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Does the Gender Composition of a Board of Directors affect Firm Performance?

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Abstract

UK female board representation has dramatically increased in recent years, largely due to various government-approved measures to improve gender equality in boardrooms, notably the landmark Davies Report (2011). The business case for increased female board participation is constructed around the notion that females tend to exhibit different characteristics and preferences to their male counterparts which enhance firm performance. This gained renewed interest particularly following the 2008 financial crisis and the Lehman Sisters hypothesis, which argues that more female directors would have mitigated the adverse effects of the crisis to a degree, given that women are more risk-averse than men. However, academic literature is inconclusive regarding the effects of female directors on firm performance. This dissertation conducts panel data analysis using a fixed effects model to investigate empirically the impact of female directors on the performance of 369 FTSE All-Share companies from 2008 to 2014. Whilst baseline regressions find that female directors do not appear to influence firm performance, further analysis reveals that female directors significantly improve performance in high-risk contexts; namely, during a financial crisis and within the banking sector. Thus, my dissertation supports both the moral and business cases for increased boardroom gender diversity.

Table of Contents

List of Figures and Tables

Section 1: Introduction

The moral case for boardroom gender diversity is indisputable: "in a world where rights to gender equality are seen as a basic human right there can be no case for exclusion" (McCann & Wheeler, 2011, p. 550). Yet, female board representation in the UK has remained stubbornly low, until recently. The case for female board participation gained renewed interest following the 2008 financial crisis, based on the argument that diversity could improve board decision-making and control risk (European Commission, 2010). This dissertation focuses on the business case for greater female board representation, constructed around the premise that female directors bring different experiences, perspectives and preferences to the boardroom, which can therefore improve firm performance (e.g. Milliken & Martins, 1996).

Whilst academic literature is inconclusive regarding the impact of more female directors on firm performance, Mark Carney, Governor of the Bank of England, claimed that "the business case for fairness, equality and inclusion is clearer than ever, and financial institutions must embrace diversity in their organisation in order to reap the benefits" (Gadhia, 2016, p. 3). This attitude is reflected in governmental pressure to increase female board representation (e.g. Davies, 2011) and the subsequent progress within UK firms. The UK has issued voluntary measures, but not yet legislative quota regimes, for companies to increase female board representation.

Given gender differences and the pressure on UK firms, it is imperative to answer the question, "Does the Gender Composition of a Board of Directors (BoD) affect Firm Performance?". In this dissertation, I conduct panel data analysis using a fixed effects model to estimate the impact of female directors on the performance of 369 FTSE All-Share companies. I add to existing literature by using multiple measures of female board representation (female presence and proportion of female directors) and by using both accounting and market-based measures of firm performance (Return on Assets (ROA) and Tobin's Q). Additionally, I conduct a natural experiment using the Davies Report (2011) to control for endogeneity and investigate how the impact of female directors changes under

different conditions (namely, during the 2008 financial crisis and within the banking sector). I also contribute to the small pool of literature examining non-US data, providing an update to the analysis of UK firms. Whilst baseline regressions find that there is no significant effect of female presence or proportion on firm performance, further analysis reveals that female directors significantly improve firm performance in high-risk climates, providing support for the business case for boardroom gender diversity.

My dissertation is structured as follows: Section 2 outlines the UK institutional context; Section 3 details the literature surrounding boardroom gender diversity; Section 4 explains the data and variables and provides exploratory data analysis; Section 5 analyses the methodology; Section 6 discusses findings from the empirical analysis; Section 7 addresses endogeneity concerns; Section 8 extends the analysis further; and Section 9 concludes the study.

Section 2: Institutional Context

The moral case for gender equality was written into UK law decades ago, with the Equal Pay Act (1970) and the Sex Discrimination Act (1975). However, until recently, female directors have been shockingly underrepresented and progress to improve the situation has been slow. At the current rate of change, it will take over 70 years to achieve gender-balanced boardrooms in the UK's largest 100 companies (Equality and Human Rights Commission, 2008). The lack of boardroom gender diversity in the UK has been scrutinised in recent years, leading to the publication of numerous reports recommending firms to appoint more female directors.

The Higgs review (2003) and the follow-up Tyson report (2003) were the first steps in this direction, outlining the business case for boardroom diversity. The landmark government-commissioned Davies Report (2011) identified four reasons to increase female board representation, which form the business case: improving performance; accessing the widest talent pool; being more responsive to the market; and achieving better corporate governance. The report set out numerous ambitious voluntary targets for UK firms to increase boardroom gender diversity, principally for FTSE

100 companies to have a minimum of 25% female directors by 2015. By this deadline, FTSE 100 firms had exceeded this target: female proportion more than doubled to 26.1% and the number of all-male boards dropped from 21 to zero (Davies, 2015). In contrast to many European countries, legislative measures have not been recommended in the UK; in fact, the follow-up report (Davies, 2015) emphasised the success of the "voluntary business-led approach" and setting "realistic, achievable and stretching targets" (p. 6).

Looking to the future, FTSE 350 firms face an updated target of at least 33% female representation by 2020 (Davies, 2015). Gadhia (2016), another key report, advocates greater boardroom gender diversity specifically in the UK financial services sector and recommends government-approved measures including reporting internal targets, executive accountability for gender diversity and remuneration tied to achieving the targets. Given these initiatives, it is essential to investigate whether greater female board representation is likely to impact firm performance and, if so, the likely nature of the impact. Consequently, this dissertation seeks to establish if current measures are appropriate.

Section 3: Literature Review

Dissertation Originality

My dissertation expands the limited literature analysing UK firms; most existing literature examines the USA. Haslam et al. (2010) and Gregory-Smith et al. (2014) are UK-focused studies, although their results are ambiguous. Furthermore, my dissertation is an updated study of the relationship between boardroom gender diversity and firm performance; the latest UK data analysed is from 2011 (Gregory-Smith et al., 2014). Given the extent of recent progress in boardroom gender equality, it is crucial to assess changes in the relationship and examine the legislative implications. Additionally, I measure firm performance using both an 'objective' accounting-based and 'subjective' stock-based measure, and measure gender board diversity using both female presence (a dummy

variable) and the proportion of female directors. Thus, my dissertation covers a wide range of measurement variables, unlike most studies.

Furthermore, I take various steps to mitigate and test for endogeneity, an issue that plagues most studies in this field but which few attempt to control for. Notably, I conduct a natural experiment using the Davies Report (2011) to assess exogenous increases in female boardroom representation. Arguably my dissertation's most important extension of the literature is its investigation of how the impact of female directors changes under different circumstances, namely in the context of the 2008 financial crisis and in a high-risk environment, the banking sector.

Why Gender Matters

Males and females differ in their values, experience and knowledge (Adams & Funk, 2012). Regarding behavioural differences, numerous studies find that females are more risk-averse and less competitive than males (e.g. Croson & Gneezy, 2009; Charness & Gneezy, 2012). Specifically, male overconfidence and competition preferences lead to excessive risk-taking whilst women shy away from competition (Niederle & Vesterlund, 2007). Most studies use samples of students, workers or the general population to investigate characteristic differences, but a small number of studies extend the research by specifically focusing on the directorship level. Adams & Funk (2012) find that female directors prioritise self-transcendence over self-enhancement: they are more benevolent, interdependent, tolerant and less power-oriented than male directors, values which may stimulate more collaborative decision-making. Contrary to findings of general populations, female directors are also slightly more risk-loving and stimulation-oriented, less tradition and security-oriented and less conforming. In contrast, Wilson & Ali's (2009) study of UK bankruptcies found that female directors significantly lower insolvency risk.

In addition, appointing more female directors allows firms to access the widest talent pool (in Europe, women account for six out of ten graduates (Raconteur Media, 2010). Robinson & Dechant (1997) assert that women's unique experiences and knowledge provide new ideas and alternative

perspectives, enhancing problem-solving skills, decision-making quality and firm performance. Although high levels of heterogeneity can create time-consuming conflict and communication issues amongst board members (Lau & Murnighan, 1998), women are more co-operative than men (Nowell & Tinkler, 1994) and, ultimately, diverse teams outperform homogenous ones (Anderson et al., 2011). Furthermore, gender diversity leads to a better understanding of the marketplace by reflecting the diversity of its employees and consumers (Tyson, 2003), resulting in more informed decision-making. Indeed, increased boardroom gender diversity improves firm reputation and consumer loyalty, improving firm performance (Robinson & Dechant, 1997). Moreover, women improve attendance rates, are more likely to hold CEOs accountable for poor stock performance and are more involved with monitoring committees (Adams & Ferreira, 2009), the latter implying less chance of legal, ethical and reputational risk-taking. Nevertheless, Carter et al. (2003) note that improved board monitoring is not guaranteed if female directors are marginalised.

