

FEMALE LEADERSHIP AND VALUE CREATION: EVIDENCE FROM LONDON STOCK EXCHANGE

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Abstract

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This study examines the effects of female leadership, at both board-level and individual-level, on the corporate value of UK FTSE100 stocks. United Kingdom is a valuable sample for this research as the UK governance sets the goal that at least a third of UK boardroom positions should be held by women by the end of 2020. Using the GMM approach with a dataset of 96 publicly firms from 2006 to 2016; our analysis reveals strong evidence that the existence of female directors on board is positively associated with firm value (Tobin' Q). Testing for the female director positions, we interestingly found the competing results: the relation between the female chairman and firm value is significantly positive whilst there exists an adverse link between female CEO and firm value. The findings imply a significant effect of quota laws for gender diversity of boards of directors and female directors' positions on UK corporate market value.

Keywords: Female Leadership, FTSE100, Gender Diversity, Firm Value, Chair, CEO

1. INTRODUCTION

"One of the European Union's founding values is to foster equality between women and men by promoting equal opportunities in corporate board representation and decision-making" (Kyaw et al., 2017, p.789). Therefore, European countries have substantially improved the presence of women in the governing boards, from 5% to 25% over the past twenty years. Following this trend, the United Kingdom (UK) governance also sets the goals at least a third of UK boardroom positions should be held by women by the end of 2020. The percentage of female directors on UK boards accounts for more than 15 percent, and the new appointments of those directors increased to 24.7 percent (Sealy and Vinnicombe, 2013). Among them, the percentage in FTSE 100 companies increased to 23.5% (12.5%) in 2015 (2011) (Davies, 2011, 2015). These facts raise central questions that why UK companies should increase the number of women on the board? Whether appointing female directors enhances

corporate market value? These questions are largely unexplored in the market context of UK.

The gender diversity of corporate boards has recently attracted special attention from media, regulators and academic literature. However, evidence linking the presence of female directors with various measures of firm performance, value, and risk is generally mixed. While significant strand of previous studies argue that gender diversity enhances board monitoring effectiveness and brings additional values for its shareholders, supported by either resource dependence theory or agency theory (see examples Westphal and Milton, 2000; Hillman et al., 2000; Carter et al., 2003; Campbell and Antonio, 2008; Carter et al., 2010), other strand of literature accumulated on the link that have found either negative or insignificant association between gender diversity and corporate performance (e.g. Zahra and Stanton, 1988; Adams and Ferreira, 2009). For example, some studies (Erhardt et al., 2003; Campbell and Vera, 2008; and Carter et al., 2010) find that more women on board of directors are

likely to improve the firm performance. More women on the boardroom could bring better understanding about the market, provoke creative thinking and improve the image of the firm. On the other hand, some researchers (Adams and Ferreira, 2009; Minguez-Vera and Martin, 2011; Daunfeldt and Rudholm, 2012) argue that a more diverse board of directors could lead to higher conflicts and slower decision-making process, and hence, women may be detrimental to their firm value. Others find no relationship between female leadership and firm performance (Farrell and Hersch, 2005; Engelen et al., 2012). In fact, some scholars question the view that female directors should have different behaviour to their male counterparts (see, e.g., Adams and Funk, 2012; Sila et al., 2016) and call for further research into the role of female directors that may disentangle the confounding impact of discrimination. Alongside such mixed literature, we, unfortunately, find the market-based UK studies on female leadership and market valuation are extremely limited. Most of the studies in this area focus on accounting performance. They (e.g. Gregory-Smith et al., 2014; Pasaribu, 2017; Shehata et al., 2017) mainly test for the effect of female CEO or Chairman on the firm performance or the board diversity-performance nexus for UK SMEs (Small and Medium Enterprises) and results are still ambiguous. We, therefore, add to this existing literature by investigating the real effects of the presence of women on board of directors and the firm market value. We also examine simultaneously the role of female CEO and female chairman in the same empirical models with board gender diversity. We attempt to explore whether different executive positions of female directors alter their relationship with market valuation.

Using a large UK sample (743 firm-year observations) for the period 2006-2016, we find a positive effect of the presence of female directors on board on the FTSE100 listed firms' market valuation. Our analysis also reveals that such positive influence only holds for female chairman, but this relation becomes negative regarding female CEO. These results are robust and consistent across different model specifications. They are justified by several theories such as agency theory, resource dependence theory, and stakeholder theory. In fact, investors' valuation towards female leadership is influenced by two major roles: the scrutinising role highlighted by agency theory and the provision of resources role suggested by resource dependence and stakeholder theory of the boards.

