

# Does Gender Diversity Improve Financial Firm's Performance?

## New Evidence using Two-Stage Least Squares Estimation and Instrument Variables

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### ARTICLE INFO

### ABSTRACT

*Article history:*

*Received:*

Mar. 4 2014

*Received in revised form:*

Jan. 2 2015

*Accepted:*

Mar. 26 2015

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*Keywords:*

gender diversity, firm's performance, two-stage least squares estimation, instrument variables.

In this paper we examine whether a positive relationship exists between board's gender diversity and financial firm's performance. The study is conducted on a sample of US firms which provides us with as many as possible observations for various econometric techniques. Findings from our two-stage least squares estimation using the fraction of male directors on at least two boards as an instrumental variable show that higher proportions of female directors adversely affect firm value. We further test whether board diversity improves the performance of firms with otherwise weak governance. However, the results are not statistically significant. We also extend our model to the committee level, and our results show that increased representation of women in Audit and Nomination committees are likely to deteriorate the performance of the company as measured using Tobin's q. The implication for Vietnam is that while a representation of female directors in a board of directors may improve firm's performance as findings from Vo and Phan (2013) indicate, increasing a number of female directors may not be the case to improve financial firm's performance.

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## 1. Introduction

Gender diversity at the board level has become a notable issue in modern corporate governance. This issue has attracted attention from numerous organizations including institutional investors, social organizations, and governments. For example, the Interfaith Center on Corporate Responsibility (ICCR) has sponsored several shareholder proposals requiring corporations to increase and report board diversity, while fund manager TIAA-CREF considers diversity is a key investment criterion as they believe board diversity would prevent excessive control of management. Pushes for gender diversity has also influenced policy. While regulators in countries such as Australia and the UK require firms to have voluntary boardroom gender quotas or disclose diversity policies (Davies, 2011), Norway has already enacted a law requiring firms to have 40% female directors, while other countries such as Spain, Iceland and France have passed their own gender quota laws.

But what effects, if any, does gender diversity have on firm's performance? Certainly investors would be concerned about value of their investments. In particular, gender quotas, formal or informal, can impose costs on companies by restricting their ability to select the most qualified directors. Because of this, we seek to further investigate the relationships between firm's performance and gender diversity.

One article of note, Carter et al. (2008), examines the relation between performance and gender diversity on board committees rather than boards themselves. They utilise a three-stage least squares (3SLS) regression to assess the economic case for diversity, concluding that gender diversity in the audit committee has a positive effect on financial performance.

By contrast, our results indicate either statistically insignificant or negative relationships between gender diversity and firm's performance. Moreover, the study covers a broader scope, examining the effects of gender diversity at both the board and committee levels, as well as whether its effects depend on the existing strength of governance mechanisms. We greatly improve upon their study by utilizing an instrumental variable and controlling for firm fixed effects. While we initially observe a positive relation between the proportion of female directors and firm's performance, this effect disappears after we adjust for firm fixed-effects. To address the potential endogeneity issue for the fraction of female directors, we introduce the fraction of male directors sitting on at least two boards with female directors as an instrumental variable

(IV), following from Adams and Ferreira (2009). After implementing IV regressions, we report a negative and statistically significant relation between the proportion of female directors and financial performance measured by Tobin's  $q$ , with no significant relation while using ROA as the measure. We also find that firms with otherwise weak corporate governance mechanisms do not perform better with gender diverse boards after incorporating the G-index of Gompers, Ishii and Metrick (2003).

Furthermore, we extend the study to examine whether the fraction of female directors in each committee affects firm's performance is affected and conclude that greater representation of women in Audit and Nomination committees are likely to deteriorate the performance of the company as measured using Tobin's  $q$ .

The paper's structure is as follows: We discuss the basic facts about the role of women on the board in Section 2 and the methodology in Section 3. In Section 4, we describe our data and methodologies. We examine the relation between gender diversity on the board and committee and firm's performance in Section 5, followed by Section 6 that concludes the research.

## **2. Literature Review**

### *2.1. Theoretical perspectives on board diversity*

In this section, we consider the economic case for greater diversity at board level (if any). As Monks and Minow (2004) assert, the board is expected to fulfil at least four important functions: (i) monitoring and controlling managers, (ii) providing information and counsel to managers, (iii) monitoring compliance with regulations, and (iv) linking the corporation to the external environment.