The theoretical framework linking board diversity and firm outcomes is the upper echelons theory (Hambrick & Mason, 1984), which incorporates the aforementioned arguments surrounding gender differences. This theory states that directors differ in their experience, knowledge and characteristics, and these influence firm outcomes, namely strategic choices and firm performance. Gender, an observable characteristic, is a proxy for directors' cognitive frames, which are otherwise difficult to capture (Dezsö & Ross, 2012).

Summary of Literature

Empirical evidence is inconclusive regarding the effect of female directors on firm performance, but meta-analyses establish key findings in this research area. Post & Byron's (2015) meta-analysis of 140 studies finds that female directors have a statistically significant positive effect on accounting-based measures of firm performance, particularly in countries with strong shareholder protection. The study fails to find a significant effect using market-based measures; however, looking closer at the legal and socio-cultural contexts, a more positive relationship is found in firms operating

in countries with greater gender equality. Pletzer et al. (2015) find a non-significant impact for both types of measures, noting that their deviation from Post and Byron's significant result is likely to be due to a smaller sample size of 20 studies. One strength of this meta-analysis is its inclusion of exclusively peer-reviewed and published studies, increasing the robustness of its conclusion of no relationship. However, its univariate approach to this complex research question may have led to biased results due to omitted variables. Moreover, both meta-analyses are limited by the population of studies used. Whilst these meta-analyses provide little evidence for the business case for increased female representation in the boardroom (both found a very small effect size), the lack of a detrimental effect on firm performance supports the moral case for diversity.

Campbell & Mínguez-Vera (2008) find that boardroom gender diversity has a statistically significant positive impact on the performance of Spanish companies, measured using market-based Tobin's Q, during 1995-2000. A key strength of this study is the range of measures used for female board representation: female presence, female percentage, the Blau index and the Shannon index. The positive and significant result found on three out of four of these measures indicates a high level of robustness. Moreover, Erhardt et al. (2003) find that this statistically significant positive relationship holds true when measuring performance using accounting-based measures (Return on Assets and Return on Investment) of 112 Fortune 1000 firms in 1998. This is a useful comparative study since it uses the same control variables as my dissertation; however, unlike my dissertation, this study establishes trends rather than causality and does not consider the issue of simultaneity. Catalyst (2004) supports these findings, concluding that Fortune 500 companies with the highest female representation on top management teams outperformed counterparts with the lowest representation, measured by Return on Equity and Total Return to Shareholders in 1996-2000, findings that were robust to analysis by industry. Carter et al. (2003) also find a significant positive relationship between female directors and firm value for 638 Fortune 1000 firms in 1997, measured by Tobin's Q.

Some studies extend research by finding that a positive effect of female directors on firm performance is enhanced, or only exists, under certain conditions. Anderson et al. (2011) find that, in a sample of 615 Russell 1000 firms in 2003 and 2005, increasing board heterogeneity by 10% generates a 7.49% increase in Tobin's Q, yet improves performance further in firms with complex operations, which require a diverse board with a range of perspectives and skills. Similarly, Dezsö & Ross (2012), using a rich panel dataset of S&P 1,500 firms over 15 years, conclude that gender diversity in top management significantly improves firm performance *only* if the firm has a focus on innovation. The key advantage from these studies is the finding that the relationship between boardroom gender diversity and firm performance is not constant across all firms and sectors; firm and industry conditions are crucial. This conclusion opens avenues for further research and fuels further analysis in my dissertation.

In contrast, Adams & Ferreira (2009) argue that the positive relationship between boardroom gender diversity and firm performance is not robust to methods combatting the issue of endogeneity of gender diversity and attempting to prove causality. Studying 1939 US companies during 1996-2003, they find a negative impact of female directors on firm performance, measured by both ROA and Tobin's Q. They assert that gender-diverse boards are valuable for firms with otherwise weak governance, as measured by their abilities to resist takeovers, but too much female representation can produce over-monitoring, which could decrease shareholder value. Haslam et al. (2010) find a negative link between female presence and stock-based Tobin's Q of FTSE 100 companies (although find no significant effect on performance using accounting ratios, ROA and ROE). A key strength of their study is its evidence of bilateral causality between female boardroom representation and poor firm performance, as measured by Tobin's Q. Furthermore, Judge (2003) claims that women "wreak havoc" on the share-price of FTSE 100 companies. This correlation was challenged by Ryan & Haslam's (2005) "glass cliff" theory, which postulates that women are more likely than men to accept precarious board appointments following poor stock-market firm performance, i.e. the appointment of female

directors signals organisational difficulties or crisis and the market reacts accordingly (as opposed to the reverse direction of causality).

Several empirical studies find that female boardroom representation yields no significant impact on firm performance. Rose (2007) finds no significant link between female directors on Danish boards and firm performance, as measured by Tobin's Q. Rose offers an argument of socialisation, whereby directors with an unconventional background conform with the ideology of the majority, limiting their impact on firm performance. Similarly, Gregory-Smith et al. (2014) find no significant relationship between UK gender-diverse boards and firm performance, as measured by ROA, TSR, ROE and Tobin's Q, suggesting that boards may have already reached their optimal gender composition. These studies support ethical and moral arguments rather than the business case for greater boardroom gender diversity.

Kanter (1997) pioneered critical mass theory regarding gender diversity in groups, which postulates that a critical mass must be achieved to ensure that women are not marginalised and can contribute their unique perspectives, knowledge and characteristics. Konrad et al. (2008) and Konrad & Kramer (2006) assert that three or more women are necessary to avoid tokenism, whereby women are not treated as individuals but as representations of their gender (Kanter, 1977), giving rise to stereotypes and marginalisation instead of creating a collaborative dynamic. However, an important limitation of these studies is highlighted by McCann & Wheeler (2011), who challenge this "magic number" of three women on BoDs since their impact depends on the total number of directors. Joecks et al. (2012) build on these findings by undertaking one of the first empirical tests based on critical mass theory in a business context, validating their results with a multivariate regression analysis and determining gender boardroom diversity endogenously. They conclude that the relationship between female boardroom representation and firm performance is U-shaped, finding that a critical mass of 30% women is needed for increased boardroom gender diversity to outperform firms with all-male boards.

The ambiguity of the empirical evidence can be attributed to data from different countries and time-periods (Campbell & Mínguez-Vera, 2008). Subsequently, there are different legal, institutional and social contexts and different proportions of female directors, where a low proportion limits the robustness of the empirical results (Francoeur et al., 2008). Furthermore, results are impacted by different estimation methods; some studies control for more variables than others, causing varying degrees of bias of coefficients. Crucially, some studies use accounting-based measures of firm performance and others use market-based measures, which each capture different dimensions of performance (Crook et al., 2005).

Section 4: Data and Variables

The balanced panel data for my empirical analysis is sourced from the FAME database and comprises FTSE All-Share firms with financial and directorship data available for the observed time-period, 2008-2014 (369 firms and 2583 observations).

Table 1 identifies the key variables in my baseline regressions and explains how they are calculated. Existing literature varies regarding the variables used to measure firm performance, the dependent variable. The two principal categories are 'objective' accounting-based measurements, such as ROA, and 'subjective' market-based measurements, primarily Tobin's Q (Haslam et al., 2010). Accounting measures are backward-looking, based on previous corporate performance and profitability, whereas market-based measures are forward-looking, reflecting investor perceptions of future value, opportunities for growth and efficiency of a firm's use of assets (Devers et al., 2007; Demsetz & Villalonga, 2001). To ensure robustness of my conclusions, I use both ROA and Tobin's Q as measures of firm performance, and I use two proxies for female board representation (the explanatory variable): female presence (a dummy variable) and the proportion of female directors. The control variables are the firm characteristics most consistently controlled for in the literature; firm size, board size and industry (e.g. Campbell & Mínguez-Vera, 2008; Haslam et al., 2010). These variables are controlled for because female board representation increases with firm size, board size

and in industries dependent on female employees (Carter et al., 2003; Hillman et al., 2007). Furthermore, board size is an indicator of firm size (Boone et al., 2007). All financial variables have been winsorised at the 1% and 99% levels to minimise the distortionary effects of outliers and increase robustness.