Our study has several contributions to literature. First, we contribute to corporate governance literature by looking at the two roles as complementary and working together to create market value. We, thus, are the first to provide direct evidence on the relationship between female leadership at either board-level or individual-level and investors' valuation within UK FTSE context. To the best of our knowledge, evidence on these associations within UK market-based basis has not been fully established. Furthermore, this study addresses the potential endogeneity issues of the relation between boards and firm value by using the Generalized Method of Moments (GMM) models, hence, relatively generates endogenous-free results. In robustness checks, we also use random-effect

Generalised Least Square (GLS) model to account for unobserved firm heterogeneity.

Moreover, our results provide insights into the worthiness of corporate governance regulations and recommendations in the UK. In recent years, the European governments have encouraged the increase in the women's representation on the boardroom. In some countries, such as Norway, Belgium, France, Germany, Iceland, governments laid down legal requirements for minimizing proportion of female members on the board. In the UK, although the government does not have a mandatory number of female members on the board, government's ambition is that at least a third of UK boardroom positions should be held by women by 2020. This trend leads to a debate on the benefits that women can bring for their firm. Based on the results of this research, regulators and investors might have a deeper understanding about the effect of women on board and how it influences firm market-based performance. Finally, because women are grossly under-represented on the UK boards, it is vital to understand the boardroom selection procedure. Nevertheless, the manner that board members are often chosen and subsequently appointed in UK firms is far from clear. Therefore, by exploring the role of female leadership at both board-level and individual-level, our findings provide better implications for UK businesses than earlier studies. Specifically, we can shed a new light on the relative importance of the board diversity, including the desire to make UK corporate boards more diverse through recruiting female directors, and the imperative to employ a female chairman who can enhance the board monitoring quality. On the other hand, UK businesses should be careful in appointing a female CEO as she can be harmful to the management decision-making. Overall findings of our study imply a high need of providing equality of opportunity to employees (male and female) in the United Kingdom labour market, especially board directors.

The remainder of the article is organised as follow: *Section 2* discusses research background and hypotheses. *Section 3* presents data collection and sample. *Section 4, 5* and *6* present methodology and empirical models, empirical results and analysis, robustness checks, respectively. *Section 7* concludes the paper.

2. RESEARCH BACKGROUND AND HYPOTHESES

The board of directors provides four major functions to a modern corporation which comprises of (i) scrutinising and managing managers, (ii) providing information and counsel to managers, (iii) scrutinising compliance with applicable laws and regulations, and (iv) connecting the corporation to the external environment (Carter et al., 2010). Previous studies have attempted to address key functions of the boardroom in various ways. It is argued that the composition of the board influences the execution of these functions. Therefore, the well-organised board includes the suitable members on the board might improve the corporate performance. That argument supports the possibility that board composition, with regard to the gender diversity of the board, is related to the financial performance of companies. However, the literature on corporate

governance mainly focuses on board characteristics and attributes, such as board size, board independence and CEO duality. Relatively little is known about the effect of the existence of female directors on the board on the operating performance of public firms. On the other hand, the emerging literature questions the view that female and male have a different behaviour (e.g. Adams and Funk, 2012; Sila et al., 2016) and they call for further studies on the role of female directors on board that could disentangle the confounding impact of discrimination. This makes the topic of gender diversity worthier to explore.

2.1. The difference of gender behavior

Numerous research find that there are differences between male and female in their decision-making. Croson and Gneezy (2009) argue the fundamental on the gender differences in risk preferences, social preferences, and competitive preferences. They indicate that women are more likely to take less risk, be more sensitive to social cues, and is lower competitive level than their male counterparts. Based on biological research, Sapienza et al. (2009) show that women are risk-averse due to their higher levels of circulating testosterone. Adams and Funk (2012) surveyed 468 CEOs and 1,372 resident board in Sweden in 2005, they find that women tend to behave more flexibly and sensitively in psychological problems of co-workers than men, so it leads to the fact that they have an ability to minimise conflicts in the working environment; however, these gender differences appear to differ across industries and ages. A review of the literature reveals that the traditional social roles of each gender also have a significant influence on their conception, behaviour, and decision-making (Wilson and Daly, 1985).

