Board Composition and Risk-taking in UK firms

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Abstract: This empirical study explores the effect of board composition on managerial risk-taking using a data sample of 270 firms from the FTSE 350 Index, over the period 2005 to 2010. On analysing the data this study found support for the hypotheses that for large UK firms a large board size decreases firm risk, while a powerful CEO and high executive director's equity ownership at board level increases firm risk. The findings can inform investors, firms and regulators regarding the use of board attributes as internal risk control mechanisms.

1. Introduction:

The recent financial crisis of 2008 has attracted the keen interest of academics and policy makers around the world to Corporate Governance. In the UK, the spectacular corporate failure of Northern Rock, led the mortgage lender to be bailed out with taxpayer's money and to be nationalised by the British government. Other banks needed to be bailed out by the government with the taxpayer's money. Such failures fuelled the debate on how to minimize risk facing large UK firms and design an effective corporate governance system that would promote sustainable economic efficiency, growth and curtail high risk investments. This study contributes to this debate by providing empirical based findings on how board attributes may affect risk-taking.

Corporate governance deals with identifying potential mechanisms by which shareholders of a corporation exercise control over management such that their interests are protected. The board of a firm is seen as an internal control mechanism to oversee the company and help manage and control the risk facing the firm appropriately on behalf of the investors and stakeholders (Davies, 2010). The board of directors not only advise and monitor managers but make strategic decisions which have inherent risk involved. The ability of board members to provide valuable input and challenge decisions depends on the board composition. The strategic advice is in the shareholders' interest and these decisions can have an effect on the stability of the firm. Poor performance of the board in monitoring the management and inability of giving strategic advice can lead to instability[1] in firm performance.

The Turnbull report (2005) advocates UK directors of large firms to inform investors in the annual reports about risks facing the firm and how it is being managed, making the topic of

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[1] Instability of firm performance is characterized by high stock volatility increasing the probability of insolvency of a firm.

risk-taking in corporations relevant to study. Previous literature on board composition has mostly investigated the effect of board composition on firm performance[2] and only a few US based studies have examined the effect of board attributes on firm risk-taking (Cheng, 2008; Pathan, 2009; and Lewellyn and Muller-Kahle, 2012). Cheng (2008) has used corporations in the sample while the other studies have examined financial institutions. Since the governance framework is different in the US and UK, examining board composition in relation to managerial risk-taking using a UK sample will provide empirical findings that can direct the thinking on corporate governance in the UK. This study also stands apart from other studies since it employs the behavioural theory of the firm to extend agency theory as well as findings from strategic management and social psychology to form the theoretical framework unlike many previous studies that have relied only on agency theory.

The aim of the paper is to find how Board Size, Non-executive directors, Women, Powerful CEOs and Executive shareholders affect managerial risk-taking. It contributes to the UK Governance literature by empirically showing how board attributes can be used as risk control mechanisms. This was done by analysing archival data of 270 large FTSE 350 firms between the years 2005 to 2010. An econometric model was developed which included the control variables of growth opportunities, financial leverage, firm size and previous firm performance. To analyse the empirical model the most suitable estimation method for the panel data was the generalised least squares, random effects method.

The results show that a large board reduces firm risk and this result is consistent with studies that have used a US based data sample. If the board size increases by one standard deviation (2.39) then total firm risk reduces by 8.75%. The association between board size and firm risk

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[2] See Adams et al (2010) for a survey of literature on Boards of directors.

was found to be significant. The expectation is that non-executive directors present on the board would monitor management; this study found that a higher percentage of non-executive director's decreases firm risk. The Davies report (2010) had recommended for an increase in number of women on UK boards to provide a challenge to decisions made by an otherwise homogenous board. This study found that when the firm had at least one woman on the board the firm risk was reduced. The results for the relationship between powerful CEOs and risk-taking are mixed in the previous literature. This study found that a powerful CEO makes decisions that increase firm risk and high equity ownership of executives at board level also increases board risk. Both the variables of a powerful CEO on the board and executive equity ownership at board level were significantly related to firm risk.

The paper is organised as follows: in section 2 the governance framework in the UK is outlined. Section 3 discusses the theoretical background for the study and previous literature on board composition leading to the Hypothesis. Section 4 presents the methodology used for this study that includes information on the data sample; the dependent, independent and control variables used; the empirical model and the estimation method chosen. The findings are discussed in Section 5 and the conclusion in Section 6 summarises the findings.

