Economics H195B: Senior Honors Thesis

Effects of Board Gender Diversity on Firm Performance and Director Compensation in India

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Abstract

This paper attempts to determine if gender diversity in the boardroom has significant effects on firm performance and directors' compensation for firms listed in the National Stock Exchange (NSE) of India. This paper finds that the presence of women on the board has no significant effect on firm outcomes as measured by Return on Assets. This paper also conducts a difference-in-difference analysis using the Companies Act of 2013 as a source of exogenous variation. Other measures of firm performance such as using Tobin's Q and measures of firm risks such as Leverage, Current and Solvency ratios also yielded insignificant results. This paper also examines pay inequality among directors and find a clear pay discrepancy between male and female directors. Female directors earn 1.19% less than male directors in monetary compensation but are compensated with a 0.426% increase in the number of shares received. Limitations to the methodology and results as well as possible extensions to the research are discussed.

Contents

1 Introduction

Corporate governance refers to dealing with the ways that suppliers of finance to corporations assure themselves of getting a return on their investment (Shleifer and Vishny, 1997). The board of directors facilitates this assurance, through four important functions of (1) monitoring and controlling managers, (2) providing information and counsel to managers, (3) monitoring compliance with applicable laws and regulations and (4) linking the corporation to the external environment (Mallin, 2004 ; Monks and Minow, 2004). In addition, the board is also actively involved in determining an overall corporate strategy by identifying and prioritising objectives that are consistent with the vision of the organisation as well as balancing potential risks involved in maximising the firm's value (Campbell & Minguez-Vera, 2007).

With the board of directors playing an important strategic role in chartering the growth path of the firm in a competitive setup, researchers have turned to investigating board characteristics and diversity due to their potential significance in influencing firm performance and compensation. A large number of studies have examined the percentage of insiders on the board (Agrawal & Knoeber, 1996), the size of the board of directors (Kini et al, 1995) and more recently board directors' characteristics such as gender and ethnicity (Francoeur et al, 2007). However, amongst the many possible board characteristics that one could survey, understanding how gender diversity on the board relates to the performance of Indian companies and the compensation of their directors are the main areas of focus for this paper. Unlike past papers on this topic in India, we use the Companies Act of 2013 as a source of exogenous variation to determine how gender diversity affects firm performance. Furthermore, we study if there is an inequality in compensation between male and female directors using panel data with time and entity fixed effects.

1.1 Motivation

India has been reported to be among the lowest in the world in terms of women representation in corporate governance (Corporate Gender Gap Report, 2010). With only 4.7% of company directors who are women in 2011 - far less when compared to major economies in Asia (Yi, 2011)[2],

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[2]The Gender Diversity Benchmark for Asia report concludes that India has the smallest percentage of women in the total workforce among China, Hong Kong, Japan, Malaysia, and Singapore.

most Indian women face a "glass ceiling" during their careers owing to psychological and societal expectations that men are the sole breadwinners in a traditional Indian family (Nandy et al, 2014). Other than societal expectations, past literature on developed countries such as the United Kingdom also highlighted that senior women do not easily gain access to the boardroom because an elite group of male directors maintain their power (Singh and Vinnicombe, 2004). Women have also been subjected unfairly to a socially constructed perspective of competence which are typically associated with men and masculinity (Martin, 1996; Abrahamsson, 2002; Tienari et al, 2002).

As a result, women roles in Indian firms are limited to entry and middle level positions predominantly, with female inclusion at the highest echelons being meagre - only one in eight for management roles and one in twenty for senior executive positions being held by Indian women (Haldar et. al, 2014). As a result, the Indian government announced the Companies Act of 2013 in August that same year ("Companies Act"), which was designed to enhance self-regulation, strengthen board governance as well as improve board gender diversity. The Companies Act required every listed company in India with paid up capital of Rs 100 Crores or more, or a Public Company with turnover of Rs 300 Crores to have at least one woman director on their boards by the end of financial year 2014 (Ministry of Law & Justice, 2013). The law also applies to newly incorporated companies that meet the criteria, with the appointment of a woman director to be conducted within the first six months of incorporation (India Ministry of Law & Justice, 2013).

This introduction of gender quotas in the boardroom is not exclusive to India. Scandinavian countries such as Norway, and Denmark have introduced legislation on requiring quotas for the number of female directors. In Norway, 40% of the directors for a company has to be women (Carter et al, 2010). Other European countries such as Spain, France and Belgium have also enacted or are currently debating laws for gender quotas in the boardroom of companies (Adams & Funk, 2012; Adams & Ferreira, 2009). Nonetheless, India is currently one of the first developing country to impose such a gender quota on private companies. Not only would increasing gender diversity potentially improve the level of accountability, the presence of women on company boards may bring an additional perspective to board decision making, possibly improving overall firm performance. Furthermore, with more women in the boardroom, further analysis on the possible existence of gender gaps in India could be examined by investigating the effects on directors' compensation.

1.2 Theoretical Foundations and Hypotheses

Theoretical foundations that support increased gender diversity in the boardroom include *Agency Theory*, and *Resource Dependence Theory* (Carter et. al (2010), Low et. al (2015) and Roberts et. al (2006)). It is believed that the above-mentioned theories, which will be elaborated in further detail in Section 2, point toward improving gender diversity in order to help the boardroom make better decisions and ultimately lead to improved firm performance. However, some researchers have argued and shown empirically in favour of a *Social Psychological Theory* that argues that having gender diversity may result in increased conflicts, therefore opposing gender diversity in the board room. Besides the effect of gender diversity on firm performance, the *Managerial Power* theory of executive compensation also highlights how a potential increase of women directors may provide a check and balance towards an optimal level of executive compensation (Balasubramaniam et al, 2013). Hence, this paper seeks to empirically test the above mentioned theories on how gender diversity may affect firm performance and directors' compensation by constructing the following hypotheses.

H1. Will Gender Diversity in the Boardroom Affect Firm Performance?

With theories providing contrary arguments, the objective of this paper is to empirically examine the impact on firm performance by the presence of women on the board of directors in India. Specifically, the following hypotheses will be evaluated:

- *Null Hypothesis:* Board gender diversity has no causal relationship with firm performance in India.
- *Alternative Hypothesis (1):* Board gender diversity improves firm performance in India.
- *Alternative Hypothesis (2):* Board gender diversity decreases firm performance in India.

H2. Will Gender Diversity in the Boardroom Affect Directors' Compensation?

Similarly, this paper will also empirically examine whether gender diversity in the boardroom has an effect on director's compensation for firms in India. The following hypotheses to address this research question will be evaluated:

- *Null Hypothesis:* Board gender diversity has no causal relationship with director's compensation in India.

- *Alternative Hypothesis (1):* Board gender diversity increases director's compensation in India.

- *Alternative Hypothesis (2):* Board gender diversity decreases director's compensation in India.

These hypotheses on the relationship between gender diversity on firm performance and compensation of directors provides an indication of whether and to what extent the previously mentioned theories apply in the context of India.

1.3 Contributions to Existing Literature

This work makes a few contributions to the literature on the relationship between gender diversity on firm performance and director's compensation, particularly in the context of India.

First, it empirically tests existing theories relating board gender diversity to firm performance and director's compensation within the context of an Asian developing country. Most articles that examine the effect of board gender diversity on firm performance and director's compensation currently uses data from developed countries such as Nordic countries and the United States. This enables better understanding of how gender diversity can affect firm performance and director's compensation in different contexts, as cultural differences across countries may affect the significance or even the direction of the relationship.

Second, this is one of the first known study on boardroom gender diversity to have been conducted in India after the announcement of the Companies Act of 2013. Furthermore, this paper uses a large sample of all publicly listed Indian firms from the National Stock Exchange (NSE) of India. Previous studies focused their research on firm data prior to the announcement of the Companies Act. Furthermore, these studies on boardroom characteristics and firm performance in India (Ghosh, 2006; Halar, Shah & Rao, 2014; Dwivedi & Jain, 2005) either focused on firms within one industry sector or only the largest 100 or 500 firms in the Bombay Stock Exchange (BSE) or the NSE. With only a small subset of companies having women directors prior to the Companies Act, their findings may not be generalizable across all Indian firms. Hence, using data before and after the announcement of the Companies Act (from 2006 to 2015) potentially provides a more representative view of the effects of gender diversity on firm performance and directors compensation in India as the number of firms with woman directors increased substantially.

Lastly, this paper uses an empirical strategy that is relatively new in the literature of assessing the effect of gender diversity on corporate performance. Previous studies most frequently used a multivariate Ordinary Least Squares (OLS) regression to determine the relationship between gender diversity on board performance and directors' compensation. Other than conducting a multivariate OLS regression, this paper also improves on the empirical strategies by using panel data thereby allowing for unobservable time and entity fixed effects. Furthermore, a difference-in-differences (DiD) regression specification was conducted to utilize the introduction of the Companies Act as a natural experiment in which companies can be sorted into treatment and control groups. As a result, the average treatment effect on firm performance and risk due to the introduction of a women director in the boardroom can be analyzed accordingly. The merits and limitations of this methodology will be explored in Section 3.

1.4 Findings & Organization of Paper

This paper finds that the presence of one or more women on the board has an insignificant effect on firm performance, as measured by the return on assets (ROA), after adjusting for firm and year fixed effects. Other measures of firm performance such as using an estimate of Tobin's Q[3] and measures of risks such as Leverage, Current and Solvency ratio also yielded insignificant results. Utilizing the Companies Act of 2013 as an exogenous random assignment of treatment and control groups and conducting a difference-in-differences analysis, this paper also finds no significant effects on boardroom gender diversity on the various measures of firm performance described above.