In the economic field, Barber and Odean (2001), by employing data from the common stock investments of over 35,000 households in the U.S, find that male investors tend to hold riskier portfolios than female investors. This is in line with the findings of Adams and Raganathan (2014) that listed banks with fewer female directors in boardroom actively involved in higher-risk investment activities. In addition, Huang and Kisgen (2013) also demonstrate an adverse relationship between the percentage of female directors on board and acquisitions and debt issue. Such studies show that the differences in gender may lead to different decision-making. By contrast, other existing literature argues there is no significant relationship between gender and behaviour of managers. According to Eagly and Johnson (1990), in the same organisational role, both men and women behave similarly. In the same vein, Sila et al. (2016) find no evidence of the risk-taking behaviour of firms with greater female directors' percentage in the boardroom.

2.2. Related studies and hypotheses

The role and effectiveness of female directors on corporate boards has attracted an increasing attention from academics (Garcia Lara et al., 2017). This growing interest drives from the notion that female directors have been historically underrepresented in high-profile careers. Recently,

the recommendation to increase the number of women on board of directors calls for further research on the role of those directors in enhancing board effectiveness as well as firm performance. Most empirical studies have attempted to explore the influence of gender diversity on both accounting-based performance and market-based performance. They generally claim that a firm is likely to improve its public image through promoting gender equality; however, there appears unclear whether gender composition of boards has a meaningful impact on the firm value (Rhode and Packel, 2010).

Existing literature shows mixed results on the relationship between female leadership and firm performance. According to Carter et al. (2010), if there is no relationship between proportions of female directors in the boardroom, the desirability of gender diversified board will be primarily a public policy issue. However, if there is a positive relationship between such two factors, the economic implications of board diversity might be important. Otherwise, the negative relationship shows that the decisions concerning the appointment of women should be considered due to involved agency costs.

The first stream of empirical research supports for the positive effects of the existence of female on the boardroom on corporate financial performance. For example, using a sample of EuroTop 100 firms (30 percent of UK firms) for the period 2004-2013, Green and Homroy (2015) find significantly positive and economically meaningful effects of female directors on the firm performance. They suggest that enhancing the female involvement in corporate governance will be beneficial to the firm. Similarly, Erhardt et al. (2003) indicate that board diversity in terms of the ethnic and gender characteristics are positively associated with the financial performance measures. This is also supported by Carter et al. (2010) who find that the S&P 500 firms having the highest representation of female directors in the boardroom will have a significantly higher return on equity than the firms with the lowest female representation. Moreover, Campbell and Vera (2008) study the impact of female directors on firm value in Spain where historically the minimal female participation in the workforce exists. Their findings reveal that the percentage of women on board has a positive impact on firm value and that the opposite causal relationship is not significant. In addition, they suggest that the legislative changes and corporate governance reforms of Spanish governance for greater gender diversity may generate economic gains. By the same token, the positive and significant relation between female leadership on the boardroom and firm performance/value is also documented in studies of Liu et al. (2014), Vo and Phan (2013), Strom et al. (2014), Carter et al. (2003), Erhardt et al. (2003).

The second stream of the prior research on the link between gender diversity and financial performance indicates that greater share of women on board tends to detrimental to the firm performance. Although Adams and Ferreira (2009) show the positive influence of gender diversity to the monitoring committees in a sample of US firms, the average effect of female directors on financial performance is negative. This negative relationship is driven by firms with strong governance, as

measured by their abilities to resist takeovers. The possible explanation is that higher presence of women in the boardroom could lead to over monitoring in those companies. Furthermore, Minguez-Vera and Martin (2011) find that women's presence on boards generates a negative impact on return on assets/equity because of higher risk aversion of women. Greater gender diversity could lead to more emotional conflicts, various views between men and women, hence the board could take more time to discuss urgent problems and less effective decision-making (Tajfel and Turner, 1985; Lau and Murnighan, 1998). As mentioned earlier, women are more risk-averse than men, which leads to lower variability economic in outcome variables. However, this could reduce the firm returns due to the low risk-taking. Moreover, Adams and Ferreira (2007) contend that if CEOs provide their information, they will receive better advice; nonetheless, the board will also monitor them more intensively. By this reason, the CEOs may be reluctant to share information that leads to the ineffective communication between them and members of the board. Consequently, too much board monitoring can reduce the effectiveness of the boardroom as well as firm performance. The third research stream fails to find a significant relationship between effects of female directors on firm financial performance (e.g. Farrell and Hersch, 2005)