Table 1: Variables

Variable	Source	Type of Variable	Description
Return on Assets (ROA)	FAME Library	Dependent	ROA (%) = Net Income/Total Assets ROA is an accounting-based measure of firm performance. The natural logarithm is used.
Tobin's Q	FAME Library	Dependent	Tobin's Q = Market Capitalisation/Total Assets Tobin's Q is a market-based measure of firm performance. The natural logarithm is used.
Female Presence	FAME Library	Explanatory	Female Presence is a dummy variable which =1 when there is at least one female director present, and =0 otherwise.
Female Proportion	FAME Library	Explanatory	Female Proportion = Number of Female Directors/Number of Total Directors
Firm Size	FAME Library	Control	Firm size is measured by the natural logarithm of total assets.
Board Size	FAME Library	Control	Board size is measured by the natural logarithm of the total number of directors.
Industry Dummies	FAME Library	Control	Industry is classified using the Primary UK Standard Industrial Classification (SIC) code (2007). The SIC classifies companies by the type of economic activity in which they are engaged (ONS, 2017). Industry dummies are formed from two-digit SIC codes.

Exploratory Data Analysis

Table 2 shows descriptive statistics for the key variables. ROA has a mean of 4.17 and Tobin's Q has a mean of 0.98, displaying stronger financial performance in comparison to the values obtained by Gregory-Smith et al. (2014) for 1996-2011 (0.03 and 0.51 respectively). On average across the time-period, 69% of firms had at least one female director on the BoD, whilst the average proportion of female directors was 0.13 (significantly higher than 0.05 for 1996-2011 found by Gregory-Smith et al. (2014)). However, separating summary statistics between firms with and without female presence (Tables 11 and 12) reveals that firms with female presence have an average proportion of female

directors of 0.19 and have a higher average firm performance, with mean ROA of 5.24 and Tobin's Q of 1. The proportion of the between-firm and within-firm variance out of the total variance changes across different variables, therefore testing will be carried out to determine which estimator is most appropriate for the empirical analysis.

Table 2: Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ROA	overall	4.169376	14.94185	-174.101	190.4482	N = 2563
	between		8.184832	-44.0272	38.54604	n = 369
	within		12.51044	-152.575	158.9006	T-bar = 6.9458
Tobin's Q	overall	0.976167	1.009461	0	20.689	N = 2530
	between		0.876672	0.014429	9.967714	n = 369
	within		0.496281	-7.89955	11.69745	T-bar = 6.85637
Female Presence	overall	0.687573	0.463573	0	1	N = 2583
	between		0.362697	0	1	n = 369
	within		0.289234	-0.16957	1.544715	T = 7
Female Proportion	overall	0.131635	0.114935	0	0.6	N = 2583
	between		0.095528	0	0.528571	n = 369
	within		0.064077	-0.2017	0.417349	T = 7
Total Assets	overall	13.62691	1.89267	7.201064	21.59942	N = 2563
	between		1.875726	9.5144	21.20766	n = 369
	within		0.240528	9.885001	14.87894	T-bar = 6.9458
Number of Total Directors	overall	8.643438	2.714865	4	23	N = 2583
	between		2.583394	4	19.42857	n = 369
	within		0.843844	3.929152	12.92915	T = 7

Figures 1 and 2 display the proportion of firms with female directors and the average proportion of female directors over 2008-2014, which both increased significantly over the time-period, reaching approximately 0.85 and 0.18 respectively in 2014. This provides evidence that not only did more firms appoint female directors, but their proportion within firms themselves also increased. Notably, 100% of FTSE 100 companies had at least one female director by 2014 and had an average female proportion of nearly 0.25, arguably because the Davies Report (2011) had recommended these firms to achieve a target of at least 25% of female directors by 2015. The overall increase of gender diversity on BoDs suggests that firms were identifying the potential benefits of female directors or were complying with the external recommendations. Interestingly, Figure 3 shows

that board size did not change significantly over the time-period (an average of 8.6 directors, similar to 8.02 found by Gregory-Smith et al. (2014)), implying that firms hired women into directorship positions formerly occupied by men, rather than simply adding new female directors to the board to meet targets.

Figure 1: Proportion of Firms with Female Directors

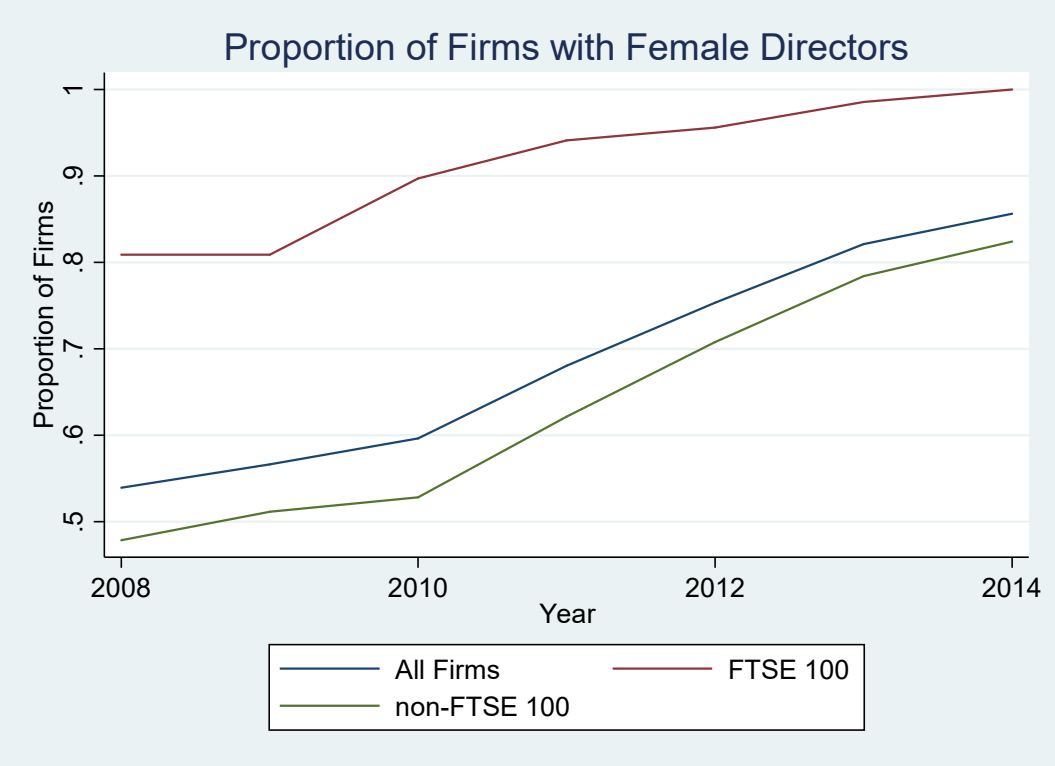

Figure 2: Average Proportion of Female Directors

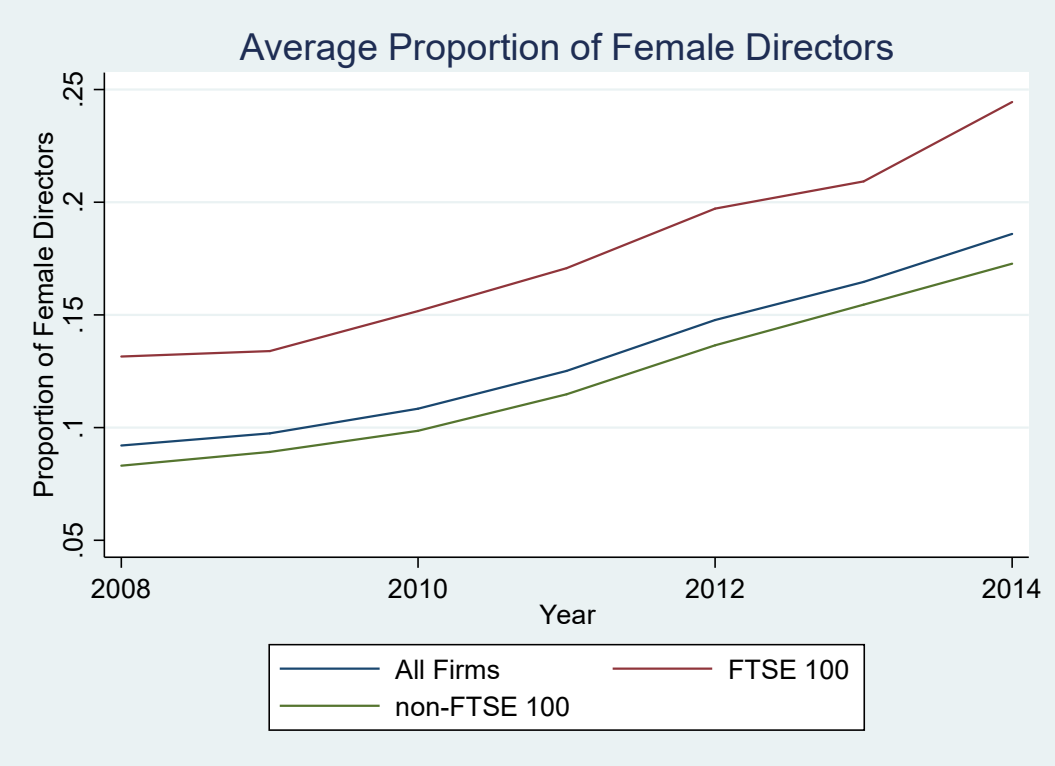

Table 3 presents a correlation matrix and shows a weak yet positive correlation between female presence, female proportion and both measures of firm performance. This suggests that whilst female directors appear to improve firm performance, many other factors apply besides boardroom gender composition. This evidence is not sufficient to prove a causal relationship and is not robust, therefore further analysis is conducted in Section 6.