Furthermore, upon evaluating how gender diversity affects compensation on directors, this paper finds no significant relationship between the proportion of women directors in the boardroom and overall director's compensation. However, we find a significant correlation in terms of remuneration between male and female directors. In particular, we find that female directors earned approximately 1.19% less in monetary compensation than their male counterparts, which is size able because it amounts to approximately 130,000 rupees, or about 1.3 times the GDP per capita in India for the year 2015 (World Bank, 2015). However, this was compensated by a significant increase of 0.426% in terms of the number of company shares that female directors receive.

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[3]Defined as the sum of the market value of stock and the book value of debt divided by the book value of total assets.

The remainder of this paper is organized as follows. Section 2 reviews theories that predominate reasons why board gender diversity may have an effect on firm performance and compensation for directors as well as existing literature on empirical findings of previous studies. Section 3 articulates the data generation and selection process and the empirical strategy used in determining the relationship between board gender diversity and firm performance in India. The results and discussion of the limitations on interpreting the findings of boardroom gender diversity and firm performance will also be covered in Section 3. Section 4 provides the empirical strategy used and the key results of the relationship between board gender diversity and directors' compensation. An evaluation and discussion of the results of the relationship between board gender diversity and directors' compensation will also be articulated in Section 4. Section 5 provides a discussion of the limitations of the overall findings as well as considers potential future research opportunities to better understand the research questions detailed in this paper. Finally, Section 6 provides the conclusion to this paper.

2 Literature Review

2.1 Gender Diversity in the Boardroom and Firm Value

With changing social norms, women will constitute a larger proportion of the workforce. As a result, gender diversity in the boardroom has also attracted attention from scholars, corporations as well as governments in recent years (Erhardt et al, 2003). Therefore, understanding gender diversity in corporate governance has important implications for both public policy and the governance of business firms (Carter et.al, 2010).

If gender diversity displays a positive relationship with firm profits, then the economic implications of gender diversity are influential as they enable higher overall economic activity, in line with predictions described by McKinsey and Company in a 2015 report (Woetzel et. al, 2015). However, if gender diversity does not show a positive relationship with firm profits, the issue of gender diversity becomes primarily a public policy affair of ensuring an equal representation and reducing (or eliminating) the "glass ceiling effect" on women in the workforce (Farrell and Hersch, 2001). The next section articulates the key economic arguments for greater gender diversity in the boardroom.

2.1.1 Economic Arguments and Greater Gender Diversity

In order to assess the complexities of gender diversity and firm economic performance, an appropriate pluralistic approach for the theoretical underpinnings of evaluating the causal relationship between gender diversity and firm performance is required (Low et. al, 2015 and Roberts et. al, 2006). The three major theories, namely: (1) *Agency Theory*, (2) *Resource Dependence Theory* and (3) *Social Psychological Theory*, relate boardroom gender diversity and corporate governance and are the most commonly cited among academics. However, the cumulative effects of these three arguments are still ambiguous. For example, while *Agency Theory* supports gender diversity and firm performance, *Social Psychological Theory* provides arguments otherwise. Hence, these effects have to be empirically tested in order to determine the effect board gender diversity has on firm performance.

2.1.2 Agency Theory and Empirical Evidence

Agency theory is currently the most dominant theory involving the causal relationship between gender diversity and firm profits (Low et. al, 2005). It is argued that women boardroom members tend to bring a fresh perspective on complex issues which can help correct informational biases in strategy formulation and problem solving (Dewatripont et. al, 1999 and Westphal and Milton, 2000). Gender diversity also seeks to resolve problems caused by agency costs arising from management's private pursuits (Finegold et al, 2007). Furthermore, women also tend to take their roles more seriously, leading to increased civilised behavior and improved corporate governance (Singh and Vinicombe, 2004). All of these point towards a reduction in the extent of the principal-agent problem, and hence better assuring shareholders of getting a positive return on their investment through the firm's improved performance.

Evidence in the reduction of the principal-agent problem upon having more women has been shown empirically through multiple research papers across different developed countries. A research conducted by Adams and Ferreira (2009) highlighted improved attendance behavior amongst male directors as a result of having more women in the boardroom. Carter et. al (2003) found significant positive relationships of board gender diversity and performance of firms in the United States using Tobin's Q as the key measure. Campbell and Minguez-Vera (2008) found that board

gender diversity had a positive effect in performances of companies from Spain, using a similar analysis. Finally, Julizaerma and Sori (2012) demonstrate a positive relationship between women in the boardroom and firm performance in Malaysian companies.

2.1.3 Resource Dependence Theory and Empirical Evidence

Pfeffer and Salanick (1978) argues that boards play multiple roles that serve to link the corporation to other external organizations, fulfilling its environmental dependencies. The introduction of women is believed to promote a better understanding of the marketplace it serves by matching the diversity of a firm's directors to the diversity of its employees and customers (Campbell & Minguez-Vera, 2007). Consequently, companies with gender diverse boards are able to penetrate markets more effectively.

Evidence of the *Resource Dependence Theory* include a survey by McKinsey which highlights that gender diversity helps in sustaining good relationships with female clients and gaining female insight into consumer buying patterns (Sussmuth-Dyckerhoff et. al, 2012). Other evidence supporting this theory articulates how women directors have close ties with other female board members in different companies (Hillman et al, 2007).

2.1.4 Social Psychological Theory and Empirial Evidence

While the previous aforementioned two theories argues in favour of gender diversity, *Social Psychological Theory* postulates that having greater gender diversity may serve to reduce firm performance. Earley and Mosakowski (2000) suggest that members of homogeneous groups tend to communicate more frequently as they are likely to share the same opinions. Furthermore, other research has also shown that more homogeneous groups are more cooperative and tend to experience fewer emotional conflicts (Williams & O'Reilly, 1998). Finally, Lau and Murninghan (1998) also argue that greater gender diversity will result in decision making becoming more time consuming and potentially less effective.

However, there are other arguments within the *Social Psychological Theory* that points to the fact that a homogeneous boardroom is more likely to conform towards group think (Miller and Del Carmen Triana, 2009) which may exacerbate the principal-agent problem. Hence, proponents of

board gender diversity argue that heterogeneous boardrooms brings forth wider perspectives which would lead to broader and more innovative ideas (Hoffman, 1959) and result in improved firm performance.

Nonetheless, Smith, Smith and Verner (2006) found a negative relationship between gender diversity and gross profits to sales for a sample of Danish firms. Farrell and Hersch (2005) employed an event study to investigate the effect of additional female directors on US boards, but also find no evidence that it affects returns on assets to shareholders. Another study in Norway reported a significantly negative relationship between the proportion of women on the boards of Norwegian firms and Tobin's Q (Bohren & Strom, 2005). Finally, Adams and Ferreira (2009) also suggested that female presence on corporate boards may lead to over monitoring for companies that already have strong governance in place, making it counterproductive for firm performance.

2.2   Gender Diversity in the Boardroom and Directors Remuneration

Another important role of the board of directors is to set and oversee firm's policies for compensating management. Traditionally, directors are compensated with an annual retainer and a separate fee provided for attending Board and Committee meetings. As director compensation has increased, the trend has been to ptovide greater focus on equity compensation which is thought to reduce the principle-agent problem (Pakela & Sinkular, 2015). In general, there are two different approaches to executive compensation, namely the (1) *Optimal Contracting Approach* and (2) *Managerial Power Approach* (Balasubramaniam et. al, 2013).

2.2.1   Optimal Contracting Approach and Empirical Evidence

This approach is based on the agency theory of corporate governance where the board's objective of acting on behalf of the shareholders is to maximise their wealth (Balasubramanian et. al, 2013). Incentives of directors and shareholders have to be aligned. As a result, directors are offered stocks and options besides cash compensation in order to better motivate decisions and judgement that will positively influence shareholder returns (Jensen & Meckling, 1976).

As a result, one implication of this approach would be that directors are compensated for their executive ability, i.e the capacity to generate profits (Fagernas, 2006). If a higher gender diversity

enables the directors to perform their roles better due to the above mentioned theories, then we will expect that directors in boardrooms with higher gender diversity will be paid better. Furthermore, an implicit implication is that there should be no pay gap between male and female directors if they are paid based on individual abilities. However, in a study by Bertrand et. al in 2014 highlighted than women directors earned about 38% less than their male counterparts in Norway after accounting for board fixed effects.

2.2.2   Managerial Power Approach and Empirical Evidence

This approach argues that outstanding talent at the top management levels is scarce and hence commands a premium in terms of compensation in a competitive market (Balasubramaniam et. al, 2013). This suggests that the greater a manager's power, the more substantial influence they have on their pay, and hence presents a form of agency problem itself (Bebchuk & Fried, 2003). As a result, greater gender diversity which can help alleviate the agency problem could possibly lead to less excessive compensation and provide a more optimal level from the viewpoint of shareholder value maximization (Bebchuk et. al, 2002).

Empirical evidence include a research conducted by Adams and Ferreira (2009) to examine directors' pay and diversity suggests that the effect of gender diversity and directors pay is positive and significant at the 10% level after accounting for firm fixed effects. Adams and Ferreira (2009) also argue that a higher proportion of female directors is associated with more equity-based pay for directors, which is suggestive of a board that is more aligned with the interests of shareholders.

2.3   Review of Arguments Applied to India's Context

Consolidating the various discussions and insights from several literature, the current empirical evidence do not provide clear support on the direction of the relationship between gender diversity and firm profits and directors compensation. The inconclusive nature of the empirical evidence on the economic arguments on gender diversity may be explained in the following possible ways.