In the United Kingdom, most of the previous research found an ambiguous relationship between female leadership and firm performance. Pasaribu (2017) tests for non-financial UK listed firms and find weak evidence that female directors have a positive and strong effect on firm performance. However, his research also analyses that the diversified gender board brings a positive impact to the small-listed firms because small firms are flexible in governance structures and they are not influenced by over monitoring. However, he/she only considers the proportion of female directors on the board and does not mention the gender of top managers such as CEO or Chairman. A similar relationship between gender-diverse boards and corporate performance is found by Gregory-Smith et al. (2014) in a sample of firms listed in FTSE350 during 1996-2011.

Notably, there are very limited studies focusing on the effect of female CEO and Chairman on firm performance/value, *apart from* some accounting-based performance studies of Peni (2012), Parrotta and Smith (2013), Strom et al. (2014). They generally claim that firms having female CEO/Chairman may often outperform firms having male CEO/Chairman. Using the data set on privately owned or listed Danish firms, Parrotta and Smith (2013) find that female CEO is related to a lower variability in economic outcome variables such as investments, profits, return on equity and sales. The rationale is that women tend to be risk-averse; for example, they often avoid risky investment activities. Furthermore, Peni (2012) argues that women are likely to have higher expectation on their responsibilities and have greater attempts to demonstrate their additional advantage to deserve executive positions on the board. Therefore, when women hold top positions (i.e. CEO and Chairman), they often focus promoting their firm performance to demonstrate their

competence. As a result, female CEO and Chairman bring positive impacts on the financial indicators such as return on assets/equity or Tobin's Q. Moreover, Strom et al. (2014) show that female CEO and Chairman induce a higher financial performance in the microfinance financial institutions. This can be justified that they have a better understanding of consumer behaviour and customers' needs of the market in which the microfinance financial institutions operate. This, therefore, may create a competitive advantage for female-controlled firms and lead to better operating performance.

Taken together, to the best of our knowledge, there are limited studies on the relation between female leadership and firm performance in the United Kingdom stock market (e.g. FTSE100). This study, therefore, fills this void by examining such relation in three cases: (i) the gender diversity or the number of female directors on the board of directors; (ii) female chairman of the board of directors; and (iii) female Chief Executive Officer (CEO). In light of the mixed evidence above, we leave an unclear association between female leadership and market valuation which states three hypotheses in the null form:

H_1 : There is no relationship between board gender diversity and firm market value.

H_2 : There is no relationship between female Chairman and firm market value.

H_3 : There is no relationship between female CEO and firm market value.

3. DATA

Our final sample includes 96 non-financial firms listed in FTSE 100 stock market for the period of 2006-2016. Corporate governance data includes the number of female directors on board of directors, the female chief executive officer (CEO) and female chairman, the total number of directors, independent directors and board meetings. Data is mainly collected from Bloomberg. The missing data of female directors on the boards is then filled by the UK female FTSE report (Cranfield University, 2006-2016). The large data of 11-year period reduces the effects of unusual fluctuations of the market to the empirical results and can be generalised to a large population. Our initial sample includes 149 listed firms. We fulfilled the sample by (i) excluding stocks in financial sector (i.e. banks, investment funds, insurance companies, unit trusts and property companies) due to their unique accounting standard, strict regulation, and the intervention of government (Huang and Kisgen, 2013); (ii) only kept stocks having at least three consecutive years' full data availability to ensure the operating continuity of the firm.

4. METHODOLOGY AND EMPIRICAL MODELS

In this study, we utilise panel data analysis to test hypotheses. Literature highlights potential endogeneity issues existing in corporate governance models, especially models including board structure (e.g. board size, board independence). Thus, traditional Pooled Ordinary Least Square (OLS) method might be inefficient and produce bias results. To address this endogeneity, we employ two-step Generalized Method of Moments (GMM) by

treating lags of all predicted endogenous variables as Instruments. By doing so, we partly solve the

endogeneity problems and enhance the reliability of the findings. Our model is established as follows:

$$\begin{aligned} Firmvalue_{i,t} = & \alpha_0 + \beta_1 Female_board_{i,t} + \beta_2 Female_Chair_{i,t} + \beta_3 Female_CEO_{i,t} + \beta_4 LogBSIZE_{i,t} \\ & + \beta_5 board_meeting_{i,t} + \beta_6 LnTA_{i,t} + \beta_7 LEV_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Where $Firmvalue_{i,t}$ is measured by the logarithm of Tobin's q for firm i at time t. $Female_board_{i,t}$ presents the number of female directors on boards and the percentage of female directors on board of directors. $Female_Chair_{i,t}$ presents the dummy Chairman gender, taking the value of 1 if Chair gender is female and 0 otherwise. $Female_CEO_{i,t}$ presents the dummy CEO gender, taking the value of 1 if CEO gender is female and 0 otherwise. $LogBSIZE_{i,t}$ is measured by the natural logarithm of the total number of board directors. $board_meeting_{i,t}$ presents the total number of board meetings within one fiscal year. $LnTA_{i,t}$ presents the natural logarithm of the total firm assets. $LEV_{i,t}$ presents for the financial leverage, which is measured by debt-to-asset ratio. The definitions of all these variables are thoroughly reported in Table 1.

4.1. Measures for firm value

We employ the logarithm form of Tobin's q (LnTobinq) as our main measure for firm value creation. This market-based proxy reflects "the

market's expectations of future earnings and is thus a good proxy for a firm's competitive advantage" (Campbell and Antonio, 2008, p.442). It is computed by "the market value of the firm's equity plus the difference between the book value of the firm's assets and equity, divided by the book value of the firm's assets all measured at the end of the year" (Cashman et al., 2012, p.3251). Tobin's q is more relevant than the return on assets (ROA) and return on equity (ROE) in our study because our purpose is to assess the investors' valuation towards female leadership, and our sample also includes firms with listed shares in the London Stock Exchange. In robustness check, we use the logarithm of market capitalisation (stock prices multiplied by the number of shares outstanding) as an alternative metrics for firm value. While Tobin's q is computed by combining both book and market value, market capitalisation is purely constructed by market figures. Both measures for firm value are used alternatively in this study to enhance the reliability of our findings.

Table 1. Variables definitions

Variables	Abbreviations	Definitions
Tobin's q	LnTobinq	The logarithm of Tobin's q
Market Capitalisation	LnMARCAP	The logarithm of market capitalisation (measured by the share price multiplied by the number of shares outstanding).
Percentage of women on board	Women_Board	Ratio of female directors and total directors
Number of female directors on board	NoWomen_Board	The number of female directors on board
Female chair	Female_CHAIR	Taking value of 1 if chair is female, otherwise 0
Female CEO	Female_CEO	Taking value of 1 if CEO is female, otherwise 0
Board size	LogBSIZE	The number of directors on board
Board meeting	Board_met	The number of board meeting per year
Firm size	LogTA	The logarithm of total assets
Firm leverage	LEV	The ratio of debt to total assets

4.2. Measures of female leadership

Following extent literature, we measure board gender diversity by employing two alternative metrics: (i) *the number of female directors on the board of directors* (NoWomen_Board) (e.g. Daunfeldt and Rudholm, 2012; Pasaribu, 2017); (ii) *the proportion of female on the board*, calculated by the number of female directors divided by total number of directors on board (Women_Board) (e.g. Lau and Murnighan, 1998; Adams and Ferreira, 2009). The Chairman and CEO gender dummy variable are also used to reflect the position and power of female leadership in the firms (Peni, 2012; Parrotta and Smith, 2013). If the Chairman's gender is female, it is set as "1", otherwise it is set equal to "0" (Female_CHAIR). If the CEO's gender is female, it is set as 1, and 0 otherwise (Female_CEO).

4.3. Control variables

Based on the literature, we include a set of control variables which may have potential effects on firm value. Those variables are expected to mitigate the bias results. We include board size which is

measured by the number of directors on board (LogBSIZE). We expect that investment decisions made by the large board are likely to be conservative, thus affect to the firm value (Sila et al., 2016). According to Kumar and Zattoni (2016), the number of board meeting reflects the intensity of the activities of the board; and thereby, the more the board meeting holds, the better monitoring function is. This can prevent frauds in firms and lead to higher firm performance and valuation. Therefore, we also take the number of the board meeting (board_met) as a control. Moreover, we control for firm size which is computed by the logarithm of total assets (LnTA). Larger firms are argued to take less risk, thus influence firm value (Sila et al., 2016). Finally, we include financial leverage (LEV) which measures the ratio of the total debt of a firm to total assets. A high leverage ratio implies higher default risk and thus negatively influences on firm value (Ilyukhin, 2015; Anton, 2016; Huang, 2017).