Table 3: Correlation Matrix

	ROA	Tobin's Q	Female Presence	Female Proportion	Total Assets	Number of Directors
ROA	1					
Tobin's Q	0.5491	1				
Female Presence	0.0446	0.0514	1			
Female Proportion	0.0028	0.0688	0.7647	1		
Total Assets	-0.1454	-0.463	0.2449	0.1777	1	
Number of Directors	0.1258	-0.1924	0.3256	0.1676	0.7061	1

Section 5: Methodology

I use panel data methodology for my regressions, which provides more robust findings than cross-sectional data and eliminates unobservable heterogeneity among firms in the sample (Campbell & Mínguez-Vera, 2008). The baseline econometric specification is as follows:

$$\log(firm\ performance)_{it} = \beta_0 + \beta_1(female\ board\ representation)_{i(t-1)} + \beta_2(firm\ characteristics)_{i(t-2)} + D_t + u_i + \varepsilon_{it}$$

In this model, subscript i represents each firm and t represents the year. The dependent variable, firm performance, is measured using ROA and Tobin's Q in alternate regressions. I separate regressions by each measure of female board representation to mitigate correlation between the two key independent variables: in one regression, I include only female presence as the key explanatory variable; in the other, I include female proportion conditional on female presence in the boardroom (i.e. where the dummy variable for female presence =1). Firm characteristics are the control variables described above, including industry dummies to control for industry trends and characteristics that could influence female board representation. D_t represents time dummies, which account for time trends that could influence all firms between 2008-2014. ε_{it} represents the random error term which varies with i and t, whilst u_i captures unobserved individual heterogeneity (i.e. time-invariant unobservable firm-specific characteristics that could impact firm performance). The explanatory variable of interest is lagged by one year to mitigate endogeneity and to control for the potentially delayed impact on firm performance arising from boardroom decision-making. The control variables are lagged by two years instead of one since firm characteristics could influence female board representation as well as firm performance. Every regression also includes robust clustered standard errors to mitigate heteroskedasticity and within-firm serial correlation.

I present my results using three models: i) pooled OLS without control variables; ii) pooled OLS with control variables; iii) firm fixed effects with control variables. The robust Hausman and Breusch-

Pagan tests were both highly significant, indicating that OLS is inappropriate and unobservable firm heterogeneity is correlated with the explanatory variables. Therefore, the fixed effects model is the most appropriate and efficient for this analysis since it controls for unobserved firm variability. Consequently, my interpretation shall focus on this model.

Given the ambiguous literature surrounding the effect of female directors on firm performance, the expected coefficient on female presence and proportion is unclear. Gender-diverse boards could generate improved decision-making, less risk and better client relationships, thus improving firm performance and yielding a positive coefficient. Alternatively, gender-diverse boards could cause more conflict or over-monitoring, lowering firm performance and generating a negative coefficient. An insignificant result is also possible if female directors do not influence firm performance. The coefficients on firm size and board size are expected to be negative, in line with Guest's (2009) finding that larger boards in the UK have a strong negative impact on profitability and Tobin's Q.

Section 6: Findings and Discussion

The fixed effects model in Table 4 shows that female presence on a BoD has no significant impact on either measure of firm performance. Whilst both coefficients are positive, neither are statistically significant. Similarly, Table 5 shows that female proportion does not significantly impact either measure of firm performance, although here the coefficients are negative. Thus, it initially appears that female board representation does not influence firm accounting performance or market value, suggesting that gender-diverse boards are unimportant from a business perspective. My finding of no significant relationship between both measures of female boardroom presence and firm performance is consistent with several academic papers, including Gregory-Smith et al. (2014) (the latest study on UK firms), McCann & Wheeler (2011) and Rose (2007). Regarding the control variables, total assets is negatively and significantly related to Tobin's Q in regressions for both female presence

and proportion, demonstrating that larger firms have weaker firm performance. In contrast, the number of directors does not have a significant impact on firm performance.

Table 4: Impact of Female Presence on Firm Performance

	Dependent Variables					
	ROA			**Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Presence	0.064 (0.080)	0.121 (0.081)	0.048 (0.080)	-0.057 (0.056)	0.103** (0.047)	0.016 (0.027)
Total Assets		-0.179*** (0.040)	-0.147 (0.131)		-0.292*** (0.032)	-0.303*** (0.115)
Number of Directors		0.438* (0.249)	-0.049 (0.195)		0.409** (0.158)	0.079 (0.082)
Observations	1,951	1,649	1,649	2,175	1,807	1,807
R^2	0.300	0.427	0.002	0.300	0.550	0.210
Number of companies			362			369
Breusch-Pagan test			617.48***			2275.91***
Robust Hausman test			532.27***			975.03***
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female presence lagged by one year; (v) control variables lagged by two years.

Table 5: Impact of Female Proportion on Firm Performance

	Dependent Variables					
	ROA			**Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Proportion	-0.520 (0.520)	-0.337 (0.475)	-0.059 (0.501)	-0.185 (0.410)	-0.147 (0.325)	-0.066 (0.282)
Total Assets		-0.199*** (0.044)	-0.030 (0.169)		-0.312*** (0.037)	-0.529*** (0.122)
Number of Directors		0.591** (0.271)	0.103 (0.211)		0.498** (0.201)	0.077 (0.111)
Observations	1,311	1,141	1,141	1,434	1,232	1,232
R^2	0.329	0.435	0.001	0.316	0.574	0.246
Number of companies			307			313
Breusch-Pagan test			374.25***			1296.21***
Robust Hausman test			256.89***			732.41***
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female proportion lagged by one year; (v) control variables lagged by two years.

There are various explanations for the finding that both measures of female board representation have no significant effect on either measure of firm performance. Firstly, applying the critical mass theory to my data, it appears that female board representation in UK firms has not yet reached the critical mass necessary for female directors to have a significant impact on firm performance. The critical mass required is at least three female directors (Konrad & Kramer, 2006; Konrad et al., 2008) or 30% of the board (Joecks et al., 2012); however, in my data sample, the average percentage of female directors is 13% and there is on average only one female director on a BoD (Table 2). Having one 'token' female director elicits many constraints, in terms of both how female directors are treated and their behavioural responses to this treatment. For instance, "role encapsulation", whereby men assign one of four stereotypical or caricatured roles to their female colleagues, automatically limits the impact and advancement opportunities of female directors (Kanter, 1977). Therefore, the non-significant result does not imply that women are poor directors; firms may simply be using female directors as "window dressing" (Carter et al., 2003).

Secondly, the insignificant impact may be because female directors do not differ from their male counterparts. Evidence that women generally avoid competition (Niederle & Vesterlund, 2007) implies that women who reach top management levels are exceptions to the wider female population. Therefore, female directors may have similar preferences to male directors, so are unlikely to impact firm performance. Indeed, Rose (2007) speculates that female directors may suppress features which differ from those of male directors (the dominant group) to assimilate into the majority and thus appear sufficiently qualified to obtain directorship positions. Consequently, the potential effects of female directors never materialise.

Finally, the impact of female directors simply might not be captured due to econometric issues. Insufficient variability of female directors over time causes the fixed effects model not to capture the effect of female presence and proportion on firm performance (the results become insignificant). Accordingly, the results of the pooled OLS model are also presented. However, the

possibility of too little variability of the key independent variables is unlikely given the dramatic increase in the number of firms with female presence and the proportion of female directors shown in Figures 1 and 2. Furthermore, female presence and proportion could be correlated with unobservable factors not included as control variables. The OLS model yields a positive and significant impact of female presence on firm performance; specifically, at least one female director leads to an expected increase of Tobin's Q by 11%. However, when including firm fixed effects this effect disappears, suggesting that this positive effect may be driven by unobservable omitted firm characteristics.