2. Governance Framework

Some of the essential guidelines relevant to this study provided by the UK regulators to enhance the monitoring ability of the board are given below.

1) There is a unitary board where the board members are collectively responsible for directing and monitoring the company

2) The chairman should be responsible for leading the board (Combined Code, 2010).

3) All directors are to devote sufficient time to their role (Combined Code, 2010).

4) There is a division of powers at the top of the company. The CEO is in charge of running the company and the chairman is in charge of the board.

5) The guidelines recommend a balance of non-executive directors and executive directors. At least 50% of the board members need to be independent non-executive directors in a large company and the non-executive directors are to provide constructive challenge (Combined Code, 2010).

6) There is a need for the board to have a balance of skills and experience (Combined Code, 2010).

7) Boards to take measures to promote the diversity of boards, in particular in relation to the benefits of diversity on the grounds of gender. FTSE 100 firms are advised to aim for a minimum of 25% female board member representation by 2015[3] and FTSE 350 companies should set up their own, challenging targets (Combined Code, 2010 and Davies report, 2011).

8) Boards are required to confirm in the annual report the risks facing the firm and how they are being managed. This information is considered necessary to assist shareholders' understanding of the main features of the company's risk management processes and system of internal control (Turnbull report, 2005).

The governance guidelines are important to try and improve the monitoring ability of the board. Firms can choose to comply with the guidelines, if not explain it in their annual report. Information in the annual report regarding the composition of the board and the risk report provides information to investors on the strength and capability of the board.

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[3] European Commission has proposed for there to be at least 40% women non-executive directors on the boards of big listed companies by 2020 in European Union countries.

3. Theoretical Background and Hypothesis development

This study uses agency theory for the theoretical framework and extends it using the behavioural theory of the firm. According to agency theory the managers are hired by shareholders to run the firm since they do not have the time or the ability to do so (Jensen and Meckling, 1976). The expectation in agency theory is that agents or managers will act in their self-interest (Jensen and Meckling, 1976). Agency theory also assumes that executives are risk averse since the agents' personal wealth in terms of salary, bonus, equity and long term job security is tied to the firm (Galai and Masulis, 1976; Amihud and Lev, 1981). However strategic management researchers modelled risk-taking behaviour based on the behavioural theory of the firm such as Bowman (1980) and Bromiley (1991), and Fiegenbaum and Thomas (1988) and they have the view that executives of a firm may also be risk-seeking depending on the previous performance of the firm or industry performance. This study aims to develop hypotheses based on the idea that executives may be risk seeking. Findings from Strategic management and Behavioural Psychology literature are used in the development of hypothesis.

The board of directors make decisions on investing in the firm to make it grow. Some of the strategic choices that the board makes include critical choices such as acquiring a new firm, divesting a division, investing in research and development, or negotiating a takeover bid (Kosnik, 1987). These decisions depend on the risk choices of the board members. These decisions may be influenced by chief executives who are powerful, non-executive board members, size of the board, presence of women on the board, or the ownership structure. Firm risk-taking reflects the board's choice of investment risk from all the investment choices it has. An appetite for risk-taking will result in high variance in asset composition and risk aversion will result in a low variance in asset structure (Wright et al., 1996). Palmer and

Wiseman (1999) developed a holistic model of risk-taking that demonstrated that managerial risk-taking is significantly and positively related to organization risk. In this study firm risk is used as a proxy for managerial risk-taking.

3.1. Size of the board

The performance of the firm depends on the quality of monitoring and decision making by the board of directors (Yermack, 1996). Due to this board size becomes an important determinant of how the firm performs. In decision theory it is suggested that diversified opinions within large groups could lead to a compromise in the final decision (Sah and Stiglitz, 1986, 1991). Experimental research findings show that when a consensus is reached through group discussions, the group judgement represents the average of the prior individual judgements (Kogan and Wallach, 1966). There is a greater likelihood that a risky project is rejected since the investment has to be considered good by many directors before it is accepted by the group. Previous literature has found that larger board size relates to lower firm risk, irrespective of the size of the firm (Pathan, 2009; Cheng, 2008). Therefore the following hypothesis may be made.

H1: Larger board size will lead to less firm risk

3.2. Non-executive directors

A board of directors comprises of executive members and nonexecutive members. The Combined Code (2010) recommends that at least half the board comprise of independent directors due to the concern of opportunism by insiders. This study uses the percentage of non-executive directors (NED) as reported by the firm, to measure board independence.