4.4. Descriptive statistics

Table 2 presents the descriptive statistics of all variables. The mean of LnTobinq and LnMARCAP are

1.56 and 23.47 respectively. We measure female leadership by using four alternative metrics: number of women (NoWomen_Board), the percentage of women (Women_Board), the gender of CEO (Female_CEO) and chairman (Female_CHAIR). On average, the women's representation on board of

directors is 2 directors, and there are companies which have no women on their board. In addition, there is a small number of women who hold CEO or chairman position in FTSE100. Finally, the mean of LogBSIZE, Board_met, LogTA, and LEV are 10.853, 7.997, 23.18 and 3.48, respectively.

Table 2. Descriptive statistics

Variables	N	Mean	Median	Std.	Min	Max
LnTobinq	743	1.560	1.264	0.976	0.084	9.063
LnMARCAP	743	23.474	23.175	1.251	20.624	26.583
Women_Board	742	16.605	15.385	10.297	0	50
NoWomen_Board	743	1.813	2	1.159	0	6
Female_CHAIR	742	0.004	0	0.064	0	1
Female_CEO	742	0.062	0	0.241	0	1
LogBSIZE	743	10.853	11	2.371	5	20
Board_met	740	7.997	8	2.960	0	25
LogTA	743	23.180	22.952	1.346	20.235	26.763
LEV	743	3.487=	2.660	6.204	1.112	163.503

Notes: The table reports descriptive statistics of all variables, including board characteristics, financials and firm-level controls.

Multicollinearity phenomenon reflects the very high level of inter-correlations or inter-associations among the independent variables. Therefore, it appears the disturbance in the data and leads to unreliable statistical inferences. The correlation analysis for the main explanatory variables is used to check for multicollinearity phenomenon. According to Kennedy (2013), the danger level for multicollinearity phenomenon of a correlation between two variables at about 0.80. In other words,

if the correlation between two variables is smaller than 0.80, there is no multicollinearity. Table 3 shows the Pearson pair-wise correlations between all variables in this study. The result indicates that all levels of correlation are very small and less than 0.80. This implies that there is no sign of multicollinearity among the variables, that is, explanatory variables may be used independently of each other.

Table 3. Pearson pair-wise correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. TOBIN	1									
2. LnMARCAP	-0.0107	1								
3. Women_Board	0.0130	0.1295*	1							
4. NoWomen_Board	-0.0219	0.2958*	0.9233*	1						
5. Female_CHAIR	0.0879*	0.0701	0.0494	0.0469	1					
6. Female_CEO	-0.0225	-0.0304	0.2297*	0.1659*	-0.0164	1				
7. LogBSIZE	-0.0700	0.5321*	0.0487	0.3577*	-0.0003	-0.0353	1			
8. Board_met	-0.0497	0.0458	-0.0321	-0.0576	0.1439*	-0.047	0.0037	1		
9. LogTA	-0.3752*	0.9153*	0.1132*	0.2799*	0.0344	-0.0226	0.5228*	0.0742*	1	
10. LEV	0.0261	0.0551	0.0872*	0.1074*	-0.0152	-0.0055	0.0483	-0.0353	0.0298	1

Notes: The table reports the Pearson pair-wise correlation matrix among all variables employed in our models. Definitions of all variables are presented in Table 1.

5. EMPIRICAL RESULTS AND ANALYSIS

Table 4 reports GMM regression results for the relationship between female leadership and Tobin's Q. Findings show that the presence of female directors on the boards of directors is highly and positively valued by the market. This is presented by the positive and significant coefficients of two metrics of board diversity: *Women_Board* and *NoWomen_Board*. This result is in line with prior studies using a sample of UK firms (e.g. Gregory-Smith et al., 2014; Pasaribu, 2017). This is also consistent with our expectation from a resource dependence or stakeholder perspective that female directors on board can be useful in enhancing firm value. Female directors appointed to the board of directors may be able to add value by bringing new ideas and different perspectives to the table (e.g. Adams and Ferreira, 2009). Thereby, more gender-diverse boards should have stronger governance, which implies that, on average, the presence of female directors on boards improves the value of UK companies (see Hermalin and Weisbach, 2003).