It has been argued that a more diverse board improves the first function as it increases board independence. That is, women directors are less closely associated with the "old-boys network" of well-connected male directors. However, Hermalin and Weisbach (2000) argue that this effect could be marginalized by the influence of more dominant board members, such as owner-CEOs or insider directors. In addition, Adams and Ferreira (2009) argue that excessive board monitoring can have negative effects, with greater interference by directors in decision making leading to a breakdown in communication between managers and directors.

Regarding the second function, scholars such as Brancato and Patterson (1999) assert that women directors can provide substantial unique information and insights to the board and managers, improving the strategic decision-making of the firm. Stephenson (2004) reasons that director diversity can lead to increased communication on topics not otherwise addressed by the board, broadening the firm's focus. For example, women directors can provide unique knowledge of certain consumer markets due to their own participation.

In terms of the third and fourth functions, Stephenson (2004) argues that a policy of board diversity helps the firm attract and retain talented female managers and employees, which is significant since women occupy a large portion of the pool of human capital. Furthermore, Brancato and Patterson (1999) argue that board diversity sends a positive signal to the public that the company values and understands the nature of diverse participants in the labour and product markets. Rosenstein and Wyatt (1990) reason that, by appointing female directors, firms signal a long-term strategy of recruiting and promoting qualified female employees. However, Kanter (1977) suggests that more diverse boards can perform worse because people prefer working with those demographically similar to themselves and exert more effort when doing so.

From the perspective of shareholders, the issue is how gender diversity affects firm's performance. However, it is not simply a matter of observing correlations between measures of gender diversity and firm's performance due to the problem of endogeneity between them.

## *2.2. Evidence on board diversity and firm's performance*

A positive relation between board diversity and firm's performance does not imply causation in and of itself. It could be that better performing firms are more willing and/or have greater resources to undertake additional effort in recruiting female board members on the grounds of fairness or equality. Hence, to disentangle the true causality effects (if any) between board diversity and firm's performance, empirical researchers must tackle the issue of endogeneity.

There are two common ways to overcome this issue. First, researchers can rely on the power of "natural experiments", in which changes in the board are considered as exogenous variables. Ahern and Dittmar (2012) present new evidence on the relationship between firm value and board characteristics by exploiting an unprecedented exogenous change to corporate boards: the law passed in 2003 requiring 40% female board

representation in Norwegian publicly listed companies. Using the pre-quota cross-sectional variation in female board representation as an instrument for exogenous changes to corporate boards, they find a significant drop in the stock price at the announcement of the law and a large decline in Tobin's  $q$  over the following years. Adams et al. (2011) use data on mandatory announcement of new director appointments and find that the market reaction for the appointment of female directors is significantly more positive than for male appointees in firms with boards that are not almost independent or are small, as well as larger firms and firms with high market-to-book ratios. They also find that market reactions to announcements of female appointees are more positive than those of male appointees in the natural resource sector and in firms that have achieved recognition for programs to improve workplace conditions for women. However, another study finds no relationship between board diversity and firm's performance. Farrell and Hersch (2005) use Poisson regression and an event study to investigate the effects of adding female directors to the board and find no evidence that this affects return on assets or market returns to shareholders.

The second method is to construct an instrumental variable that is independent of firm's performance but correlated to board diversity. Employing the two-stage least squares regression and a system of simultaneous equation, Carter et al. (2003) find that Tobin's  $q$  is positively related to the percentage of female directors. Adams and Ferreira (2009) use the fraction of male directors who sit on other boards with female directors as their instrumental variable. They find that the average effect of gender diversity on firm's performance is negative. This result is driven by companies with fewer takeover defences.

### **3. Hypotheses**

#### *3.1. Data*

We utilize several sources of data to obtain the sample of all US firms in the Standard & Poor's (S&P) 500, S&P MidCaps, and S&P SmallCaps in the five-year period from 1998–2003. The director-level data is collected by the Investor Responsibility Research Center (IRRC) and readily downloadable from the Risk Metrics database. The IRRC data set contains information on directors from company proxy statements or annual reports, such as the director's gender, the number of other directorships each director holds, the classification of director independence and membership of directors on the

nomination, compensation, audit, and corporate governance committees. We obtain financial data, standard industrial classification (SIC) codes and business segment data from Compustat. Some firms in our sample changed their ticker or name due to M&A or spin-off activities, and we correct for these changes by hand to ensure the accuracy of firm-level data. Our final sample of complete director and firm-level data consists of 13,200 unique directors holding a number of 56,556 directorships in 6,048 firm-years of data on 1,367 firms. The number of observations varies across regressions due to a lack of data either in the dependent variable or independent variable.