Firstly, the empirical evidence above spans different countries with significant difference in characteristics as well as time periods. In other words, the effect on board gender diversity and firm performance may be highly localized. Secondly, researchers have been using different empirical

methods to estimate the relationship between gender diversity and firm performance. In some studies, key control variables such as firm size and firm age were not included. Hence, there could be problems of omitted variable bias permeating the different research conducted which could possibly explain the varying nature of the results found. Thirdly, the relationship between firm performance and directors compensation based on the characteristics of the board of directors is of a complex nature because of large amounts of possible variations and unobserved variables.

2.3.1 Understanding Gender Diversity and Firm Performance in India

Taking these insights into consideration, this paper conducts a separate study to understand the relationship between board gender diversity and firm performance specifically in India. As mentioned earlier, previous studies on this topic in India focused on firms within one industry sector or only the largest 100 or 500 firms in the Bombay Stock Exchange (BSE) or the NSE. However, the low percentage of Indian firms with women on the boardrooms (about 4.00% of total Indian directorships) in India could indicate that their results may not be representative of all companies in India in general. Hence, besides using a multivariate regression to compare the difference in performance of a small sample of firms with gender diverse boards to that of firms with less gender diverse boards, this paper introduces year and firm fixed effects as well as utilizes the introduction of the Companies Act 2013 as an exogenous shock to conduct a DiD analysis. Detailed explanations of the empirical strategy and the data collection process is articulated in Section 3.

2.3.2 Understanding Gender Diversity and Directors Compensation in India

While no prior literature has surveyed the effect of gender diversity on directors compensation in India, other determinants of executive payment have been studied. In particular, research has been done to ascertain if family ties affect directors compensation. In fact, directors who are related to other directors or are part of the founding family are paid more than those who are not (Fagernas, 2006; Jaiswall, 2009). The introduction of independent directors seem to have a disciplinary effect in lowering pay that aligns more to firm performance (Fagernas, 2006). Taking these insights into consideration, this paper surveys if gender diversity has an effect on directors pay through a fixed effects regression on a panel sample of director-level data. Detailed explanations of the empirical strategy and data collection process is articulated in Section 5.

3 Gender Diversity and Firm Performance

3.1 Data Sources and Construction of Dataset

The sample for this paper consists of an unbalanced panel of financial information for all of the firms listed in the NSE for the period of 2006 to 2015. The sample was obtained from the Osiris database managed by Bureau Van Dijk, a worldwide major publisher of business information. Specifically, financial information of each firm and their Standard Industry Classification (SIC) categorizations were collected.

Data on the number of board directors with their respective genders was also collected for all firms listed in the NSE. This data was obtained from the PRIME Database Group[4], which collects data directly from the stock exchange itself. Furthermore, the data on the board of directors is updated daily within the database in order to remain relevant. Table 1 articulates the list of variables collected from these two data sources.

Table 1: Summary of Variables Measuring Firm Performance

Variable Name	Definition
Boardroom	Size of the boardroom for a company; total number of directors in the boardroom.
PercentWD	Proportion of women directors in the boardroom, calculated by dividing the number of women directors by the total number of directors in the boardroom.
ROA	Return on Assets for a company, calculated by dividing a company's annual earnings by its total assets.
CurrentRatio	A liquidity and efficiency ratio that measures a firm's ability to pay off its short-term liabilities with its current assets. Calculated by dividing current assets by current liabilities.
Solvent	Denotes the solvency ratio of the firm.
Leverage	Denotes a firm's financial leverage, which is defined as the degree to which a company uses fixed-income securities, such as debt and preferred equity.
TobinsQ	Ratio of the firm's market value to its book value of assets.
Firmage	Denotes the firm's age in years.
Ln(AssetUSD)	Natural logarithm of the firm's total assets (in USD) in the stated year.
Firmage	Denotes the age of the firm.
PercentIndep	Proportion of independent directors in the boardroom. Data is available only for years 2014 and 2015.

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[4]Subscribers of the database, which include globally renowned financial institutions such as Goldman Sachs, consulting companies such as McKinsey & Company and many large institutions in India.

3.2 Overall Descriptive Statistics for Company Performance

The subsample for which complete financial data is available for all firms was used to obtain an understanding of the level of female representation of publicly listed companies in the NSE. The subsample contained data for 804 firms for 10 years. Table 2 below displays the key statistics on variables measuring firm performance.

Table 2: Descriptive Statistics of Firm Performance (2006 - 2015)

Variable	N	Mean	SD	Min	Max
Boardroom	8040	8.272139	2.643389	1	21
PercentWD	8040	.0575043	.0829161	0	1
ROA	8040	6.309514	11.28141	-92.24	98.84
Current Ratio	8040	2.627332	4.538678	.02	90.8
Solvent	8040	43.72537	24.00035	-95.78	99.99
Leverage	8040	96.79007	150.5679	-993.59	998.2
TobinsQ	8040	1.015014	3.003443	0	152.299
Ln(AssetUSD)	8040	12.06963	1.635973	4.489609	18.20502
Ln(AssetLCU)	8040	15.98698	1.643962	8.626227	22.34164
Firmage	8040	38.24117	22.27499	5	152
PercentIndep[a]	1608	0.5214634	0.1372202	0	1

[a]Observations available only for year 2014 and 2015.

The average boardroom size was 8.27 directors, with a standard deviation of 2.64. The average boardsize has been fairly consistent of about 8 directors across 2006 to 2015. This is highlighted in Figure 1 below, with the grey bands denoting the standard errors of the boardroom size.
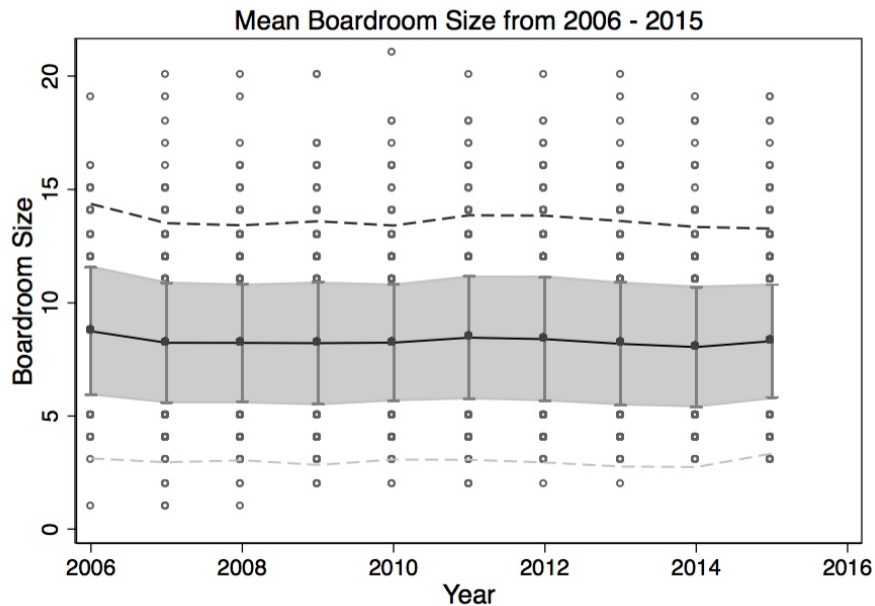
Figure 1: Graph of Boardroom Size from 2006 - 2015

From the sample, women directors constitute approximately 5.7% of all directors with a standard deviation of 8.29%. This is consistent with the findings from a paper written by Banerji and Mahtani in 2010. Further analysis of how the proportion of women directors changed across the years highlighted that the percentage of women directors ranged from 4.0% to 4.5% on average from 2006 to 2014, before a significant increase to about 13% in 2015 after the implementation of the Companies Act 2013. This surge in the percentage of women directors is also shown in Figure 2 below, with the grey bands displaying the corresponding standard errors.
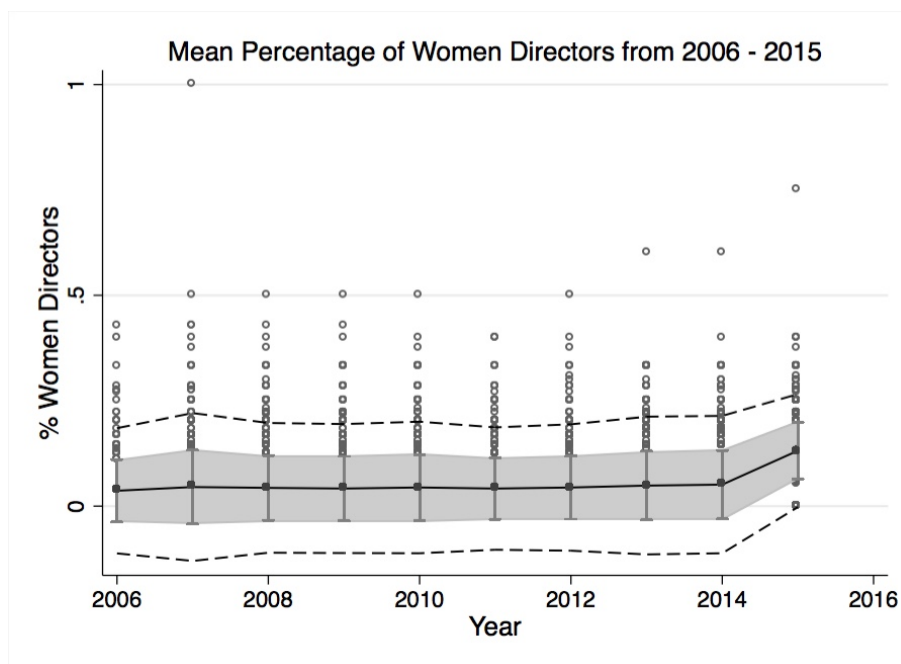
Figure 2: Graph of % Women Directors from 2006 - 2015

3.3 Comparison of Firm Performance with and without Female Directors

Table 3 provides a comparison of firm performance for observations that had involvement of female directors.[5] Within the 10-year period, there were 3153 observations of firm performance that had the involvement of a female director, constituting approximately 39.2% of all observations. Consequently, there are 4887 observations (or approximately 60.8%) of firm performance that did not have the involvement of a female director.

