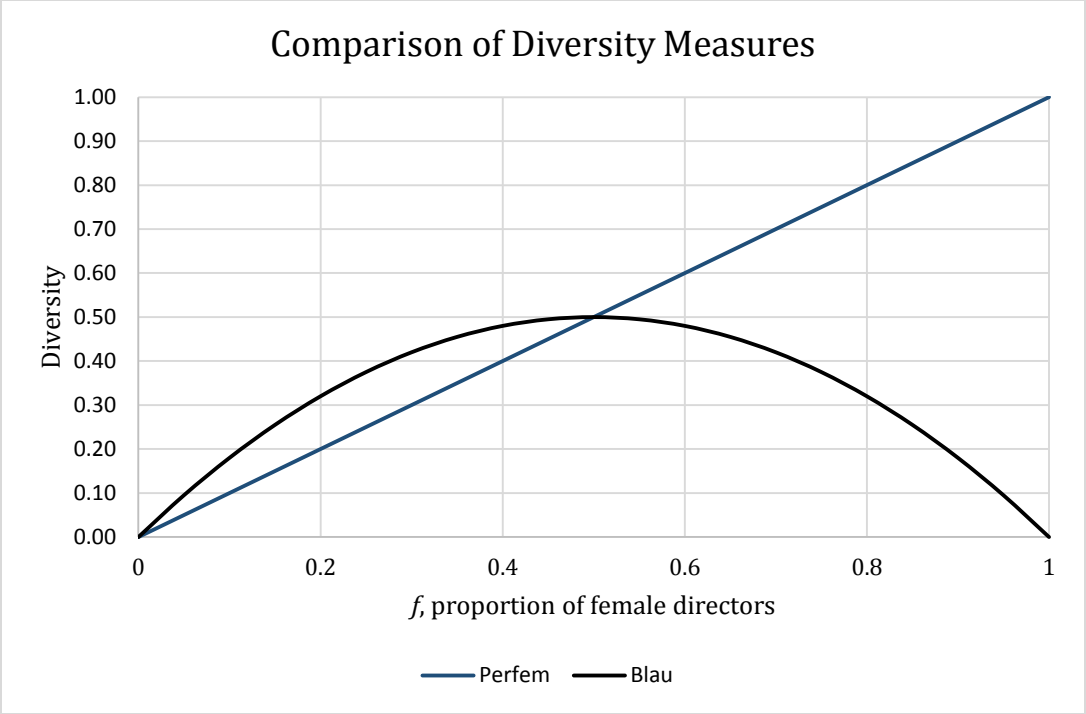
$$Blau(f) = 1 - \sum_{i=1}^{2} p_i^2 = 1 - (f^2 + m^2) \tag{2}$$

We can rewrite equation (2) solely as a function of *f* by substituting *1-f* for *m* (because *f* + *m=1*). This results in equation (4).

$$Blau(f) = -2f^2 + 2f \tag{4}$$

Advantages of Blau Over Perfem

Perfem is a linear objective function, and thus, its extrema occur at corner solutions (0% or 100% females). *Blau* is a quadratic objective function that can be maximized when we take the derivative with respect to *f* and solve for the critical point in which diversity is maximized. Setting the first derivative equal to zero, we find that *Blau* is maximized when *f*=0.50 or 50%. The second derivative with respect to *f* confirms that 0.50 is a maximum point.



In Figure 1, we plot the two diversity functions, *Perfem* and *Blau*. As mentioned earlier, we can see that *Blau* is maximized when the proportion of female directors is exactly 50%. The analysis reveals two important benefits of using *Blau* over *Perfem*:

1) *Perfem* fails to parsimoniously measure diversity when *f* is greater than 0.50. *Perfem* incorrectly translates an all-female board as perfect diversity.

2) Since *Perfem* is a linear function, the proportion of female directors has a constant, positive marginal effect on diversity, i.e. going from 0% to 10% has the same marginal effect as going from 10% to 20% and so on. However, this is not the case with *Blau* as the marginal effect on diversity is higher when going from 0% to 10% than when going from 10% to 20% and so on until 50% is reached when, unlike *Perfem*, the *Blau* index begins to have a negative marginal effect to correctly measure the fact that 100% females is 0 diversity.