Table 1 shows descriptive statistics at the firm, board and director levels. In our analysis, we use a market-based measure of performance, Tobin's  $q$ , and an accounting measure, return on assets (ROA). Tobin's  $q$  is calculated as the ratio of the firm's market value to book value of assets. The firm's market value is the book value of assets minus the book value of equity plus the market value of equity. ROA is the net income before extraordinary items and discontinued operations divided by the book assets of the firm. It measures firm's performance from an accounting perspective that compares the net income generated from all of the operations of the firm to the average book value of assets.

As Table 1 shows, firms generate an average of \$5,212 million in sales per year, ranging from \$0.32 million to \$245,308 million. The mean number of business segments is 3.23 with a standard deviation of 2.28. With respect to firm's performance, Tobin's  $q$  ranges between 0.37 and 78.56 with a mean of 2.13, while the average ROA is 2.13 with a standard deviation of 2.23. At the board level, a firm has a board size of 9.35 members on average, and the independent directors account for 64.5% of the board. The summary statistics in our sample are not markedly different from those in Adams and Ferreira (2009), whose sample covers all firms in the S&P 500, S&P Midcaps and S&P Smallcaps in the 1996–2003 period, except for the firm sales as we report a higher mean value. The average board in the sample is comprised of 8.9% of women, consistent with a proportion of 8.6% reported by Farrell and Hersch (2005). Among these female directorships, it should be noted that 8.21% are affiliated directors, 86.15% are independent directors, and remainders (i.e. 5.64%) are inside directors.

Our sample shows that the proportion of women directors in the boardroom has increased over time, from 7.33% in 1998 to 9.85% in 2003, consistent with the increasing trend of women on boards reported by Adams and Ferreira (2009) and

Catalyst (2003). Surprisingly, we find that the proportion of firms with only one female director has increased over time in our sample, starting from 36.18% (1998) to 41.09% (2003). The differences in this proportion and firm sales may be due to our procedure of merging firm data from several sources. The participation rates of females at the committee level are not dramatically different across committees, ranging from 9.1% to 13.5%.

**Table 1**

Descriptive statistics

Variable	Number of observations	Mean	Standard deviation	Min	Max
<i>Firms characteristic</i>					
Sales (millions)	5,995	5212	14393	0.32	245308
Log(Sales)	5,995	7.31	1.52	-1.15	12.41
# Business Segments	5,695	3.23	2.28	1	17
Tobin's Q	5,983	2.13	2.23	0.37	78.56
ROA	5,991	3.42	16.70	-587.97	60.09
<i>Board characteristic</i>					
Board Size	6,048	9.35	3.00	1	25
Fraction Independent Directors	6,048	0.645	0.185	0	1
Firm Has Female Directors	6,048	0.62	0.49	0	1
Firms Has Only One Female Director	6,048	0.40	0.49	0	1
Fraction Female Directors	6,048	0.089	0.087	0	0.6
Fraction Audit Female	6,017	0.109	0.155	0	1

Variable	Number of observations	Mean	Standard deviation	Min	Max
Fraction Compensation Female	5,942	0.091	0.149	0	1
Fraction Nomination Female	4,228	0.111	0.159	0	1
Fraction Corporate Governance Female	2,414	0.135	0.169	0	1
CEO-Chair Duality	6,047	0.17	0.37	0	1
<i>Director characteristic</i>					
Female Dummy	56,556	0.10	0.29	0	1
Attendance Problem	56,555	0.02	0.15	0	1
# Other Directorships	56,514	0.90	1.29	0	10
Tenure	56,481	10.27	8.14	0	64
Age	56,550	59.17	8.64	26	98
Committee Member	56,556	0.69	0.46	0	1
Audit Committee Member	56,555	0.39	0.49	0	1
Compensation Committee Member	56,555	0.37	0.48	0	1
Nomination Committee Member	56,555	0.29	0.45	0	1