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[5]For example, the observation for Company A when it had no female directors will be grouped in HasFemale = 0 and another observation for Company A when it appoints a female director will be grouped in HasFemale = 1. This provides a "macro-view" of how all firms in the sample perform with and without female directors.

Table 3: Descriptive Statistics of Firm Performance by Female Directors

Variable	Mean HasFemale = 1	Mean HasFemale = 0	Difference	T-stat
No. Firms in Sample	3153 (39.2%)	4887 (60.8%)	-1734 (21.6%)	N/A
Boardroom	8.880431	7.879681	1.000751	16.8633***
Firmage	38.1405	38.30612	-0.1656172	-0.3255
ROA	6.473565	6.203671	.2698939	1.0473
CurrentRatio	2.489083	2.716528	-2.716528	2.1943**
Solvent	44.46034	43.25117	1.209165	2.2061**
Leverage	96.89736	96.72085	0.1765068	-0.0513
Tobin's Q	1.177038	0.9104794	0.2665589	3.8888***
Ln(AssetUSD)	12.22158	11.97159	0.2499972	6.7081***
Ln(AssetLCU)	16.19377	15.85356	0.3402098	9.1057***

** indicates significance at 5% level and *** indicates significance at 1% level

Table 3 also reports the mean of the various firm performance measures in each of the two groups. A t-test of the difference between the means of the performance measures within the two groups was conducted, with the corresponding t-statistics articulated in the rightmost column. From the t-tests, measures of the Current Ratio, Solvency Ratio showed a significant and positive difference at the 5% level of significance while other variables such as the Tobin's Q, Ln(AssetUSD) and Ln(AssetLCU) showed a significant and positive difference at the 1% level of significance.

From a macro-perspective, it might seem that the influence of a female director may have significant and positive impacts on the various performance measures shown. However, this analysis is inconclusive because it does not highlight how the introduction of a female director significantly affects each performance measure at the individual firm level. Furthermore, the co-variation across different variables has to be accounted for in order to determine how gender diversity can affect firm performance. As a result, this paper extends the analysis through a multivariate regression with fixed effects as well as a difference-in-differences regression, which will be elaborated further in the next section.

3.4 Empirical Strategy

In order to ascertain the effects of gender diversity in the boardroom on firm performance, this paper uses a multivariate ordinary least squares (OLS) regression specification, as shown in equation (1) below.

$$ROA_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \quad (1)$$

$ROA_{i,t}$ denotes the dependent variable and $PercentWD_{i,t}$ represents the independent variable of interest. Control variables such as the firm's age as well as a natural logarithm of the firm's assets measured in US dollars are also included in the regression. The error term of the regression is denoted by $u_{i,t}$. These variables will be further elaborated in the next few sections.

3.4.1 Dependent Variables

A previous study by Haldar et. al (2014) on gender diversity and firm performance in India used Economic Value Add (EVA)[6] and Market Value Add (MVA)[7] in their paper. This paper, however, uses a different accounting measure of firm performance, namely the Return on Assets (ROA) that parallels the dependent variables used in other studies key studies on gender diversity and firm performance for other countries. The ROA of a firm, which is calculated by taking the Net Income and dividing by the firm's average Total Assets indicates how profitable a company is relative to its assets (Investopedia, 2016). The ratio illustrates how the firm's total assets have been utilized to make a profit, and hence the higher the ROA, the more efficient the management is utilizing the firm's assets (Campbell and Minguez-Vera, 2007).

Other than only using accounting measures of performance, this paper also includes an approximation of the Tobin's Q, defined as the sum of the market value of stock and the book value of debt divided by the book value of total assets (Campbell and Minguez-Vera, 2007). In other words, the ratio is measured by the market value of its outstanding stock and debt to the replacement cost of the firm's assets (Investopedia, 2016). If a firm is worth more than its value based on what it would cost to rebuild it, then excess profits are being earned. Distinct from accounting measures which offer performance insights based on events that have already occurred, Tobin's Q reflects the market's expectations of future earnings and hence is a good proxy for a firm's competitive advantage (Montgomery and Wernerfelt, 1988). The regression specification with Tobin's Q as the dependent variable is shown in equation (2) below.

$$TobinsQ_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t}$$
$$(2)$$

---

[6]EVA is a measure of true economic profit or the amount by which earnings exceed or fall short of the required rate of return by investors while investing in risky assets (Haldar, Shah and Rao, 2014).

[7]Estimated by subtracting the market value of capital invested in a firm from the total market value of the firm's equity and debt (Haldar, Shah and Rao, 2014).

3.4.2 Independent Variable

The independent variable of interest in this case is $PercentWD$, which represents the proportion of women directors in the boardroom. It is calculated by taking the total number of female directors in each firm and dividing it by the total number of directors within the same firm.

3.4.3 Control Variables

The control variables for the regression include: (1) $Boardroom$, (2) $Firmage$ and (3) $Ln(AssetUSD)$.

$Boardroom$ measures the size of the boardroom, which is the total number of directors. It has been included as a control variable in previous empirical research on gender diversity and firm performance (Adams & Ferreira, 2009). Past empirical evidence has also shown that the size of a boardroom has a direct inverse effect on firm performance in India (Garg, 2007).

$Firmage$ measures the number of years since the firm's incorporation. It has been included as a control variable in light of increasing empirical research on firm age and performance (Low et. al, 2015). While older firms may have more experience, which enhances firm performance, it may also encounter organizational rigidities that would diminish firm performance (Majumdar, 1997).

$Ln(AssetUSD)$ is the natural logarithm of the firm's assets, measured in USD. This accounts for the growth of the assets of the firm, which is directly related to the dependent variable ROA. Hence, it has been also included as a control variable in order to better ascertain the effect of board gender diversity on firm performance.

3.5 Other Measures of Performance: Variables to Measure Risk

Other than measuring firm performance in terms of ROA and Tobin's Q, the effect of board gender diversity on measures of risk is also investigated. This is because return and risk can be seen as two sides of the same coin, with firms engaging in more risky projects with positive net present value in order to generate higher returns for shareholders (Sila et al, 2015). This paper includes three measures of risk, namely (1) Solvency Ratio, (2) Financial Leverage and the (3) Current Ratio.

The solvency ratio ($Solvent$) is a key metric used to measure an enterprise's ability to meet its debt and other obligations. The solvency ratio indicates whether a company's cash flow is sufficient

to meet its short and long term liabilities. The lower the company's solvency ratio, the greater probability that it would default on its debt (Investopedia, 2016). A mathematical representation of the regression model with *Solvent* as the dependent variable is as expressed in equation (3) below.

$$Solvent_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \quad (3)$$

Financial leverage (*Leverage*), is defined as the degree to which a company uses fixed-income securities, such as debt and preferred equity. A high degree of financial leverage would necessarily result in high interest payments which affects the bottom-line earnings per share negatively, and thus increasing risk to stockholder return (Investopedia, 2016). The regression specification with *Leverage* as the dependent variable is expressed in equation (4) below.

$$Leverage_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} \\ + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \quad (4)$$

The Current Ratio (*CurrentRatio*) is a liquidity and efficiency ratio that measures a firm's ability to pay off its short-term liabilities with its current assets. As such, current ratio can be used to take a rough measurement of a company's financial health (Investopedia, 2016). The higher the current ratio, the more capable the company is of paying its obligations, as it has a larger proportion of asset value relative to the value of its liabilities. A Current Ratio of less than 1 indicates that the company will be unable to pay off its debt obligations if they were due at that point (Investopedia, 2016). The regression specification with *CurrentRatio* as the dependent variable is expressed in equation (5) below.

$$CurrentRatio_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} \\ + \beta_4 Log(AssetUSD)_{i,t} + u_{i,t} \quad (5)$$

Analysing how gender diversity affects different dependent variables enables a better understanding of the contributions of having a higher proportion of women directors on the boardroom, especially given ambiguous cumulative theoretical effects highlighted in Section 2 of this paper. The key findings and empirical results of the regressions will be discussed in the next section.

3.6 Empirical Results and Key Findings

Table 4 below reports the regression results of a multivariate OLS regression for the regression models with the different variables of interest specified in Sections 3.4 and 3.5. Standard errors were clustered for each firm. This clustering of standard errors assumes that the standard errors are correlated within each firm but are uncorrelated across different firms, which is reasonable for the data in our sample.