It is crucial to stress the importance of not finding a negative impact of female directors on firm performance. The relationship between female board representation and firm performance might be expected to be negative: external recommendations regarding the gender of a firm's directors (e.g. Davies Report, 2011) can act as a constraint since the firm may not hire the most suitably qualified candidate in terms of characteristics and skills, weakening firm value. For instance, Ahern & Dittmar (2012) found that a quota requiring at least 40% female board representation caused a severe decline in Tobin's Q of Norwegian firms due to a deterioration of board capabilities, including younger and less experienced directors. Gregory-Smith et al. (2014) assert that the fall in firm value was therefore a result of a forced deviation from a possible optimal gender-balance. However, my analysis does not reveal any detrimental or restrictive impact of female directors on firm performance. At worst, female directors have a neutral impact on firm performance, therefore more gender-diverse boards should be pursued to advance social justice and gender equality. Thus, my findings provide support for the moral case for improved boardroom gender diversity, whereby equal opportunity and representation are not a means to an end, but a "desirable end in itself" (Brammer et al., 2007, p. 395).

Section 7: Endogeneity and Robustness Checks

Hermalin & Weisbach (1998) outline the two potential endogeneity concerns surrounding the empirical relationship between boardroom gender diversity and firm performance. Firstly, this model could be subject to reverse causality: female representation may be a function of firm performance. Female directors are likely to self-select into higher-performing firms (Joecks et al., 2012) and, equally, such firms are more likely to appoint female directors (e.g. Singh et al., 2001). This is because they have more flexibility and can risk employing a female director (Gregory-Smith et al., 2014; Smith et al., 2006) or because they are more pressurised to do so (for example, targets in the Davies Report (2011) specifically concerned FTSE 100 companies). Secondly, omitted variables may affect both gender board diversity and firm performance, rendering coefficients biased. For example, greater female boardroom presence is more likely the closer the proximity of the industry to female consumers (Brammer et al., 2007) and the more ethical the company (Bernardi et al., 2009). Hillman et al. (2007) assert that organisational predictors such as industry type, firm diversification strategy and links to other boards with female directors also influence the likelihood of female board representation. The factors impacting gender boardroom diversity are innumerable, consequently a certain degree of omitted variable bias appears unavoidable despite efforts to mitigate it within my model specification.

Few studies control for endogeneity, and most of those who do so use an instrumental variable, including Adams & Ferreira (2009) and Smith et al. (2006). However, it is extremely difficult to find a valid instrument, especially in this case where it must affect female board representation but not firm performance. Whilst the publication of the Davies Report (2011) was intuitively an appropriate instrument to use, given that it had time and cross-firm variability and satisfied the aforementioned conditions, it did not pass the statistical tests verifying its validity. As a solution to potential endogeneity problems, in line with Joecks et al. (2012), I use panel estimation techniques, whereby the fixed effects model solves the endogeneity problem of time-constant omitted variables

(Wooldridge, 2009). Furthermore, the key explanatory variables are lagged by one year and the control variables are lagged by two years since they can also potentially influence gender diversity.

I have tested for reverse causality (Tables 13 and 14), whereby measures of firm performance are used as explanatory variables, and female presence and proportion are used as dependent variables. According to the fixed effects model, these regressions do not yield significant results, suggesting that the reverse direction of causality is not present here. Similarly, firm and board size do not appear to affect female board representation, contrary to Brammer et al. (2007). However, one must be cautious with interpreting these results as robustness has not been tested here.

As a further robustness check, I tested for a non-linear relationship between female proportion and firm performance in response to the critical mass theory postulating that a minimum level of female board representation is required to impact firm performance. Table 15 shows that no significant coefficient was found on the quadratic term, implying a linear relationship between the proportion of female directors and firm performance. Nevertheless, there may be insufficient female directors in UK firms for a non-linear relationship to exist, given that the critical mass of female directors has not yet been reached.

As a robust solution to self-selection bias, I used the Davies Report (2011) as a natural experiment to examine exogenous changes to gender boardroom diversity and differences in firm performance for treated firms. The Davies Report recommended FTSE 100 firms to reach a target of at least 25% female directors by 2015, therefore the FTSE 100 are used as the group of treated firms. A new variable has been created, interacting treated firms with the years following the publication of the Davies Report (2012 onwards). Table 6 shows that, post-report publication, treated firms have a 12% higher expected Tobin's Q on average than the counterfactual of firms with no recommendations for a minimum proportion of female directors (the interaction terms are significant at the 1% level under both the pooled OLS and fixed effects models). Figures 4 and 5 support this finding, showing that companies that were the subject of recommendations for more female directors in the Davies

Report (2011) (i.e. the FTSE 100) consistently outperformed the overall sample after its publication. This result suggests that recommendations for a minimum proportion of female directors are effective in improving firm performance and thus supports the business case to increase female board representation.

Table 6: Natural Experiment using the Davies Report (2011)

	Dependent Variables			
	ROA (first difference)		**Tobin's Q (first difference)**	
Variables	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS & Controls**	**Fixed Effects**
Interaction Term (post*treatment)	-0.032 (0.144)	-0.026 (0.156)	0.114*** (0.030)	0.115*** (0.033)
Total Assets	0.227 (0.148)	0.418*** (0.152)	0.076 (0.065)	0.174*** (0.065)
Number of Directors	-0.052 (0.073)	0.023 (0.270)	-0.043 (0.030)	-0.083 (0.098)
Observations	1,246	1,246	1,424	1,424
R^2	0.036	0.009	0.117	0.023
Number of companies		351		366
Firm Fixed Effects	No	Yes	No	Yes
Firm Controls	Yes	Yes	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) control variables lagged by two years; (v) first differences taken of all variables.

There are two endogeneity concerns within this natural experiment, but they have both been mitigated, thus we can confidently estimate the impact of the Davies Report (2011). Firstly, its publication coincides with the UK's economic recovery following the financial crisis, hence much of the increase in firm performance is arguably due to economic recovery, rather than more female directors. However, this problem has been countered by using year fixed effects, which control for time trends affecting all firms in this period. Furthermore, the FTSE 100 (the treated firms) comprises the largest listed UK firms by market capitalisation, therefore are likely to have higher firm performance than the other firms in the sample. Nevertheless, first differences were used for these regressions, controlling for differences in growth rates and unobserved effects.

Section 8: Further Analysis

Whilst I do not find that female board representation had a negative impact on firm performance, my baseline results do not appear to support the business case for more female directors. However, further analysis reveals that the impact of female directors changes under different conditions. Specifically, this section analyses how the 2008 financial crisis and sectoral heterogeneity affect the impact of female directors on firm performance.

The Financial Crisis

The 2008 financial crisis devastated the UK economy, triggering the deepest recession since the Second World War (ONS, 2013). Since my observed time-period covers the crisis years, it is crucial to consider this economic climate of uncertainty, volatility and high-risk when analysing the impact of female directors on firm performance. I have constructed a financial crisis dummy variable which takes the value 1 during the crisis years (2008-2010) and 0 otherwise. The coefficient of this variable represents the direct impact of the financial crisis on firm performance, therefore we can expect the sign to be negative. Additionally, I have created an interaction term between the crisis dummy and each measure of female board representation respectively to investigate if female directors had a differential impact on firm performance during the financial crisis. It should be noted that Tobin's Q, a market-based measure, is likely to be impacted more significantly here than ROA, an accounting ratio, because market capitalisation is much more sensitive than profitability to fluctuations in financial markets, therefore is far more likely to be influenced by the financial crisis.

Since a key cause of the financial crisis was excessive risk-taking (e.g. Williams, 2010), we might expect the effect of female directors to change during the crisis because women tend to be more risk-averse than men (e.g. Charness & Gneezy, 2012), therefore female board representation may have mitigated some detrimental effects to firm performance arising from the crisis. Moreover, the Lehman Sisters hypothesis (van Staveren, 2014) postulates that had there been greater gender equality in boardrooms, the financial crisis would have had a less catastrophic impact because some

behavioural causes of the crisis would have diminished. This ground-breaking conclusion is rooted in biological evidence in addition to economic theory and research proving that female directors tend to outperform their male counterparts, especially in times of uncertainty. This argument is echoed by Věra Jourová, the EU commissioner for justice and gender equality: "women have a very good talent for… crisis-solving because they can come up with proposals for negotiation and compromise. It is a necessary balance to the approach of men: attack and escape" (The Guardian, 2017).