Variable	Number of observations	Mean	Standard deviation	Min	Max
Corporate Governance Committee Member	56,551	0.17	0.38	0	1

#### Number of observations with female directors

Variable	Number of observations	Mean	Standard deviation	Min	Max
Log(Sales)	3,720	7.83	2,275	6.47	1.362***
# Business Segments	3,466	3.64	2,229	2.60	1.036***
Tobin's Q	3,711	2.05	2,272	2.26	-0.203***
ROA	3,718	4.58	2,273	1.52	3.057***
Board Size	3,749	10.47	2,299	7.54	2.930***

In Table 1, we consider various firm characteristics across firm-years between firms having at least one woman on the board and the other firms. The results show that firms with women on the board are larger, have more business segments, have worse market-based measure of performance but better accounting performance, and have larger boards than firms without female directors. The comparison suggests that a firm's choice to appoint female directors could be affected by firm characteristics and indicates that we require control variables for these characteristics in our analysis.

### 3.2. Methodology

When we analyse the effects of women on firm's performance, two concerns arise: (i) omitted unobservable firm characteristics; and (ii) reverse causality.

The omitted variables, usually considered as time-invariant, affect both the firm's performance and the choice of female directors and lead to spurious correlation between these variables. Hence, we use firm-fixed effects methods to tackle this problem and only discuss the results robust to the inclusion of fixed effects.

The second concern is reverse causality. Firms with better performance could deliberately nominate female directors to satisfy the increasing public demand of board diversity or to increase their reputation. We address this problem by using instrumental variables and discuss the economic rationale of their use in our discussion of results.

We adopt an approach in Carter et al. (2008) which implements the use of the 3SLS technique with the following simultaneous equations:

$$q_{i,t} = \beta_0 + \beta_1 d_{i,t} + \beta_2 r_{i,t-1} + \beta_3 w_{i,t-1} + \beta_n \Gamma_{i,t-1} + \beta_m \Phi_{i,t} + \beta_p \Omega_{i,t} + e_{i,t} \quad (1)$$

$$d_{i,t} = \gamma_0 + \gamma_1 q_{i,t} + \gamma_2 r_{i,t-1} + \gamma_3 w_{i,t-1} + \gamma_j X_{i,t-1} + \gamma_u \Phi_{i,t} + \gamma_v \Omega_{i,t} + \varepsilon_{i,t} \quad (2)$$

where:

$q$  is a measure of firm's performance Tobin's  $q$ ;

$d$  represents the fraction of women the committee;

$r$  represents the return on assets;

$w$  represents the log of total assets;

$\Gamma$  is a vector of control variables hypothesized to affect financial performance;

$X$  is a vector of control variables hypothesized to affect diversity;

$\Phi$  is a vector of dummy variables that represent the years in the panel data; and

$\Omega$  is a vector of dummy variables that represent the industry of the firm.

Our model includes several explanatory variables beside the main variable which is the fraction of women on the board or committee. Firm size, measured by the natural logarithm of sales, is widely used as a control variable when analysing firm's performance, and Fama and French (1992) show that size of the firm is related to market returns. We also use the number of business segments as a proxy for the firm complexity. We employ a set of variables that measure various aspect of the governance structure of the firm and have been shown to be related to firm's performance. Yermack (1996) reports an inverse relation between board size and Tobin's  $q$ , and Adams and Ferreira (2009) include board size in their regression. The effect of independent directors on firm's performance is a major area of interest in the corporate governance literature. Numerous papers have explored this issue and results have been mixed. However, we include the fraction of independent directors to compare our results with those of Adams and Ferreira (2009) as well as Carter et al. (2008). Unlike Carter et al. (2008), we exclude the CEO-chair duality and the percentage of board ownership, as firm's

performance may reversely have an impact on both factors, according to Demsetz and Villalonga (2001) and Anderson and Reeb (2003). In summary, we include four control variables: the board size, the fraction of independent directors, firm size and number of business segments.