Table 4: OLS Regression of Gender Diversity and Firm Performance

	(1) ROA	(2) ROAW	(3) SolventW	(4) CurrentRatioW	(5) LeverageW	(6) TobinQW
PercentWD	-3.133	-3.413	13.93*	-0.161	-39.50	0.814**
	(2.450)	(2.317)	(5.563)	(0.799)	(25.57)	(0.274)
Boardroom	0.601***	0.576***	0.387	-0.0540*	-1.539	0.0348**
	(0.0847)	(0.0804)	(0.210)	(0.0254)	(1.150)	(0.0121)
Firmage	0.0484***	0.0429***	0.0133	-0.00491*	-0.314*	0.00477**
	(0.0119)	(0.0112)	(0.0243)	(0.00231)	(0.134)	(0.00174)
Ln(AssetUSD)	0.0596	0.0310	-3.170***	-0.265***	18.79***	0.0123
	(0.153)	(0.143)	(0.403)	(0.0480)	(2.070)	(0.0199)
Constant	-1.051	-0.242	77.73***	6.336***	-101.7***	0.258
	(1.876)	(1.717)	(4.536)	(0.554)	(21.92)	(0.248)
Firm Fixed Effects	No	No	No	No	No	No
Year Fixed Effects	No	No	No	No	No	No
N	8040	8040	8040	8040	8040	8040
R^2	0.035	0.037	0.047	0.033	0.050	0.017
Adjusted R^2	0.034	0.037	0.047	0.033	0.049	0.016

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of the preliminary regression (i.e with ROA as the dependent variable) are displayed as Model (1) in Table 4. As stated in Section 3.4, our independent variable of interest, $PercentWD$, is the variable which measures the proportion of women directors in the boardroom. We can see that the coefficient of the $PercentWD$ variable in Model (1) is -3.133 with a standard error of 2.450, which makes it statistically insignificant at the 95% level. This means that under this regression method, a higher proportion of women directors boardroom did not result in a significant improvement in firms' ROA, holding all other factors constant. In other words, the preliminary results from

Model (1) show that although there seems to be a negative correlation between boardroom gender diversity and firm performance, there is no statistical indication that the relationship is causal and significantly different from zero.

3.6.1 Robustness Check 1 - Winsorizing Variables

3.6.1.1 Results for Winsorized ROA. From the descriptive statistics articulated in Table 3, large outliers for ROA were present, with the lowest ROA was -92.24% and the highest was 98.84% over the period of 2006 - 2015. To account for possibility that these outliers may have led to the regression coefficient of the $PercentWD$ variable from Model (1) to be biased, the ROA was winsorized at the 99% level.

Specifically, all observations of ROA below the 1st percentile will be set to the value of the 1st percentile and ROA above the 99th percentile will be set to the value of the 99th percentile. The winsorized ROA is indicated by the variable $ROAW$ and is the dependent variable for Model (2) in Table 4.

The new coefficient of the interaction variable after winsorizing the ROA decreased to -3.413 with a standard error of 2.317. Furthermore, the t-statistic of the coefficient showed an reduction from -1.278 in Model (1) to -1.47 in Model (2), but is still insignificant at the 95% level. This indicates that the lack of statistical significance is not related to the presence of outliers. Nonetheless, while the coefficient of the $PercentWD$ variable is negative and possibly indicating a negative correlation between the percentage of women directors on the board and firm performance, there is still no evidence that the proportion of female board directors led to a significant change in firm performance at the 95% significance level.

3.6.1.2 Results for Other Winsorized Dependent Variables. The other dependent variables were similarly winsorized at the 99% level to account for any potential outliers. Table 4 reports the OLS regression of these winsorized dependent variables.

Results for Solvency Ratio and Tobin's Q. From Table 4, we see that the coefficient on the independent variable $PercentWD$ in Model (3) is 13.93 with a standard error of 5.563, and is significant at the 95% level. Also from the same table, we see that the coefficient on $PercentWD$

in Model (6) is 0.814 with a standard error of 0.274, and is significant at the 95% level. This harbors the potential implication that a unit increase in $PercentWD$ may lead to a corresponding 13.93 units increase in the company's Solvency Ratio as well as a 0.814 units increase in the company's Tobin's Q.

In other words, the significant and positive effect of $PercentWD$ on the Solvency Ratio potentially implies that companies with a higher proportion of women directors are less risky because they have a higher cash flow to pay off their short and long term debt liabilities. This means that there will be a lower probability of the firm defaulting on its debt obligations. Correspondingly, the positive and significant coefficient of $PercentWD$ on Tobin's Q also indicates a potentially positive relationship the market's reflection of future firm earnings with a higher proportion of woman directors on the board.

However, these preliminary findings may not be conclusive because there may be other omitted variables or endogenous factors that could contribute to the above findings. In particular, the Adjusted R^2 for Model (3) and (6) is very low, and hence indicating that only a small fraction of the variation in the Solvency Ratio and the Tobin's Q is explained by the regression specified in those two models.

Results for Leverage Ratio and Current Ratio. Table 4 also reports the effect of $PercentWD$ on the Current Ratio and the Leverage Ratio for a company. We see that the coefficient of $PercentWD$ in Model (4) is -0.161 with a standard error of 0.799, showing that the proportion of women directors does not have a significant relationship with the Current Ratio of a firm at the 95% significance level. Similarly, the coefficient of $PercentWD$ in Model (5) is -39.50 with a standard error of 25.57, also showing no significant relationship between the proportion of women directors with the Leverage Ratio of a firm at the 95% significance level.

Overall, the findings given by the multivariate OLS regression of how the proportion of women directors affects the various identified measures of company performance and risk have not been conclusive due to potential omitted variables, endogenous factors or the lack of significance of the coefficient on $PercentWD$ at the 95% level.

3.6.2   Robustness Check 2 - Fixed Effects Regression

As a result of the issues with omitted variable bias highlighted in the previous section, year and firm fixed effects were included in the regressions shown in Table 5 to account for any unobserved endogenous factors or variation across different firms and years.

Table 5: Fixed Effects Regression of Gender Diversity and Firm Performance

	(1) ROAW	(2) SolventW	(3) CurrentRatioW	(4) LeverageW	(5) TobinQW
PercentWD	-3.112	1.596	0.546	30.69	-0.276
	(2.765)	(5.198)	(1.040)	(37.91)	(0.289)
Boardroom	0.444***	0.642**	0.00511	-1.725	0.0307**
	(0.102)	(0.196)	(0.0272)	(1.476)	(0.0102)
Ln(AssetUSD)	-0.833	-5.213***	-0.0480	60.77***	-0.430***
	(0.442)	(1.122)	(0.125)	(7.033)	(0.0712)
Constant	14.92**	100.7***	3.647**	-591.9***	6.230***
	(4.937)	(12.79)	(1.345)	(80.09)	(0.820)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	8040	8040	8040	8040	8040
R^2	0.645	0.807	0.626	0.642	0.758
Adjusted R^2	0.576	0.770	0.553	0.573	0.711

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results of Fixed Effects Regression.   Table 5 reports the results of the regression models specified in Section 3.4 and 3.5, but with firm and year fixed effects. We see that the coefficient on *PercentWD* for all of the models are not significant at the 95% level. The adjusted R^2 of Models (1) to (5) have increased significantly after including firm and year fixed effects and in general do a better job at explaining the variation in the dependent variables than the models examined in Table 4. On the whole, while there may be a negative correlation between the proportion of women directors with ROA and Tobin's Q as well as a positive correlation between the proportion of women directors with the Solvency, Current and Leverage Ratios, there still seem to be no statistically significant relationship between the proportion of women directors on these variables to measure firm performance and risk.

3.6.3   Robustness Check 3 - Difference-in-Differences Model

Besides using an mulviariate OLS regression with fixed effects, this paper also uses a difference-in-differences (DiD) analysis in measuring the effect of gender diversity on firm performance. This research methodology is appropriate in identifying the effects of a specific intervention, in this case the announcement of the Companies Act of 2013 by the Indian government. After which, a comparison is conducted between the outcomes after and before the intervention for groups affected by the intervention to the same difference for the unaffected groups (Bertrand, Duflo & Mullainathan, 2003).

For this paper, the DiD methodology may be able to circumvent some of the endogeneity problems that underlie between gender diversity and firm performance. One potential endogeneity problem that could be averted would be that better performing firms may have a higher willingness and ability to higher female directors (Adams and Ferreira, 2009) since firms are now "forced" to comply and hire a new woman director regardless of firm characteristics.

3.6.3.1   Treatment and Control Groups.   Specifically in this paper, the Companies Act of 2013 serves as an exogenous shock on firms. Thereafter, a treatment and a control group can be assigned amongst the listed Indian firms.

- **Treatment Group:** Firms who <u>did not have a woman director</u> at the time of the announcement of the Companies Act.
- **Control Group:** Firms who already <u>had at least one woman director</u> during the announcement of the Companies Act.

We can construct a DiD model for the treated and control group across two time periods before and after the announcement of the Companies Act, namely financial year 2014 (FY2014) and financial year 2015 (FY2015).[8] Using the return on assets (ROA) as the main dependent variable to measure firm performance, the mathematical equation relating the relationship between board gender diversity and firm performance can be expressed as that in equation (6) below.

$$ROA_{i,t} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 Treatment_i \times Post_t + u_{i,t} \tag{6}$$

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[8]The financial year in India runs from 1 April to 31 March. Hence, the announcement of the Companies Act falls within FY2014.

The coefficient of interest, i.e β_3, will be the DiD estimate:

$$\hat{\beta}_3 = (\Delta \overline{ROA}^{Treated}) - (\Delta \overline{ROA}^{Control}) \tag{7}$$

If the DiD estimate is positive and statistically significant, then it indicates a positive relationship between board gender diversity and firm performance in India. Conversely, if the DiD estimate is negative and statistically significant, then it indicates a negative relationship between board gender diversity and firm performance in India. Lastly, if the DiD estimate is not statistically significant, it indicates that board gender diversity has no effect on firm performance in India.

3.6.3.2 Descriptive Statistics - Exogeneity of Policy. An important condition for using the government policy to create a natural experiment situation to conduct the corresponding DiD analysis hinges on the fact that the policy creates an exogeneous shock to the firms in the sample. Table 6 reports the descriptive statistics of the treated group of firms before and after Companies Act 2013.