Agency theorists argue that higher percentage of NED's will be able to monitor the management team better and improve firm performance (Jensen and Meckling, 1976; Fama and Jensen, 1983; Williamson, 1985; Hambrick and Finkelstein, 1987; Eisenhardt, 1989; Dalton et al, 1998). Arguably NED's in the interest of the shareholders would challenge risky projects that may jeopardise the long term performance of the firm. Linck, Netter and Yang (2008) argue that adding an independent director to the board brings benefits in terms of skill, knowledge and expertise but also costs in terms of difficulty in co-ordination and communication. Fama and Jensen (1983) propose that firms with high stock return volatility are more likely to have specific information not known to NEDs. This can hinder their ability to monitor the executives.

Recent studies such as Pathan (2009) found a positive relation between the proportion of NEDs on the board and firm risk while Cheng (2008) found an insignificant relationship between number of non-executives on corporate boards and risk-taking. In spite of these mixed results theoretically agency theory proposes that NEDs should monitor management decisions. This would reduce the possibility of extreme decisions being made and reduce firm risk.

 H2: A higher proportion of independent directors will reduce firm risk.

3.3. Presence of Women

Most boards in the UK have board members, with similar backgrounds, education and networks. This homogeneity among directors is seen to produce similar thinking. A key aspect to improve diversity on boards is to have women on board. According to the Davies report (2010) gender diversity at board level matters because 'inclusive and diverse boards are more likely to be effective boards, better able to understand their customers and

stakeholders and to benefit from fresh perspectives, new ideas, vigorous challenge and broad experience. This in turn leads to better decision making.'

Adams and Ferreira (2009) found that the attendance records for meeting were better for females leading to better monitoring. A recent study (TCAM, 2009) has shown that female directors exercise strong oversight and are more likely to pay attention to managing and controlling risk. Brennan and McCafferty (1997) add that female directors may have a better understanding of consumer behaviour, the needs of the customers, and the opportunities for companies in meeting those needs. Studies in the field of decision making have found that risk-taking behaviour of women with respect to investment decisions is more risk averse than men (Agnew, Balduzzi, and Sunden, 2003). The risk-averse behaviour could be due to the fact that women are less overconfident than men (Niederle and Vesterlund, 2007). It can also be due to the fact that women invest more in information acquisition (Goel and Thakor, 2008).

The empirical findings that relate women on the board to risk-taking are mixed. Adams and Funk (2011) and Berger, Kick and Schaeck (2012) find in their studies a positive relationship that suggests that having women on the board need not lead to more risk-averse decision-making. Other studies have found a negative relation between gender diversity and risk-taking (Adams and Ferreira, 2003, Wilson and Altanlar, 2009). Wilson and Altanlar (2009) show that having at least one female director on the board cut a company's chances of going bankrupt by 20%. This could be the result of the difference in risk preference and attitudes towards debt management between genders.

H3: The presence of women on the board lowers firm risk.

3.4. Powerful CEO

The position of CEO in a firm is at the apex of power having the expertise and status to exert control over strategic decisions (Finkelstein, 1992). A powerful CEO in this study is evaluated as one who has duality of top positions of Chairman-CEO or the chairman of the firm is an executive or the CEO is the founder of the firm. Regulators encourage a clear division of responsibilities at the head of the company and the chairman of the board is a non-executive. The reason for the separation of CEO and chairman position is grounded in Agency theory which assumes that management will try to dominate the board. Duality also promotes CEO entrenchment (Finkelstein and D'Aveni, 1994) and can also restrict the information flow to other board directors and reduce the independent oversight of directors (Jensen, 1993). Also, if the Chairman is an executive, it can make the CEO powerful so as to influence the board's decisions towards management's policies and ideas.

Amihud and Lev (1981) and Pathan (2009) have shown that powerful CEO's back safe projects (less risky) since their wealth in terms of job, salary and perquisites are all tied to the firm and they could risk losing their job backing risky projects. On the other hand, Adams, Almeida, and Ferreira (2005) showed that firms with more powerful CEOs have higher firm risk-taking since the decisions with extreme consequences are likely to be taken by a powerful CEO. Lewellyn and Muller-Kahle (2012) using a sample of sub-prime lending firms in the US also found that CEO's power was positively related to excessive risk-taking. This finding supports the behavioral theory of the firm which proposes that managers may be risk-seeking (Cyert and March, 1963) depending on the aspiration level of the decision makers.