Although we above find that including female directors on boards will bring more resources to the UK firms (e.g. improved decision making and external linkages), group dynamics suggests that female directors may have either positive or negative effect on firm value (Carter et al., 2010). We, therefore, further examine whether the different positions of female directors affect such relation. We interestingly find that the positive contribution of female directors on firm value holds for female Chairman whilst the effect of female CEO is significantly negative. These results are consistent across models 1 and 2. The positive relationship between female Chairman and firm value is in line with prior studies (e.g. Peni, 2012; Parrotta and Smith, 2013) which shows that firms having female Chairman may often outperform firms having male Chairman. Women are likely to have higher expectation on their responsibilities and have greater attempts to demonstrate their additional advantage to deserve executive positions on the board. Therefore, when women hold top positions (i.e. Chairman), they often focus promoting their

firm performance to demonstrate their competence. As a result, female Chairman brings a positive effect on the Tobin's Q. Furthermore, information of appointing a female Chairman can positively signal to the stock market as investors may perceive that the management is better monitored because female chairman, with her stronger power and responsibilities on board decision-making, tends to be more careful and effective in providing her supervising and advising services to the managers which should reduce the agency conflicts between investors and management.

By contrast, the negative result of the linkage between female CEO and firm value is inconsistent with the previous literature that shows a positive impact on the financial indicators such as ROA and Tobin's Q. However, it can be justified by the higher risk aversion of women (Minguez-Vera and Martin, 2011) which may lead to the rejections of positive net present value projects and thus fail in maximising the shareholder value. Noting that CEO has the strongest power to exercise or abandon any

investments, and if a woman holds CEO position, returns of the firms may be reduced due to her risk-averse. Additionally, a female CEO tends to less share information with other board members because if she provides her information, the board may monitor them more intensively. This leads to higher information asymmetry and agency costs. Too much board monitoring can reduce the effectiveness of the boardroom as well as firm performance. This may send an adverse signal to the UK market.

Regarding control variables, we find that larger firms are lower valued by FTSE100 investors. This is because investors are more likely to invest in high-growth companies such as smaller firms. Thus, they may higher value smaller firms than larger firms. Results of AR(1) and AR(2), as well as Hansen test, show that GMM is suitable method for our database and research. This method can address the potential endogenous problems that arise because past firm value may influence board attributes (e.g. board gender diversity).

Table 4. Generalized method of moments - GMM

Variables	Tobin's Q as Dependent variable	
	(1)	(2)
Women_Board	0.0308***(0.000)	
NoWomen_Board		0.2493***(0.004)
Female_CHAIR	0.4852***(0.008)	0.3225**(0.043)
Female_CEO	-0.3182***(0.005)	-0.2431*(0.060)
LogBSIZE	0.1594(0.344)	-0.2139(0.383)
Board_met	-0.0001(0.996)	0.0089(0.389)
LogTA	-0.1438***(0.000)	-0.1548***(0.000)
LEV	0.0021(0.192)	0.0022(0.151)
Constant	105.7222***(0.001)	84.6721**(0.043)
TobinQ	0.6899***(0.000)	0.7377***(0.000)
Observations	640	640
Number of firms	96	96
Wald Chi2	1525***	1309***
AR(1) p-value	0.011	0.009
AR(2) p-value	0.882	0.828
Hansen-J-P-value	0.798	0.693

Notes: the table reports GMM estimations to examine the association between female leadership and firm value. P-values are reported in parentheses, *p < 0.10, **p < 0.05, ***p < 0.001. Definitions of all variables are presented in Table 1.

6. ROBUSTNESS CHECKS

6.1. Using alternative proxy for market valuation

As explained in the methodology section, we further use an alternative proxy for the firm value that is the log of market capitalisation. This measure is purely

calculated by using market-based data. Table 5 reports the relationship between female leadership variables and the firm value measured by LnMARCAP. We find consistent findings with the main results that gender diversity and female chairman have a positive impact on firm valuation while female CEO has an opposite influence.