#### 4. Results

Gender diversity could have both positive and negative effects on firm's performance. Corporations with a diverse board are more likely to have strong governance in the sense of stricter monitoring and more active directors in the decision-making process. Hermalin and Weisbach (2003) claim that stronger corporate governance, the essence of minimizing agency issues between managers and shareholders, should generally create extra value for shareholders. On the other hand, Adams and Ferreira (2009) argue that excess director interference when making decisions could lead to a breakdown in communication between management and the board. Therefore, the more diverse a board is, the higher possibility that disagreements and conflicts will occur. Thus, it is important that the ultimate effect of gender diversity be empirically tested.

Our first simple model in Table 2 includes the fraction of women on the board, controlling variables, year dummies and two-digit SIC industry dummies. We also cluster by firms to address heteroskedasticity and serial autocorrelation within firms. Column 1 presents the results for Tobin's  $q$ . We observe a positive relation between gender diversity and firm's performance which is consistent with previous studies, but the coefficient is not statistically significant. We include firm fixed-effects in Column 2 to control for the omitted variables problems. The sign of the coefficient is now negative but not statistically significantly different from zero. We conclude that the positive correlation between the fraction of female directors on the board and firm's performance is driven by omitted firm specific factors, although the coefficients in the first two columns are not statistically significantly different from zero.

The potential reverse causality previously mentioned in section 4.2 could mislead us as to the influence of women on boards. Therefore, it is crucial to address this concern. We need an instrument with correlated with the proportion of female directors but not firm's performance. Adams and Ferreira (2009) propose a link between the connection of male to female directors and the fraction of female directors on the board. Their

instrument is the fraction of male directors on at least two boards containing female directors. They argue that women directors are less closely associated with the “old-boys network” of well-connected male directors.

Based on the ideas in Medland (2004), the better connected male directors are to women, the more female directors we should observe on their firm’s board. Hence, we use the fraction of male directors on the board who sit on other boards on which there are female directors as an appropriate proxy for such connections – the higher this fraction, the greater the gender diversity on the board should be. Since the fraction of men connected to women possibly relates to firm’s performance through industry effects, the use of firm fixed effects is also employed in this model. In addition, since the instrument is a proxy for the connectedness of the board, it could itself be correlated with firm’s performance. To ensure the result robustness, we include separately several direct measures of board connectedness in the performance regression: the total number of external board seats by directors and the total number of male external board seats. We confirm that our results are robust to inclusion of these controlling variables, but due to space limit, those tables should not be reported in this section.

**Table 2**

Performance: Ln (Tobin’s q) and gender diversity

<i>Independent variables</i>	<i>Dependent variables</i>			
	<b>Ln(Tobin's Q) Least squares regressions</b>	<b>Fraction Female Directors</b>	<b>Ln(Tobin's Q) IV regression</b>	
	(1)	(2)	(3)	(4)
Fraction Female Directors	0.19 (1.16)	-0.176 (1.3)		-6.647*** (3.21)
Board Size	-0.011* (1.91)	-0.003 (0.82)	6.80^ (1.24)	0.001 (0.28)
Fraction Independent Directors	-0.096 (1.32)	0.088* (1.7)	0.039*** (5.98)	0.357*** (3.49)
Log(Sales)	0.040***	0.023	-0.004	0.002

<i>Independent variables</i>	<i>Dependent variables</i>			
	<b>Ln(Tobin's Q) Least squares regressions</b>		<b>Fraction Female Directors</b>	<b>Ln(Tobin's Q) IV regression</b>
	(1)	(2)	(3)	(4)
	(3.3)	(0.98)	(1.47)	(0.08)
# Business Segments	-0.042***	-0.011***	9.42^*	-0.004
	(6.93)	(2.8)	(1.67)	(0.83)
Fraction Males with Board Connections to Female Directors			0.033***	
			4.96	
Number of observations	5637	5637	5637	5637
Adjusted R-squared	0.25	0.74		
Industry dummies	Yes	No	No	No
Firm fixed effects	No	Yes	Yes	Yes
Regression type	<i>OLS</i>	<i>Fixed effects</i>	<i>First- stage IV with fixed effects</i>	<i>IV with fixed effects</i>

We re-estimate the specification in Column 2, using the IV technique. Column 3 and 4 report the results for the first and second stage of our IV regression. Column 3 reemphasises the correlation between our instrument and the fraction of female directors on the board at 1% level. The second stage regression shows that the coefficient on gender diversity becomes statistically significantly negative at 1% level, consistent with Adams and Ferreira (2009). The Hausman test statistic for the null hypothesis that the fraction of female directors is exogenous to firm's performance is rejected at 1% level. Hence, we accept the possibility of endogeneity between variables of interest even after firm fixed effects are included. It supports the importance of using the IV techniques. In conclusion, Table 2 shows that the positive correlation between firm's performance and

gender diversity in prior literature is not robust to any specification addressing the endogeneity problem, and the effect appears to be negative.