Table 6: Treated Firms Before and After Policy

Variable	N	Mean	SD	Min	Max
FY2014, Pre-Policy					
Boardroom	543	7.515654	2.414446	3	19
PercentWD	543	0	0	0	0
ROA	543	3.784162	11.67989	-79.27	59.73
CurrentRatio	543	1.895341	3.142657	.02	51.6
Solvent	543	41.6147	25.94108	-81.13	99.85
Leverage	543	101.1656	170.6327	-905	941.25
TobinsQ	543	.743512	1.581529	0	18.802
Ln(AssetUSD)	543	11.87227	1.611973	7.236536	17.80564
Ln(AssetLCU)	543	15.96914	1.611874	11.33254	21.90165
Firmage	543	36.39042	22.62429	6	132
FY2015, Post-Policy					
Boardroom	543	8.055249	2.443586	3	19
PercentWD	543	.1216948	.0585393	0	.4
ROA	543	2.99628	11.91825	-70.05	50.63
CurrentRatio	543	1.980479	4.386874	.02	89.2
Solvent	543	41.01735	29.54092	-95.39	99.89
Leverage	543	98.8953	194.5614	-868.25	995.51
TobinsQ	543	1.268387	4.024292	.003	81.604
Ln(AssetUSD)	543	11.87589	1.625041	7.250177	17.80358
Ln(AssetLCU)	543	16.01307	1.625152	11.3868	21.9402
Firmage	543	36.39042	22.62429	6	132

For this analysis, a subsample of 832 firms listed in the NSE with complete data for FY2014 and

FY2015 was obtained from the collected data obtained from Osiris and the PRIME Database Group as explained in Section 3.1 of this paper. Table 6 above shows that there are 543 firms in FY2014 that did not have a woman director in their boardroom, which constitutes approximately 65% of all of the firms in the sample.

We see that there is a stark increase in the proportion of woman directors before and after the implementation of the Companies Act of 2013. In FY 2014, before the policy was implemented, the mean percentage of woman directors for firms in this treated group was 0. However, one year after the policy was implemented, the mean proportion of woman directors in the boardroom increased to 12.16%, signalling that the Companies Act of 2013 served as an exogenous shock for these firms to hire additional women directors in the boardroom. Descriptive statistics of other firm performance measures for firms in the treated group are also articulated in Table 6 above.

3.6.3.3   Empirical Results and Key Findings of DiD Regression.   Table 7 reports the regression results for the DiD model, as stated in Section 2.3.1. Standard errors were clustered by individual firms to account for possible standard errors that are independent across firms but correlated within each firm across the 2-year period.

Results for ROA. The result of the preliminary and baseline DiD regression (i.e without control variables) coefficients are displayed as Model (1) in Table 7. As stated in Section 3.6.3.1, our variable of interest is the interaction variable $Treatment \times Post$. We can see that the coefficient of the interaction variable in Model (1) is 0.399 with a standard error of 0.600, which makes it not significantly different from zero at the 95% confidence level. This means that under this regression method, the introduction of female directors in the treated firms did not result in a significant improvement in firms' ROA. In other words, the preliminary results from Model (1) show that although there seem to be a positive correlation between boardroom gender diversity and firm performance, there is no statistical indication that the relationship is causal and significantly different from zero.

Table 7: DiD Regression for ROA

	(1) ROA	(2) ROAW	(3) ROAW	(4) ROAW
Treatment	-3.034***	-2.711***	-1.398	0
	(0.795)	(0.721)	(0.737)	(.)
Post	-1.187**	-1.076**	-0.810*	-0.997*
	(0.448)	(0.342)	(0.354)	(0.491)
Post×Treatment= 1	0.399	0.358	-0.317	0.105
	(0.600)	(0.454)	(0.475)	(0.718)
Boardroom			0.754***	0.295
			(0.134)	(0.292)
Firmage			0.0363*	
			(0.0178)	
Ln(AssetUSD)			-0.0273	4.185
			(0.211)	(2.263)
PercentIndep			0.715	-0.198
			(2.523)	(2.625)
Constant	6.818***	6.613***	-1.744	-48.03
	(0.617)	(0.564)	(3.023)	(27.72)
Year Fixed Effects	No	No	No	Yes
Firm Fixed Effects	No	No	No	Yes
N	1664	1664	1664	1664
R^2	0.015	0.015	0.058	0.904
Adjusted R^2	0.013	0.013	0.054	0.808

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Treatment variable in Model (4) is absorbed by the firm fixed effects.

Results for Winsorized ROA. As shown in Table 7, the new coefficient of the interaction variable after winsorizing the ROA decreased to 0.358 with a standard error of 0.454. However, the t-statistic of the coefficient showed a slight increase from 0.665 Model (1) to 0.788 in Model (2). While the coefficient of the interaction variable is positive and possibly indicating a beneficial relationship in introducing female directors, the effect is still not statistically significant at the 95% level. In summary, there is still no evidence that the introduction of female board directors led to an improvement in firm performance even using the DiD regression method.

Results of Adding Control Variables. Additional control variables that could account for the variation in ROA were included in Models (3). Firm and year fixed effects were also included in Model (4). This resulted in an overall increase in the $\bar{R}^2$ of the regression models. However, even after accounting for these control variables, the coefficient of the interaction variable, -0.317 with a standard error of 0.475 in Model (3) and 0.105 with a standard error of 0.718 in Model (4), is still statistically insignificant at the 95% level. As such, the regression results fail to conclude definitively that there is a significant relationship between board gender diversity and firm performance.

Results for Other Dependent Variables. Table 8 reports the results of DiD regressions with fixed effects for the other dependent variables that measured firm performance and risk.

Table 8: DiD Regression for Other Dependent Variables

	(1) SolventW	(2) CurrentRatioW	(3) LeverageW	(4) TobinQW
Treatment	0	0	0	0
	(.)	(.)	(.)	(.)
Post	0.521	-0.0324	1.253	0.373***
	(0.713)	(0.0672)	(5.869)	(0.0613)
Post×Treatment= 1	-0.853	0.0596	-3.108	-0.0213
	(0.905)	(0.0872)	(10.87)	(0.0837)
Boardroom	0.469	-0.0190	-0.0733	0.00149
	(0.377)	(0.0399)	(4.753)	(0.0291)
Ln(AssetUSD)	-3.178	-0.0599	29.70	-0.131
	(4.456)	(0.315)	(33.65)	(0.332)
PercentIndep	-1.948	-0.0320	-49.01	0.107
	(3.646)	(0.297)	(50.10)	(0.343)
Constant	79.13	2.760	-233.5	2.295
	(53.61)	(3.812)	(410.0)	(4.036)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
N	1664	1664	1664	1664
R^2	0.974	0.967	0.887	0.938
Adjusted R^2	0.948	0.934	0.772	0.875

Standard errors in parentheses.

$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Note: The treatment variable in each Model is absorbed by the firm fixed effects.

The variables were winsorized at the 99% level and control variables were also included to obtain a DiD model that resulted in a higher $\bar{R}^2$. Similar to the analysis conducted in Table 7, standard errors were clustered by individual firms.

Effect on Solvency Ratio and Current Ratio. We see from Table 8 that the coefficient on the interaction variable of interest for Solvency Ratio (Model 1) is -0.853 with a standard error of 0.905, indicating that having a woman on the board of directors has no significant effect on reducing the level of risk for the average firm. Similarly, the coefficient of the interaction variable of interest on the Current Ratio (Model 2) is 0.0596 with a standard error of 0.0872, also indicating that there is not significant relationship between having an additional women director on the board with the Current Ratio at the 95% level.

Effect on Leverage Ratio and Tobin's Q. Furthermore, Table 8 also reports that the coefficient on the interaction variable of interest for the Leverage Ratio (Model 3) is -3.108 with a standard error of 10.87, indicating that having an additional woman on the board of directors has no significant effect on reducing the leverage ratio for the average firm at the 95% level. Finally, the coefficient of the interaction variable of interest on the Tobin's Q (Model 4) is -0.0213 with a standard error of 0.0837, also indicating that there is not significant relationship between having an additional women director on the board with the market's relection of future firm earnings at the 95% level.

While these findings may show conflicting directions of correlation with the addition of a woman director on the boardroom, they are all not statistically significant at the 95% level. This could be because the sample contains financial information for only 2 periods, which means that the effect of having an additional woman on the board may not have been realized yet in the short term. Hence, in order to ascertain the true causal effect of having an additional women director on the board to the level of firm risk, we will need to obtain a sample of data with financial information for a longer period before and after the Companies Act of 2013.

Section 6 discusses the limitations to the overall findings in this paper and suggests potential research opportunities to better ascertain the relationship between board gender diversity and firm performance in India.

4 Gender Diversity and Director Compensation

4.1 Data Sources and Construction of Dataset

In this section, we attempt to evaluate whether and to what extent gender diversity in the boardroom significantly affects remuneration for directors in terms of both monetary compensation as well as stocks. We will also evaluate if there is a significant pay gay between male and female directors. A director-level dataset was compiled for all firms listed in the NSE from 2010 to 2015 from the Osiris database and the dataset obtained from the PRIME Database Group as articulated in Section 3.1. Director characteristics such as their gender ($Female$), the number of years of education ($Educ$), length of appointment in current board position ($Tenure$) as well as a breakdown on the sources of remuneration that these directors received were collected. A list of all variables measuring director characteristics is articulated in Table 9 below.