Table 7 shows that, as predicted, the financial crisis has a negative and highly significant impact on Tobin's Q at the 1% level, decreasing Tobin's Q by 33%. The equivalent coefficient is not significant for ROA. The interaction term for Tobin's Q is significant at the 10% level, suggesting that female presence on a BoD during the crisis improved Tobin's Q by 7%. Table 8, which shows the impact of female proportion on firm performance, offers more robust results. Similar to Table 7, the crisis dummy is negative and highly significant, lowering Tobin's Q by 42%, although having no significant impact on ROA. The interaction term for ROA is significant at the 10% level and implies that increasing female proportion by 10 percentage points[1] leads to an expected increase in profitability of 7% during the crisis years. The interaction term for Tobin's Q is statistically significant at the 1% level and indicates that a 10 percentage point increase in female proportion of a firm's BoD leads to an increase of 8.9% in expected firm value.

Thus, my findings provide support for the Lehman Sisters hypothesis. During times of crisis and economic uncertainty, female board representation significantly improves firm performance. Given that financial crises are generally unpredictable, these results support the business case for more female directors to mitigate adverse effects on firm performance in case of a crisis or other economic climate of uncertainty or risk.

[1] Intuitively, an increase of 10 percentage points in female proportion is equivalent to replacing one male director with a female director.

Table 7: Differential Impact of Female Presence on Firm Performance during the Financial Crisis

	Dependent Variables					
	ROA			**Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Presence	0.097 (0.092)	0.153 (0.095)	0.046 (0.095)	-0.039 (0.061)	0.130*** (0.048)	0.011 (0.028)
Total Assets		-0.220*** (0.038)	-1.012*** (0.168)		-0.287*** (0.033)	-0.250** (0.103)
Number of Directors		0.529** (0.241)	0.050 (0.237)		0.402** (0.159)	0.146 (0.099)
Financial Crisis	0.542*** (0.126)	0.467*** (0.126)	0.171 (0.126)	-0.297*** (0.053)	-0.328*** (0.047)	-0.407*** (0.045)
Interaction term: Female Presence * Financial Crisis	-0.058 (0.099)	-0.063 (0.097)	-0.077 (0.089)	-0.030 (0.061)	-0.054 (0.052)	0.071* (0.040)
Observations	1,951	1,938	1,938	2,175	2,162	2,162
R^2	0.300	0.350	0.097	0.300	0.526	0.203
Number of companies			364			369
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female presence lagged by one year; (v) control variables lagged by two years.

Table 8: Differential Impact of Female Proportion on Firm Performance during the Financial Crisis

	Dependent Variables					
	ROA			Tobin's Q		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Proportion	-0.410 (0.479)	-0.228 (0.454)	-0.602 (0.422)	-0.331 (0.353)	-0.049 (0.269)	-0.076 (0.239)
Total Assets		-0.224*** (0.041)	-0.761*** (0.195)		-0.310*** (0.037)	-0.394*** (0.087)
Number of Directors		0.706*** (0.260)	0.047 (0.248)		0.515** (0.200)	0.145 (0.115)
Financial Crisis	0.282* (0.162)	0.233 (0.161)	-0.100 (0.141)	-0.419*** (0.098)	-0.440*** (0.080)	-0.549*** (0.074)
Interaction term: Female Proportion * Financial Crisis	0.590 (0.569)	0.358 (0.540)	0.704* (0.420)	0.648 (0.482)	0.347 (0.349)	0.855*** (0.264)
Observations	1,412	1,403	1,403	1,550	1,540	1,540
R^2	0.323	0.376	0.062	0.312	0.548	0.226
Number of companies			320			325
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female proportion lagged by one year; (v) control variables lagged by two years.

Sectoral Heterogeneity: The Banking Sector

Given the Lehman Sisters hypothesis, and my finding that female directors significantly improve firm performance in high-risk and uncertain climates, I now restrict my data sample and focus on the impact of female directors in a high-risk industry, the banking sector. Female directors might be expected to have a more significant impact on the performance of banks since they might mitigate the riskier decision-making made by male directors.

Whilst Table 9 shows that the impact of female presence on banks' performance remains insignificant, Table 10 indicates that female proportion has a positive and significant effect on banks' Tobin's Q, a contrasting result to the full sample of firms where the result was insignificant. If female proportion within a bank's BoD increases by 10 percentage points, Tobin's Q is expected to increase by 7.6%. This result supports the theory that female directors outperform their male counterparts in

high-risk contexts and represents further evidence for the business case for more gender-diverse BoDs. Tables 16 and 17 show that the impact of female presence and proportion on firm performance of non-banking firms both remain insignificant.

Table 9: Impact of Female Presence on Firm Performance of Banks

	Dependent Variables					
	ROA			**Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Presence	0.011 (0.136)	0.101 (0.142)	-0.175 (0.156)	-0.160* (0.089)	0.099* (0.057)	-0.007 (0.030)
Total Assets		-0.101 (0.093)	0.300 (0.213)		-0.332*** (0.039)	-0.118*** (0.037)
Number of Directors		-0.004 (0.625)	-0.325 (0.402)		0.155 (0.188)	0.069 (0.103)
Observations	682	577	577	763	634	634
R^2	0.238	0.026	0.017	0.016	0.731	0.147
Number of companies			127			130
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female presence lagged by one year; (v) control variables lagged by two years; (vi) firms in the banking sector sourced from FAME.

Table 10: Impact of Female Proportion on Firm Performance of Banks

	Dependent Variables					
	ROA			**Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Proportion	0.245 (0.760)	-0.239 (0.701)	-0.136 (0.871)	0.628 (0.486)	-0.195 (0.294)	0.732** (0.328)
Total Assets		-0.107 (0.102)	0.490 (0.375)		-0.354*** (0.048)	-0.126 (0.111)
Number of Directors		-0.095 (0.666)	0.109 (0.385)		0.283 (0.271)	-0.362** (0.153)
Observations	390	341	341	422	363	305
R^2	0.180	0.045	0.020	0.013	0.789	0.281
Number of companies			95			95
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female proportion lagged by one year; (v) control variables lagged by two years; (vi) firms in the banking sector sourced from FAME.

Section 9: Conclusion

This dissertation has sought to establish whether the gender composition of a BoD affects firm performance, given the mounting pressure on UK firms to increase boardroom gender diversity. Panel data analysis is conducted on 369 listed UK firms from 2008 to 2014 using a fixed effects estimator. This study extends existing literature by using multiple measures of female board representation (both female presence and proportion) and firm performance (ROA and Tobin's Q). Moreover, this study updates the literature on the UK market, which has rarely been the object of study in this field. My dissertation also attempts to control for endogeneity by conducting a natural experiment which investigates the effects of more female directors on firms subject to recommendations in the Davies Report (2011). Furthermore, this study explores how the impact of female directors changes under different conditions; namely, the differential effect of female directors during the 2008 financial crisis and within the banking sector.

Empirical analysis of baseline regressions did not find a significant impact of either measure of female board representation on firm performance, a result consistent with papers including Gregory-Smith et al. (2014) and Pletzer et al. (2015). This result was primarily due to the similarity of characteristics between female and male directors, or insufficient female directors on UK corporate boards over the time-period, meaning the critical mass necessary for female directors to impact performance was not reached. Crucially, no detrimental impact of female directors on firm performance was found, a result which supports the moral case for improved boardroom gender diversity. Nevertheless, the natural experiment found that firms with greater female boardroom representation due to recommendations in the Davies Report (2011) experienced significantly improved firm performance; expected Tobin's Q of treated firms increased by 12%. Moreover, the baseline result of no significant effect was not robust when accounting for the economic climate; in high-risk conditions, female directors significantly improve firm performance. During the financial crisis, female presence improves Tobin's Q by 7% and a 10 percentage-point increase in female

proportion of a firm's BoD leads to an expected increase of 8.9% in firm value. Similarly, in the banking sector, if female proportion on a BoD rises by 10 percentage points, Tobin's Q is expected to increase by 7.6%. Thus, my findings also provide support for the business case for more female directors, especially within high-risk environments.

However, there are certain limitations to my study. Firstly, endogeneity could result from either reverse causality or omitted variable bias. Whilst I have endeavoured to mitigate and test for this issue, a more robust method of addressing reverse causality would be to use a valid instrumental variable to estimate the model; however, limited data availability meant this was not possible. Future research should investigate other factors that I was unable to account for which could affect female directors' impact on firm performance, such as corporate culture or proximity of the industry to female consumers. Secondly, despite significant progress in boardroom gender diversity over my observed time-period, there are possibly still insufficient female directors in the UK to obtain robust or significant results of the overall relationship between female board representation and firm performance. On average, the current proportion of female directors is only 0.13 and there is only one female director per board. Further research should be conducted once UK firms have enough female directors to test empirically for the existence of a non-linear relationship and, more specifically, to test the critical mass theory (once boards have at least 30% or three female directors and females no longer represent tokenism). An additional limitation concerns data availability. My sample consists of 369 firms from the FTSE All-Share index, which comprises approximately 600 of the UK's largest listed companies by market capitalisation. Therefore, my findings are relevant for large firms, but they may not hold true for smaller firms. Further research should use a larger sample size including a range of different sized firms to increase robustness of conclusions.