We replicate the analysis in Table 2 for ROA and present results in Table 3. Consistent with previous literature, we find a positive and statistically significant relationship, at the 10% level, between firm's performance and gender diversity in Column 1. However, as for Tobin's q, the result is negative but statistically insignificant when we control for the firm fixed effects. In the IV specification, the coefficient becomes positive but statistically insignificantly different from zero. We conclude that there is no significant effect of the gender diversity on boards to accounting performance.

**Table 3**

Performance: ROA and gender diversity

<i>Independent variable</i>	<i>Dependent variable: ROA</i>		
	Least squares regressions		Fraction Female Directors
	(1)	(2)	(3)
Fraction Female Directors	6.595*	-2.255	28.731
	(1.81)	(0.61)	(0.4)
Board Size	-0.257*	-0.21	-0.232
	(1.69)	(0.93)	(1.36)
Fraction Independent Directors	-3.672**	0.362	-0.92
	(2.33)	(0.14)	(0.26)
Log(Sales)	2.007***	4.849**	4.950***
	(3.69)	(2.56)	(6.71)
# Business Segments	-0.355***	-0.034	-0.065
	(3.16)	(0.21)	(0.35)
Number of observations	5642	5642	5642
Adjusted R-squared	0.06	0.39	

<i>Dependent variable: ROA</i>			
<i>Independent variable</i>	Least squares regressions		Fraction Female Directors
	(1)	(2)	(3)
Regression type	<i>OLS</i>	<i>Fixed effects</i>	<i>First-stage IV with fixed effects</i>

Our previous findings suggest that gender diversity on boards does not add value to firms. More specifically, gender diversity hinders firm's performance measured by Tobin's q. Despite the discouraging results, there is no implication that these boards never create extra value. Adams and Ferreira (2009) find that more gender-diverse boards have stronger governance and suggest that a tough board adds values when firms have weak governance. To test this hypothesis, we employ the governance index (G-index) introduced by Gompers, Ishii, and Metrick (2003) as a proxy for the strength of other governance mechanisms. The higher the index, the greater the expected agency problem is. A benefit of using the G-index is that it measures the governance mechanisms completely differently from what we have conducted above.

**Table 4**

Performance and interaction of gender diversity with the Investor Responsibility Research Center (IRRC) shareholder rights index

Independent variable	Dependent variable			
	Ln(Tobin's q)	ROA	Ln(Tobin's q)	ROA
Fraction Female Directors	-0.043 (0.17)	-5.195 (0.81)	-0.776 (1.03)	-27.823* (1.83)
Gindex times Fraction Female Directors			0.077 (1.13)	2.364 (1.62)
Gindex	-0.025** (2.13)	-0.388 (1.44)	-0.031** (2.2)	-0.591* (1.93)

Independent variable	Dependent variable			
	Ln(Tobin's q)	ROA	Ln(Tobin's q)	ROA
Board Size	-0.004 (0.56)	-0.469** (2.37)	-0.004 (0.49)	-0.453** (2.28)
Fraction Independent Directors	0.079 (0.76)	3.529 (1.28)	0.08 (0.77)	3.538 (1.29)
Log(Sales)	0.086** (2.06)	8.838*** (5.51)	0.087** (2.09)	8.889*** (5.56)
# Business Segments	-0.013** (2.15)	0.208 (0.75)	-0.013** (2.19)	0.2 (0.72)
Number of observations	2562	2564	2562	2564
Adjusted R-squared	0.7	0.49	0.7	0.49
Regression type	Firm fixed effects	Firm fixed effects	Firm fixed effects	Firm fixed effects