Table 9: Summary of Variables Measuring Director Characteristics

Variable Name	Definition
$Educ^a$	Total number of years of education that a director has completed.
Age	Denotes the age of the director.
$Tenure$	Number of years the director has been appointed in his/her current position on the board.
$SalaryLCU$	Salary obtained by a boardroom director in local currency units (Indian Rupees).
$SittingFeeLCU$	Sitting Fee obtained by a boardroom director measured in Indian Rupees.
$CommissionLCU$	Commission obtained by a boardroom director measured in Indian Rupees.
$OtherLCU$	Other forms of monetary payments obtained by a director and measured in Indian Rupees.
$Shares$	Number of company's shares a director obtains.
$ESOP$	Number of company's shares held in an employee stock ownership plan.
$Ln(TotalPay)$	Natural logarithim of a director's total monetary compensation in LCU. TotalPay is the sum of a director's Salary, Sitting Fee, Commission and Other payments obtained by a director.
$Ln(TotalShares)$	Natural logarithm of a director's total shares in the company. TotalShares is the sum of the number of Shares and ESOP belonging to a director.

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[a] the number of years of education obtained by someone with a completed undergraduate degree will be 16 years. Number of years of education for a Masters and a PhD is recorded as 18 and 22 years respectively.

4.2 Descriptive Statistics

Table 10 below reports a summary of director characteristics collected from the sample. From this table, we see that female directors only make up approximately 6.8% of all directorships in India, which is similar with the findings obtained by Haldar et. al (2014) in their research paper. Furthermore, the average education level of a director is 16.9 years, indicating that most of the directors have obtained at least some form of a postgraduate degree. The table also shows that the average tenure for a director is 12.76 years, indicating that board of directors do not change often from year to year. Lastly, with the Companies Act of 2013 mandating that at least one-third of directors in a boardroom to be independent, companies in general have abided by the law with approximately 50% of all directors being independent.

Table 10: Descriptive Statistics - Director's Characteristics

Variable	N	Mean	SD	Min	Max
Female	39396	.0688649	.2532274	0	1
Educ	39396	16.91999	2.300222	0	22
Age	39396	61.59752	12.30191	23	95
Tenure	39396	12.76	9.463485	1	67
Independent	39396	.5053305	.4999779	0	1
SalaryLCU	39396	1.09e+07	1.51e+09	0	3.00e+11
SittingFeeLCU	39396	67179.58	134382	0	8400000
CommissionLCU	39396	2207654	1.52e+08	0	3.00e+10
OtherLCU	39396	65816.41	2667645	0	1.95e+08
Shares	39396	1351114	9601063	0	3.77e+08
ESOP	39396	13001.55	489165.8	0	7.04e+07
TotalPay	39396	1.33e+07	1.52e+09	0	3.00e+11
TotalShares	39396	1364116	9612186	0	3.77e+08
Ln(TotaPay)	39396	10.25623	5.935553	0	26.42705
Ln(TotalShares)	39396	4.129808	5.881477	0	19.74744

In Table 11 on the next page, we compare the differences in characteristics for male and female directors in order to assess if there is a general difference between the male and female directors that have been appointed to the board room. Interestingly, we see that women directors on average have a significantly higher level of education at the 1% level. This potentially highlights a possible "glass ceiling" for women to be promoted from senior or middle managers into the board of directors as the criteria on education for women is higher than that for men, assuming similar competencies and gender distribution in the labor force on average. However, further analysis and research would

be required before any conclusive findings can be discussed. In addition, women directors in the sample are significantly younger than male directors at the 1% level, which makes intuitive sense given a recent emphasis by the government to include more women in the board room. As a result, the average tenure for woman directors is also significantly less than male directors at the 1% level. An interesting find from this sample was that the proportion of Independent Directors for women was significantly less than that for men, also at the 1% level. This potentially means that the Companies Act of 2013 may have not only introduced women into the boardroom, but also enabled women directors to have a closer involvment with the transactions and decision making process of each firm.

Table 11: Director Characteristics Grouped by Gender

Variable	Mean Female = 1	Mean Female = 0	Difference	T-stat
No. of Directors	2713 (0.0689%)	36683 (99.93%)	-33970	N/A
Educ	17.28824	16.89276	0.3954849	8.6496***
Age	55.46849	62.05081	-6.582329	-27.1429***
Tenure	9.155179	13.02661	-3.871428	-20.6723***
Independent	.4131957	.5121446	-0.0989489	-9.9594***
SalaryLCU	3547474	1.15e+07	-7923308	-0.2635
SittingFeeLCU	60357.29	67684.15	-7326.861	-2.7406*
CommissionLCU	900658	2304316	-1403658	-0.4656
OtherLCU	15599.63	69530.34	-53930.71	-1.0161
Shares	1445183	1344157	101026	0.5289
ESOP	1709.48	13836.68	-12127.2	-1.2461
Ln(TotalPay)	9.678041	10.29899	-0.6209479	-5.2598***
Ln(TotalShares)	4.778965	4.081797	0.6971672	5.9604***

** indicates significance at 5% level and *** indicates significance at 1% level

Table 11 also highlights the difference in directors remuneration between male and female directors. While the difference in remuneration may not be significant between male and female directors at the 95% level, this is due to the fact that director's compensation varies across different directors widely, causing extremely high standard errors. We see evidence of this where there is a huge difference in the average salary that a female director makes when compared to men (-7923308 Indian Rupees) while the t-statistic is non-significant. However, after computing the natural logarithm of director's total monetary compensation ($Ln(TotalPay)$) and the shares and stock options for each director ($Ln(TotalShares)$), we see a significant difference between male and female directors. In particular, female directors receive a significantly less amount of monetary compensation compared to their

male counterparts at the 1% level, although they are "compensated" by a significantly higher amount of company shares and stock options offered to them.

4.3   Empirical Strategy

From the insights obtained in Table 10 and Table 11, this paper empirically tests on whether and to what extent the proportion of woman directors $PercentWD$ in a boardroom and a director's gender affects his or her pay. As a result, the following empirical strategies was constructed.

a. Multivariate OLS Regression of Director's Monetary Compensation:

$$Ln(TotalPay)_{i,t} = \gamma_0 + \gamma_1 Female_i + \gamma_2 Boardroom_{i,t} + \gamma_3 PercentWD_{i,t} +$$

$$\gamma_4 Educ_i + \gamma_5 Tenure_{i,t} + \gamma_6 Independent_{i,t} + \gamma_7 ROA_{i,t} +$$

$$\gamma_8 TobinsQ_{i,t} + \gamma_9 Ln(TurnoverLCU)_{i,t} + \xi_{i,t}$$

b. Multivariate OLS Regression of Director's Stock Compensation:

$$Ln(TotalShares)_{i,t} = \pi_0 + \pi_1 Female_i + \pi_2 Boardroom_{i,t} + \pi_3 PercentWD_{i,t} +$$

$$\pi_4 Educ_i + \pi_5 Tenure_{i,t} + \pi_6 Independent_{i,t} + \pi_7 ROA_{i,t} +$$

$$\pi_8 TobinsQ_{i,t} + \pi_9 Ln(TurnoverLCU)_{i,t} + \eta_{i,t}$$

4.4   Key Findings and Results

4.4.1   Results for Monetary Compensation

Table 12 highlights regression results of how gender diversity affects director compensation. In Model (1), we see that the $PercentWD$ has a significant and positive impact on directors' salary at the 95% level. In particular, for every unit increase in $PercentWD$, we see that a director's total salary increases by approximately 4.328% on average, ceteris paribus. However, we also see from Model (1) that female directors are paid significantly less than their male counterparts at the 95% level. In particular, female directors earn approximately 1% less than male directors in terms of monetary compensation, holding all other variables constant. Within the same model, we also see that a director's education level, tenure as well as his / her director status contributes significantly

in determining a director's total monetary compensation at the 95% level. This makes intuitive sense since we would expect that a director with a higher level of education, more experience and is actively involved in making decisions for the company would be paid more. We also see that measures of firm performance also have significant and positive effects on director's salary at the 95% level.

Table 12: Regression of Gender Diversity and Director Compensation

	(1) Ln(TotalPay)	(2) Ln(TotalPay)	(3) Ln(TotalShares)	(4) Ln(TotalShares)
Female	-1.004***	-1.190***	0.470***	0.426*
	(0.122)	(0.161)	(0.114)	(0.176)
Boardroom	0.157***	0.0283	0.0130	0.0111
	(0.0112)	(0.0294)	(0.0106)	(0.0248)
PercentWD	4.328***	-0.744	4.947***	-0.440
	(0.377)	(0.737)	(0.357)	(0.663)
Educ	0.168***	0.0546**	-0.0210	-0.0230
	(0.0123)	(0.0196)	(0.0110)	(0.0212)
Tenure	0.0659***	0.0692***	0.145***	0.144***
	(0.00328)	(0.00515)	(0.00335)	(0.00634)
Independent	-0.773***	-1.022***	-3.583***	-3.816***
	(0.0606)	(0.0896)	(0.0555)	(0.0990)
ROA	0.0298***	0.00680	0.000362	-0.00471
	(0.00317)	(0.00392)	(0.00260)	(0.00343)
TobinsQ	0.151***	-0.0244	-0.00213	-0.0560
	(0.0223)	(0.0181)	(0.0144)	(0.0305)
Ln(TurnoverLCU)	0.570***	0.182**	0.123***	0.0689
	(0.0167)	(0.0580)	(0.0139)	(0.0634)
Constant	-3.984***	4.483***	2.041***	2.908**
	(0.317)	(0.992)	(0.273)	(1.066)
Year Fixed Effects	No	Yes	No	Yes
Director Fixed Effects	No	Yes	No	Yes
N	39396	39396	39396	39396
R^2	0.090	0.389	0.192	0.396
adj. R^2	0.090	0.368	0.192	0.375

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Effects on Monetary Compensation after Fixed Effects. However, after incorporating year and director fixed effects into the regressions on Table 12, we see that the the coefficient on the $PercentWD$ variable becomes insignificant at the 95% level, indicating that the gender diversity of the boardroom has no significant impact on a director's salary. Yet, it is interesting to note that after accounting for these fixed effects, the coefficient on the $Female$ variable is still significant at the 95% level. In fact, we see a further decrease in the coefficient of $Female$ to -1.190 with a standard error of 0.161, indicating that female directors receive about 1.19% less than their male counterparts in terms of monetary compensation, after including the fixed effects. This equates to approximately 130,000 rupees on average, which is 1.3 times the GDP per capita in India for the year 2015 (World Bank, 2015). This highlights a potential insight that while gender diversity in the boardroom may not have a significant relationship with a director's compensation, gender pay gaps for directors in India exist between male and female directors.