My findings that female directors improve firm performance during a financial crisis and in the banking sector have several policy implications. Given the extreme difficulty of predicting a financial crisis, it is important for all sectors to increase boardroom gender diversity. I therefore support the

targets in the Davies Report (2015) of a minimum of 33% female representation in the boards of FTSE 350 firms by 2020. Specifically, more female directors should be concentrated within the banking sector (a traditionally male-dominated, high-risk industry). Hence, the Gadhia report (2016) is particularly encouraging, focusing on promoting boardroom gender diversity in financial services. These conclusions are reinforced by the results of the natural experiment, which reveals that voluntary measures to increase boardroom gender diversity are effective in improving firm performance.

An important avenue for future research is to establish whether quotas should be introduced to increase female board representation. Since my dissertation does not examine an institutional context in which a quota has been enforced, it is impossible to know whether the positive effects of female directors on firm performance observed in my research would hold true in a more constrained context, where women have been appointed purely as a result of the quota, rather than based on their own merits. Ahern & Dittmar (2012) find that Norway's 40% quota had a negative impact on firm performance, although they emphasise that this outcome is not guaranteed for other countries that might adopt similar legislation due to varying socio-economic, institutional and cultural contexts. Thus, a cross-country comparison of the effects of mandatory legislation and voluntary measures on compliance and firm performance is crucial, especially since legislative measures are increasingly widespread across Europe (The Guardian, 2017).

In conclusion, my dissertation supports both the business and moral cases for increased female board representation, just one crucial aspect of a wider goal of more women in leadership and gender equality. My dissertation finds that, although female board representation does not impact firm performance overall, in higher-risk environments more female directors significantly improve firm performance. Therefore, current voluntary measures to increase boardroom gender diversity in the UK are not only appropriate, but the progress and positive attitude towards female directors in UK businesses is a trend that must continue in the future.