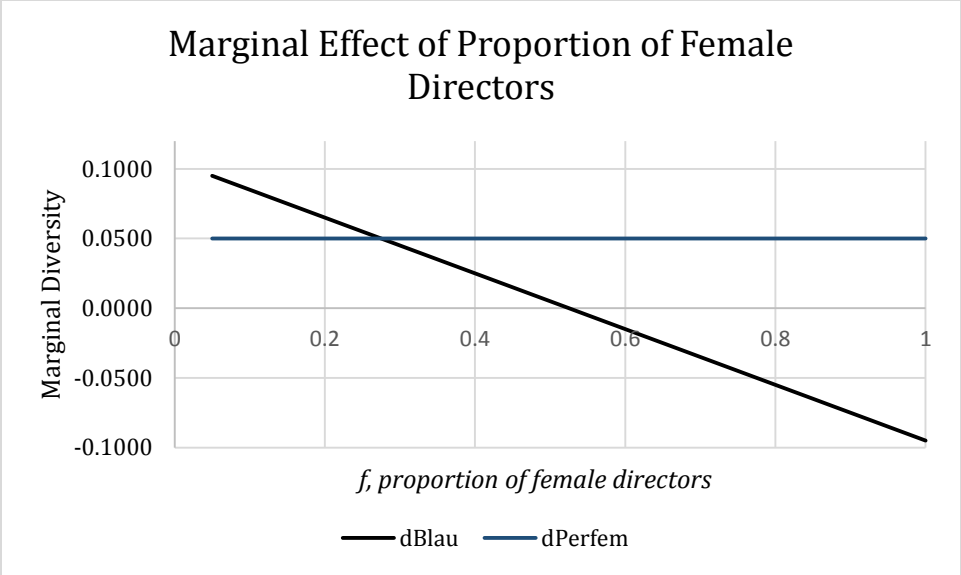


Figure 2 highlights the second benefit of using the *Blau* index by comparing the slopes of the diversity functions across different levels of *f*. It is clear that *Perfem* has the same positive effect on diversity and is incorrectly increasing its diversity function as *f* approaches 1 (100%). Additionally, it is clear that *Blau* more strongly affects diversity than *Perfem* when going from 0% to 10% and, eventually, begins to have a negative effect on diversity (when $f = 0.50$ or slope = 0). This is beneficial as the effect of adding the first and second woman will impact the firm more strongly than adding a fourth or fifth woman to the board.

VITA

JODONNIS RODRIGUEZ

Born, Miami, Florida

2005-2009	B.A., Business Administration University of Florida Gainesville, Florida
2009-2010	M.A., International Business University of Florida Gainesville, Florida
2011-2012	M.S., Finance Florida International University Miami, Florida
2012-2016	Doctoral Candidate Florida International University Miami, Florida

WORKING PAPERS AND PRESENTATIONS

Lawrence, E.R., Dandapani, K., Rodriguez, J. Determinants of Online Banking. *Journal of Financial Services Research* (Revise and Resubmit, *Journal of Financial Services Research*).

Rodriguez, J., Hamid, S. (2014). *Cash Reserves, Risk, and Financial Distress: An Asset Pricing Perspective*. Paper presented at the Global Finance Association 2014 Annual Meeting, Dubai, UAE.

Lawrence, E., Dandapani, K., Rodriguez, J. (2014). *Determinants of Online Banking.* Paper presented at the World Finance & Banking Symposium 2014 Annual Meeting, Singapore, Singapore.

Lawrence, E., Dandapani, K., Rodriguez, J. (2015). *Determinants of Online Banking.* Paper presented at the Southwestern Finance Association 2015 Annual Meeting, Houston, Texas.

Rodriguez, J., Lawrence, E. (2015). *The Impact of Board Gender Diversity on Firms' Risk and Financial Performance*. Paper presented at The Academy of Behavioral Finance & Economics 2015 Annual Meeting, Philadelphia, Pennsylvania.

Rodriguez, J., Lawrence, E. (2015). *The Impact of Board Gender Diversity on Firms' Risk and Financial Performance*. Paper presented at the Southern Finance Association 2015 Annual Meeting, Captiva Island, Florida.