4.4.2 Results on Stock Compensation

However, upon analyzing how gender diversity affects a director's compensation in terms of company shares received, we see that in both Model (3) and (4) of Table 12, the coefficient of $PercentWD$ is not significant at the 95% level, implying that gender diversity in the boardroom does not affect a director's compensation. Interestingly, the coefficient of $Female$ is positive and significant at the 95% level. In particular, after accounting for year and director fixed effects, a woman director receives approximately 0.426% more than male directors in terms of company shares.

Consolidating the findings from Table 12, we note that a female director earns about 1.19% less than their male counterparts in terms of monetary remuneration but are "compensated" by a 0.426% increase in the number of company shares that they receive. In order to ascertain the reason why this might be the case, data on the value of the stock options provided to the female directors will have to be obtained. If the additional value of shares obtained by the female directors is similar to the difference in monetary compensation between male and female directors, then there will not be a gender pay gap when taking director remuneration as a whole to include monetary and stock compensation.

4.4.3 Structure of Directors Compensation

An interesting area of focus is to look into the structure of how directors are compensated. In other words, an understanding of why women are compensated more in shares will need to be obtained. One possible explanation could be the lower percentage of female directors who are independent. This indicates that the difference in compensation structure could be due to the fact that female directors are paid in terms of equity in order to be incentivised as non-independent directors.

Table 13: Regression of Non Independent Directors Compensation

	(1) Ln(TotalPay)	(2) Ln(TotalPay)	(3) Ln(TotalShares)	(4) Ln(TotalShares)
Female	-1.773***	-2.099***	0.555**	0.172
	(0.176)	(0.236)	(0.183)	(0.264)
Boardroom	0.179***	0.0725	0.00485	0.0475
	(0.0176)	(0.0464)	(0.0186)	(0.0419)
PercentWD	5.774***	0.349	7.872***	0.351
	(0.619)	(1.191)	(0.643)	(1.132)
Educ	0.124***	0.0372	-0.0275	0.0493
	(0.0216)	(0.0367)	(0.0214)	(0.0358)
Tenure	0.0810***	0.0668***	0.166***	0.162***
	(0.00439)	(0.00750)	(0.00465)	(0.00915)
ROA	0.0306***	0.00347	-0.00408	-0.00706
	(0.00492)	(0.00626)	(0.00457)	(0.00629)
TobinsQ	0.0687*	-0.0219	-0.0103	-0.0552
	(0.0291)	(0.0278)	(0.0242)	(0.0540)
Ln(TurnoverLCU)	0.547***	0.321***	0.121***	0.0806
	(0.0267)	(0.0877)	(0.0253)	(0.117)
Constant	-3.287***	1.917	1.771***	0.166
	(0.534)	(1.536)	(0.513)	(1.925)
Year Fixed Effects	No	Yes	No	Yes
Director Fixed Effects	No	Yes	No	Yes
N	19488	19488	19488	19488
R^2	0.068	0.434	0.074	0.477
Adjusted R^2	0.067	0.395	0.073	0.441

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

To remove this potential variation, a subsample of all non-independent directors was obtained and further analyzed. The same regression specifications as stated in Section 4.3 were conducted and the results of the analyses are reported in Table 13 on the previous page. Table 13 shows that within the subsample of non-independent directors, gender diversity in the boardroom shows no significant effects for directors monetary compensation or total number of shares.

Similar to the results found on Table 12, female directors still earn significantly less in terms of monetary compensation than male directors at the 95% level after accounting for year and director fixed effects, as shown by the coefficient of the *Female* variable of Model (2). Specifically, female directors earn approximately 2.1% less than their male counterparts in terms of monetary remuneration, which equates to about 240,000 rupees or about 2.45 times the GDP per capita in India in 2015.

However, the coefficient of *Female* in Model (4) is not significant at the 95% level, indicating that female non-independent directors do not significantly earn a higher number of shares than their male counterparts. This analysis potentially highlights that women directors who are equally involved in the decision making process for the firm do not receive a higher amount of shares that compensates for the gap in monetary compensation. Further discussion on possible areas to improve the inference of the relationship between gender and director remuneration will be conducted in the next section.

5   Discussion and Further Areas of Research

The results of this paper on the effects of boardroom gender diversity on firm performance seem to provide empirical evidence that the theories explaining how gender diversity in the boardroom affects firm performance may not apply in the context of India. Furthermore, the results contradicts a previous study done by Haldar et. al (2014) - instead of finding a positive relationship between board diversity and firm value, this paper finds no significant effects between gender diversity and firm performance when using an alternative measure.

While extreme care was taken to ensure that the empirical strategies were robust in order to obtain the true causal impact of having women directors in the boardroom on firm performance, potential

limitations to the findings of this study exist because of potential unobservable factors and limited data that impede a clearer interpretation of the regression results. Possible solutions and areas for further research are discussed below.

5.1 Better Understanding of Dynamics in Boardrooms

One possible unobservable factor revolves around the boardroom dynamics upon the introduction of the woman director. For example, "seasoned" directors in the boardroom may not readily accept fresh opinions provided by newly appointed inexperienced women directors. If that were the case, the appointment of a new woman director would not have much impact on firm performance, as we have seen through our regression results.

Furthermore, most firms have only appointed their first woman director. It is intuitively plausible that one woman director may not be influential enough to single-handedly channel an improvement in firm performance or inject a fresh enough to change the board's advice for the company, especially in a short space of a year. Hence, this could be another possible explanation for the lack of significant results. To circumvent these potential limitations, future research could be conducted on finding the relationship between board gender diversity and firm performance when more company data becomes available a few years down the road. This will also enable clearer interpretations of the results obtained using the DiD regression method.

5.2 Further Research on Determinants of Compensation Structure

Besides further research required to assess how gender diversity affects firm performance, additional research should also be conducted to ascertain the determinants of director's compensation structure. From the results articulated in section 4.4.3, further data on the value of the shares obtained by directors would need to be obtained to evaluate whether a gender pay gap exists for directors in Indian firms. One possible area is to use the Black-Scholes formula to estimate the value of the shares and stock options. In order to do so, we will need to collect information or estimate parameters such as the risk-free interest rate and the options strike price and expiration date.

Furthermore, an assessment of the mentality towards paying directors in shares versus monetary compensation in India should be explored as this provides a valuable insight on possible factors

that may have led to women being paid more in shares and paid less in monetary terms. For example, if monetary compensation is the generally preferred form of remuneration in India when compared to shares, then paying women directors more in shares could constitute in itself a form of gender pay gap between directors. If a gender pay gap truly exists, then addressing it is critical in order to motivate more female middle managers to step up and become senior managers within the firm. Furthermore, past papers have also shown that female leadership raises the aspirations and educational attainment for girls in India (Duflo et al, 2011) which has important public policy implications for the Indian government.

6 Conclusion

On the whole, this paper has found that the relationship between board gender diversity and firm performance measures (ROA & Tobin's Q) is statistically insignificant. Similarly, gender diversity in the boardroom also shows no significant relationship with firm risk measures such as the Current, Leverage and Solvency ratio. The robustness of these results was verified by utilizing the Companies Act of 2013 as an exogenous shock and conducting a DiD analysis on the above mentioned measures although limitations persist due to limited data. Referencing the theories mentioned in Section 2, this paper's results indicate that the effects of boardroom gender diversity as highlighted by the *Agency Theory* and the *Resource Dependence Theory* are uncertain and may not be applicable to the context of India.

This paper also conducted a multivariate OLS regression with fixed effects to determine the relationship between gender diversity and directors' compensation. While gender diversity does not have a significant impact in director compensation, female directors were found to earn 1.19% less than their male counterparts in terms of monetary compensation at the 95% level. This is sizeable because it amounts to approximately 130,000 rupees, or about 1.3 times the GDP per capita in India for the year 2015 (World Bank, 2015). We also find that female directors are also compensated with 0.426% more shares when compared to male directors. However, an estimation of the value of the stock options as well as further study on determinants of director compensation structures should be examined in order to ascertain if a gender pay gap exists.

Next, limitations of the empirical strategy as well as the sample data were also discussed. Unobservable factors such as board room dynamics made it difficult to ascertain an average treatment effect of increased board gender diversity on firm performance in India. Furthermore, the potential effects of gender diversity on firm performance may only be realized in the long term or with greater woman representation in the board. Additional research on the determinants of the structure of directors' compensation should also be conducted in order to better ascertain on the observed gender pay gaps in director's compensation found in this paper.

Finally, the performance of the firms in the sample should be tracked across the years as the announcement of the Companies Act provides opportunities to research how board gender diversity may lead to improvements in other aspects of corporate governance, such as corporate philanthropy (Williams, 2003). Future research on such areas should be conducted in order to obtain a holistic view on how gender diversity can affect corporate governance in India, which is important in sustaining India's continued economic progress.

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