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Appendix

Figure 3: Average Number of Directors on a Board

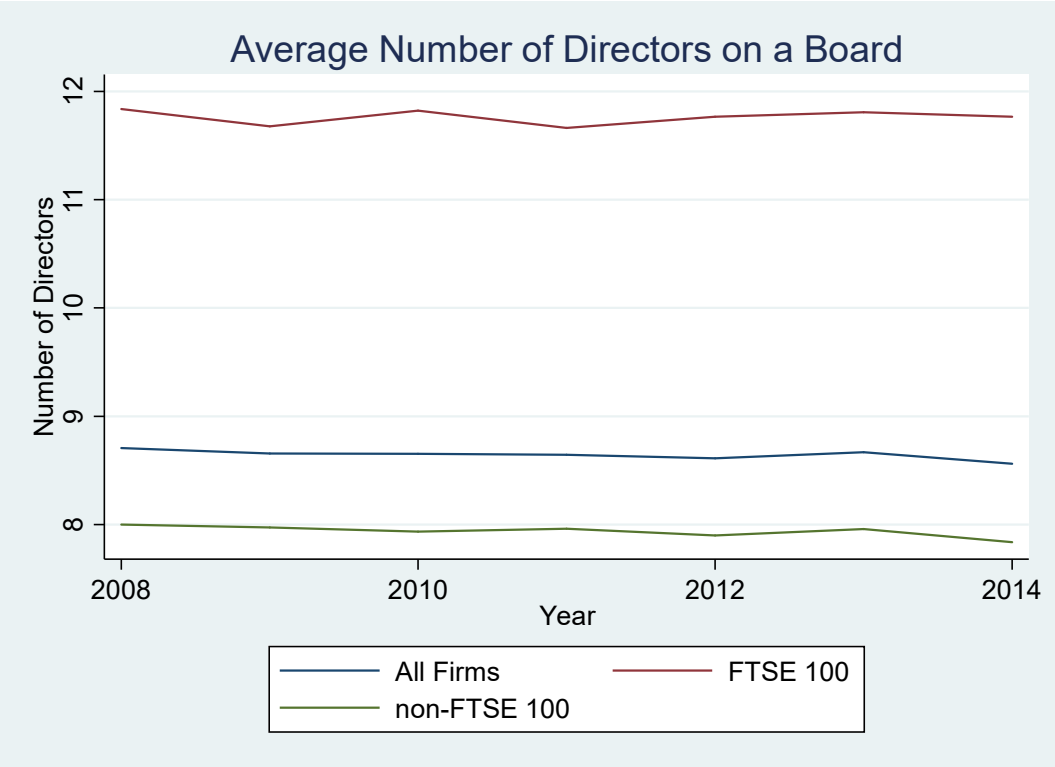

Figure 4: Average Return on Assets

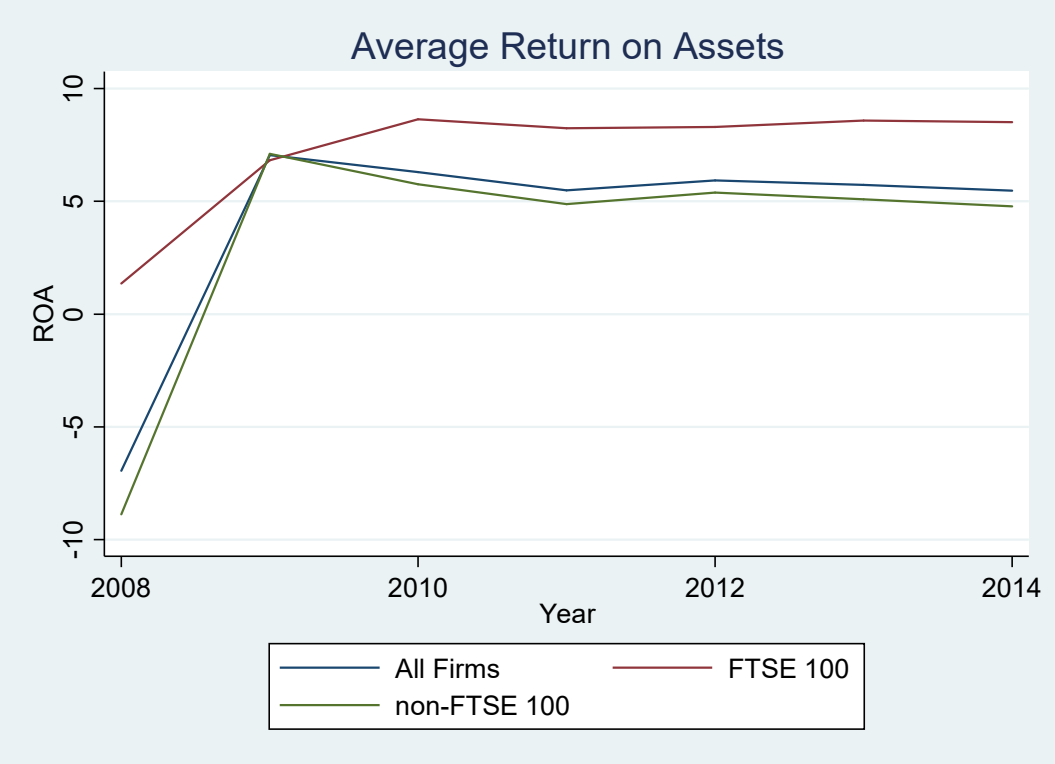

Figure 5: Average Tobin's Q

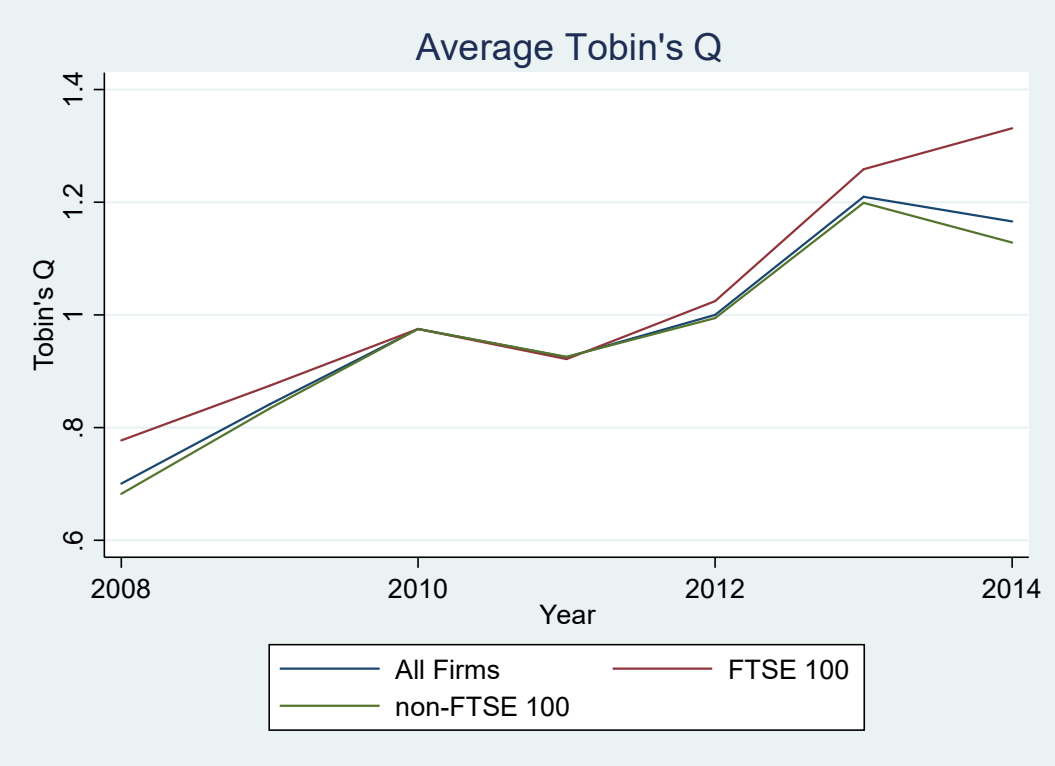

Table 11: Summary Statistics for Firms with Female Presence

Variable		Mean	Std. Dev.	Min	Max	Observations
ROA	overall	5.24258	13.65339	-174.101	190.4482	N = 1763
	between		8.507076	-42.6868	38.54604	n = 326
	within		11.0413	-151.501	159.9738	T-bar = 5.40798
Tobin's Q	overall	0.998703	0.900431	0	11.184	N = 1743
	between		0.799997	0.015167	7.881429	n = 326
	within		0.371514	-1.42973	4.301274	T-bar = 5.34663
Female Proportion	overall	0.191448	0.088082	0.055556	0.6	N = 1776
	between		0.067874	0.070748	0.528571	n = 326
	within		0.053211	-0.02964	0.422617	T-bar = 5.44785
Total Assets	overall	13.98068	1.972967	10.46891	21.59942	N = 1763
	between		1.866824	10.81259	21.20766	n = 326
	within		0.204174	12.63026	15.23271	T-bar = 5.40798
Number of Directors	overall	9.231419	2.805818	4	23	N = 1776
	between		2.556602	4	19.42857	n = 326
	within		0.874132	4.517133	13.51713	T-bar = 5.44785

Table 12: Summary Statistics for Firms with No Female Presence

Variable		Mean	Std. Dev.	Min	Max	Observations
ROA	overall	1.804303	17.22343	-128.268	48.86193	N = 800
	between		10.86477	-50.3896	31.70037	n = 200
	within		14.2477	-116.838	62.22267	T-bar = 4
Tobin's Q	overall	0.926255	1.215811	0	20.689	N = 787
	between		0.960405	0.01	9.967714	n = 198
	within		0.649265	-7.94946	11.64754	T-bar = 3.97475
Total Assets	overall	12.84729	1.420372	7.201064	21.25183	N = 800
	between		1.595669	9.5144	21.25183	n = 200
	within		0.251947	9.330261	14.0589	T-bar = 4
Number of Directors	overall	7.349442	1.958457	4	15	N = 807
	between		1.955188	4	14.75	n = 200
	within		0.57528	4.778014	9.778014	T-bar = 4.035

Table 13: Reverse Causality Regression (Female Presence)

	Dependent Variable: Female Presence					
	Key Independent Variable: ROA			**Key Independent Variable: Tobin's Q**		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
ROA	0.009 (0.012)	0.024* (0.013)	-0.004 (0.012)	-	-	-
Tobin's Q	-	-	-	-0.019 (0.016)	0.043** (0.021)	0.012 (0.034)
Total Assets		0.014 (0.012)	-0.045 (0.062)		0.038*** (0.014)	0.001 (0.047)
Number of Directors		0.325*** (0.100)	-0.140 (0.094)		0.254** (0.101)	-0.133 (0.090)
Observations	1,833	1,612	1,612	2,160	1,796	1,796
R^2	0.181	0.214	0.147	0.165	0.217	0.138
Number of companies			363			368
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) ROA and Tobin's Q lagged by one year; (v) control variables lagged by two years.

Table 14: Reverse Causality Regression (Female Proportion)

	Dependent Variable: Female Proportion					
	Key Independent Variable: ROA			Key Independent Variable: Tobin's Q		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
ROA	0.002 (0.003)	0.005 (0.003)	0.000 (0.002)	-	-	-
Tobin's Q	-	-	-	-0.005 (0.005)	0.010 (0.007)	0.000 (0.007)
Total Assets		0.006* (0.004)	-0.012 (0.013)		0.013*** (0.004)	-0.006 (0.009)
Number of Directors		0.030 (0.028)	0.014 (0.019)		0.015 (0.028)	0.006 (0.018)
Observations	1,833	1,612	1,612	2,160	1,796	1,796
R^2	0.187	0.183	0.266	0.156	0.175	0.229
Number of companies			363			368
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) ROA and Tobin's Q lagged by one year; (v) control variables lagged by two years.

Table 15: Testing for a Non-Linear Relationship between Female Proportion and Firm Performance

	Dependent Variables					
	ROA			Tobin's Q		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Proportion	0.535 (1.825)	0.337 (1.641)	0.157 (1.456)	0.261 (1.603)	0.743 (1.280)	0.617 (0.785)
(Female Proportion)^2	-2.196 (3.165)	-1.381 (2.798)	-0.476 (2.948)	-0.931 (2.990)	-1.829 (2.274)	-1.507 (1.438)
Total Assets		-0.199*** (0.044)	-0.027 (0.170)		-0.313*** (0.037)	-0.521*** (0.119)
Number of Directors		0.593** (0.271)	0.103 (0.211)		0.500** (0.201)	0.079 (0.110)
Observations	1,311	1,141	1,141	1,434	1,232	1,232
R^2	0.329	0.436	0.001	0.316	0.574	0.247
Number of companies			307			313
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female proportion and female proportion squared lagged by one year; (v) control variables lagged by two years; (vi) firms in the banking sector sourced from FAME.

Table 16: Impact of Female Presence on Firm Performance of Non-Banks

	Dependent Variables					
	ROA			Tobin's Q		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Presence	0.046 (0.108)	0.160 (0.101)	0.139 (0.094)	-0.059 (0.100)	0.124 (0.083)	0.038 (0.036)
Total Assets		-0.247*** (0.050)	-0.405** (0.159)		-0.288*** (0.045)	-0.377* (0.193)
Number of Directors		0.571** (0.234)	-0.139 (0.218)		0.567*** (0.218)	0.077 (0.100)
Observations	1,269	1,264	1,264	1,412	1,173	1,173
R^2	0.005	0.118	0.035	0.032	0.236	0.255
Number of companies			235			239
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female presence lagged by one year; (v) control variables lagged by two years; (vi) firms not in the banking sector sourced from FAME.

Table 17: Impact of Female Proportion on Firm Performance of Non-Banks

	Dependent Variables					
	ROA			Tobin's Q		
Variables	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**	**Pooled OLS**	**Pooled OLS & Controls**	**Fixed Effects**
Female Proportion	-0.166 (0.707)	0.426 (0.709)	-0.082 (0.596)	0.491 (0.663)	0.817 (0.656)	-0.196 (0.348)
Total Assets		-0.256*** (0.056)	-0.288 (0.186)		-0.276*** (0.053)	-0.697*** (0.178)
Number of Directors		0.583** (0.265)	0.085 (0.254)		0.481* (0.269)	0.068 (0.136)
Observations	921	800	800	1,012	869	869
R^2	0.003	0.137	0.006	0.036	0.238	0.294
Number of companies			212			217
Firm Fixed Effects	No	No	Yes	No	No	Yes
Firm Controls	No	Yes	Yes	No	Yes	Yes

Notes: (i) Robust (clustered) standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) all regressions include year and industry fixed effects (not reported); (iv) female proportion lagged by one year; (v) control variables lagged by two years; (vi) firms in the banking sector sourced from FAME.