Table 5. Sensitivity test - Testing for market capitalisation

Variables	Log of Market capitalisation as Dependent variable	
	(1)	(2)
Women_Board	0.0129***(0.009)	
NoWomen_Board		0.1106***(0.002)
Female_CHAIR	0.5505***(0.000)	0.5344***(0.000)
Female_CEO	-0.1406***(0.000)	-0.1064***(0.000)
Constant	44.9429**(0.034)	35.3699*(0.018)
Observations	640	640
Number of firms	96	96
Wald Chi2	3185***	2960***
AR(1) p-value	0.038	0.037
AR(2) p-value	0.922	0.871
Hansen-J-P-value	0.367	0.206

Notes: the table reports GMM estimations to examine the association between female leadership and firm value. P-values are reported in parentheses, *p < 0.10, **p < 0.05, ***p < 0.001. Definitions of all variables are presented in Table 1.

6.2. Using alternative model specifications

Each company tends to face different opportunities and challenges over year, resulting in the case that unobservable variables determine the value of firms and other corporate governance characteristics (female leadership, board size) jointly (Guest, 2009); and using OLS method may not detect those problems. This study deals those by utilising the panel data estimation to reduce endogeneity problems. Furthermore, pooled OLS combines all firms into the pool to estimate, thus this may ignore the existence of the heterogeneity. Consequently,

fixed-effect and random-effect regression models appear to be more appropriate than OLS towards corporate governance research. Nonetheless, random-effect GLS is chosen because some time-invariant variables (e.g. board size, female leadership) cannot be tested with the fixed-effect models due to perfect multicollinearity issue (Wooldridge, 2002). This is consistent with numerous corporate governance studies (e.g. Pathan, 2009). Our results are kept remained and thus the story of female leadership is consistent across different model specifications.

Table 6. Robustness check - Random-effect GLS regression

Variables	Tobin'Q as Dependent variable	
	(1)	(2)
Women_Board	0.0076*(0.086)	
NoWomen_Board		0.0719*(0.055)
Female_CHAIR	0.7171***(0.000)	0.7083***(0.000)
Female_CEO	-0.0799*(0.069)	-0.0897*(0.058)
Constant	10.5784***(0.000)	35.3699***(0.018)
Observations	739	739
Number of firms	96	96
Wald Chi2	3268***	3226***
Adjusted R-square	0.1542	0.1521

Notes: the table reports Random-effect GLS estimations to examine the association between female leadership and firm value. P-values are reported in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$.

7. CONCLUDING REMARKS

This study contributes to the ongoing debate and corporate governance literature. The main purpose of this study is to test whether greater gender diversity on the boards of directors affects firm valuation in FTSE100. This research reviews the academic theories such as agency theory, resource dependence theory and social theory, and numerous empirical studies related to gender diversity on the board and firm value. Literature shows mixed results on the relationship between female leadership and firm performance with signs of positive, negative and no relationship. To clarify the link of female leadership and firm value on the UK market, this research uses GMM regression model to examine the data of 96 non-financial firms over 11 years from 2006-2016. We first find that there is a positive relationship between the board gender diversity and the valuation of the market. We then find that such positive coefficient holds for female Chairman but not female CEO. Specifically, while female CEO has a negative correlation with firm value, there is a positive link between female Chairman and market value.

According to the agency theory, more women on the board of directors could minimise the subjective factors to the board decisions; however, the agency theory does not provide a clear prediction of the relationship between the gender diversity of the board and firm value. In addition,

resource dependence theory also suggests that the unique set of human capital attributes of women may not always bring positive or negative results on valuation. The results of this study suggest female leadership and value nexus depends on the female positions and more importantly, how the firm takes advantage of its available human capital on boardroom to achieve its targeted performance.

From the results of this study, the UK government's plan that at least a third of UK boardroom positions should be held by women by 2020 is essential. However, proposals for regulations enforcing quotas for women on boards should take the female directors positions into considerations. Future studies can be implemented in Asian countries such as China, Korea, and Japan. They are high-growth and huge markets but the representation of women on the boardroom is still very low. Also, the further development of our study should carry out a comparative analysis of London Stock Exchange and other stock markets inside and outside Europe, such as United States, Canada and Australia. Moreover, further studies may examine the relationship between firm value and diversity of culture, religion, race in multinational groups; and, it would be more interesting if they can explore the role of other attributes of the women appointed on the board of directors, such as international experience, education, family relationships, multiple directorships, and so on.

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