In Table 4, we perform our previous regressions and add two new variables: the governance index and the product of the index with the fraction of female directors. All regressions control for firm fixed effects. We do not include the IV estimates because no instrument is available for the G-index. We first report firm fixed effects estimates for the log of Tobin's q and ROA regressions including the governance index in Column 1 and 2. Consistent with the implications of this index, the coefficients are negative for all columns, but only statistically significant for Tobin's q at the 5% level. In Columns 3 and 4, we include the interaction between the index and the fraction of female directors. The coefficients for G-index both become negative and statistically significant at 5% and 10% levels respectively. However, the coefficients of the interaction terms in both columns become statistically insignificantly positive. Meanwhile, Adams and Ferreira (2009) find a statistically significant positive result for the interaction term at 10% level. Our insignificant results could be caused by our smaller data set which ranges from 1998



to 2003. In sum, we do not find that gender diversity adds value to firms with otherwise weak governance.

Our interpretation of the results is that boards with gender diversity appear to be tougher monitors but do not add value to firms with weak governance in the manner suggested by Adams and Ferreira (2009). Furthermore, the results emphasize the importance of addressing the potential endogeneity problem for gender diversity. Our results suggest that firms should not put women directors with the hope that gender diversity improves firm's performance.

Klein (1998) argues that the four committees (Nomination, Audit, Compensation, and Corporate Governance) in a firm lead to a more accurate picture of the role of board members. Directors have a firmer and more direct impact on executive remuneration, strategic decision-making, new director appointments, and other decisions that substantially impact on corporate performance if they serve on board committees with primary responsibility for these functions. Any distinct advantages or disadvantages that might exist for women relative to board process should have a more direct effect through committee assignments. Our results show that greater proportions of women on boards negatively affect firm's performance, and we now investigate whether this effect occurs at the committee level.

We employ two potential instrumental variables, namely the fraction of male directors on the committee who sit on other committees on which there are female directors and the gender of the chair of the Nomination, Audit, or Compensation committee (we do not have data on chairs of Corporate Governance committees). While the first instrumental variable follows the economic argument explained above, we argue that the chairwoman of the committee is more likely to appoint other female directors because of their social connections. Any redundant instrumental variable would be detected through overidentification tests. We also control for the hypothesis that the instrument is a proxy for the connectedness of the committee, but any of our significant results are robust to additional of these variables.

The odd columns in Table 5 show the first stage of the IV regression of the fractions of female directors in the Nomination, Audit, Compensation, and Corporate Governance committees respectively. The coefficients of our instrumental variables are statistically significantly positive at 1% level, and the overidentification tests are accepted in the case of Nomination and Audit committees. The second stage regressions in the even Columns

of Table 5 present interesting results. We find significantly negative coefficients for the proportion of female directors in the nomination and audit committees, at the 5% and 1% levels respectively. Meanwhile, the coefficients are not statistically significantly different from zero and small in magnitude in the two other committees. Using the same setup, we run regressions with ROA as dependent variable. Similarly to Table 4, our coefficients of interest are statistically insignificantly different from zero. Therefore, we only conclude that the fraction of female directors in Nomination and Audit committees negatively affects the firm's performance as measured by Tobin's  $q$ .

Carter et al. (2008) point out that women directors who sit on influential board committees are likely to substantially impact the actions of the board and management (and hence the company's financial performance). They assert that companies are less likely to place token directors on committees that make critical firm decisions. They perform a three-stage least-squares estimation to test whether the fraction of females on the committees affect firm's performance or vice versa. They find that causation appears to go from the percentage of women directors on the audit committee to Tobin's  $q$ . With respect to the nomination and compensation committees, they discover a two-way causality issue in the relation between the percentage of women on each committee and firm's performance, measured by Tobin's  $q$ . In contrast, our results support the conclusion that gender diversity in the Nomination and Audit committees does not improve firm's performance. The main explanation is that their model does not tackle the problem of endogeneity well and leaves out time-invariant omitted firm specific variables. Our results (not reported in the tables due to space limit) show the changes in sign of the coefficient from positive to negative when we use the same setup in Table 2 and 3.

**Table 5**

Firm's performance and gender diversity in the committee level

Independent variable	Dependent variable											
	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fraction Nomination Female		-0.380** (2.51)	2.946 (0.49)									
Fraction Audit Female					-0.422*** (2.9)	-0.23 (0.03)						
Fraction Compensation Female								0.015 (0.09)	9.501 (1.24)			
Fraction Corporate Governance Female											-0.021 (0.12)	-2.835 (0.37)
Board Size	3.18^ (0.21)	-0.003 (0.81)	-0.028 (0.2)	0.003** (2.31)	-0.003 (0.84)	-0.246 (1.47)	0.001 (1.09)	-0.005 (1.39)	-0.246 (1.44)	-15.61^ (0.82)	-0.008** (2.02)	0.429** (2.37)
Fraction Independent Directors	0.050** (2.53)	0.083* (1.79)	1.831 (1.01)	0.021 (1.33)	0.095** (2.14)	0.309 (0.15)	0.025* (1.77)	0.077* (1.74)	0.01 (0)	0.038 (1.21)	0.013 (0.22)	3.794 (1.49)
Log(Sales)	1.95^ (0.03)	0.036** (2.23)	4.737*** (7.39)	-0.005 (0.94)	0.023 (1.5)	4.907*** (7)	-0.003 (0.66)	0.025* (1.64)	4.865*** (6.85)	-0.014 (1.15)	-0.024 (1.07)	-2.207** (2.33)
# Business Segments	5.03^ (0.33)	-0.011*** (3.01)	-0.215 (1.57)	8.30^ (0.64)	-0.011*** (3.05)	-0.043 (0.26)	1.84^ (0.16)	-0.011*** (3.06)	-0.045 (0.27)	0.003 (1.18)	-0.017*** (4)	-0.242 (1.29)

Independent variable	Dependent variable											
	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA	IV	Ln(Tobin's q)	ROA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fraction Males with Board Connections to Female Directors	0.262*** (15.13)			0.299*** (19.28)			0.276*** (18.18)			0.245*** (10.29)		
Number of observations	3911	3911	3914	5610	5610	5615	5534	5534	5539	2264	2264	2266
Regression type	<i>First-stage IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>First-stage IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>First-stage IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>First-stage IV with fixed effects</i>	<i>IV with fixed effects</i>	<i>IV with fixed effects</i>

## 5. Conclusions and implications for Vietnam

The empirical findings of this study on a sample of all US firms in the S&P500, S&P Midcaps, and S&P Smallcaps in the six year period from 1998 to 2003 report a negative link between gender diversity of the board and financial firm's performance. Results indicate that the direction of causation goes from the fraction of female on the boards to the firm's performance. Although one may argue that female directors can bring beneficial features, such as stronger corporate governance to the board, our results do not support this idea. Instead, we find that firm values are likely to diminish when more female directors are present on the board.

We first observe positive relation (only significant for ROA) between the fraction of female directors and firm's performance. However, after we adjust for firm fixed-effects, both coefficients become negative and insignificant. To address the potential endogeneity issue for the fraction of female directors, we introduce the fraction of male directors on at least two boards with female directors as an instrument for the IV technique. Results from the IV regression project a negative and statistically significant relation between the proportion of female directors in a firm and financial performance measured by Tobin's q.

However, we do not observe any significant relation in using ROA as the measure. The true relation between gender-diverse boards and firm's performance are likely to be more complex. We further test whether performance of firms with otherwise weak corporate governance tends to be ameliorated with a gender-diverse board. However, our hypothesis is not supported by the results after we include governance index and the interaction of G-index and the fraction of female directors in our model. We extend our model to test whether firm's performance is affected by the fraction of female directors in each committee. Results show that females in Audit and Nomination committees are likely to deteriorate the performance of the company as measured by Tobin's q.

This study is conducted on a sample of US firms which provides us with as many as possible observations for various econometric techniques. Thus, replicating this study using data on Vietnamese listed firms may be desirable. Findings from empirical studies on female representation and firm's performance for Vietnam's listed firms such as Vo and Phan (2013) has concluded that a representation of female directors in a board of directors may improve firm's performance as measured by both ROA and Tobin q. The findings from this paper indicate that the positive contribution of female representation may not be as strong as others have expected. The implications from this study on the US data are that increasing a number of female directors may not be the case to improve firm's performance, at least for the US case. A similar study on the data for Vietnam using similar approaches may provide more robust evidence to draw any conclusion on a contribution of female representation to firm's performance■

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