H4: A powerful CEO will increase firm risk.

3.5. Board Ownership Structure

Executive directors are compensated in terms of equity as well as salary whereas NEDs are compensated with director fees for their work and may be compensated with firm equity. In this study board ownership is measured as the percentage of firm equity that the executives on the board hold.

According to agency theory managers who are given equity in the firm should have their interests aligned with the interests of the shareholder (Jensen and Meckling, 1976) but Demsetz and Lehn (1985) show that the level of managerial ownership and the riskiness of the firm are positively related. Saunders, Strock and Travlos (1990) found that firms where managers had stock holding in the firm were risker than those that did not. They explain that if the manager's wealth is in non-diversible human capital then they will be risk averse. If managers have equity in the firm their preference will be to value maximise and be risk-seeking. Wright et al (1996) argue that owners influence the success of their firm to obtain profits for themselves. They found a positive relation between concentration of executive ownership and measures of instability such as standard deviation of monthly stock return. This argument is supported by the behavioral theory of the firm which supports the thesis that managers' choices can be influenced by their aspiration level.

H5: Larger equity shareholding by executives on the board will be related to higher firm risk.

4. Methodology

4.1. Sample

Agency problem is most relevant in large UK firms where there is diffused ownership and the executives manage the firm. The sample is comprised of an unbalanced panel of 270

companies from 2005 to 2010 from the FTSE 350 Index. Accounting and market data was collected from Bloomberg database. The data on the board members was hand collected from the Morningstar database. The sample does not include financial and utility firms due to stricter regulation in these sectors.

Survivorship bias has been avoided by including all the FTSE 350 firms over the sample period. Survivorship bias occurs when only firms that have survived over the sample period are included in the sample. Since some firms have joined the index for the first time or been acquired or become insolvent the list is not the same year on year. From the lists of firms in every year[4], a final list was collated with a condition that firms needed to exist on the FTSE 350 for at least two consecutive years. This sample therefore does not have survivorship bias.

4.2. Independent Variables

The definition of the variables is shown in Table 1. The size of board was measured as the total number of board members. For Board size a natural log transformation was used to reduce the heteroskedasticity that is caused by variables that are always in the positive (Wooldridge, 2002). The independence of the board was measured as percentage of independent directors. 50% of the sample had at least one woman on the board and only 8 firms had more than 30% women on the board hence it was decided that the measure of diversity on the board would be the presence of women on boards. The presence of women on boards was measured using a dummy variable which takes the value 1 to denote the presence of women on the board and zero otherwise. Powerful CEO was measured using a dummy variable which takes the value of 1 if the CEO is the founder or there is duality of the CEO as a chairman of the board or if the Chairman is an executive of the firm. Board

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[4] The total number of unique firms which appeared on the FTSE 350 Index over the sample period of 2005-2010 was 599. After excluding firms that appeared only once on the list and excluding utility and financial sector firms the sample was of 270 firms.

Ownership was measured as percentage of equity held by the executive members of the board.

4.3. Dependent Variable

In this study three alternative measures of the dependent variable which is Firm risk are used. Firm risk is measured using accounting and market data which ensures that the results of the study are robust. Firm risk measures used in this study are Total Risk (TR); Insolvency Risk (IR) and Asset return Risk (ARR).

Market data has been used to measure Total Risk[5] which includes both the risk involved in the particular stock (idiosyncratic risk) and market risk (systematic risk) and reflects the market's perceptions about the risks inherent in the firm's assets and liabilities. Total risk can be explained as the extent of the stock volatility and measured by previous studies as the standard deviation of equity returns (R_{it}) for each fiscal year (Leaven and Levine, 2008 and Pathan, 2009). The daily stock return is calculated as the natural logarithmic of the ratio of equity return series, i.e. $R_{it} = \ln(P_{it}/P_{it-1})$, where P_{it} is the stock price (Pathan, 2009). The standard deviation of this ratio times the square root of the number of days of trade activity (260 days) gives the annualised volatility of equity return for each stock. Both regulators and firm executives frequently monitor this risk (Pathan, 2009).

Insolvency risk[6] or z-score is the probability that the firm will become insolvent (where losses surmount equity) and can be calculated using accounting data of the firm. The probability of the firm becoming insolvent will be Prob(-ROA<Equity) where ROA is the return on assets (Laeven and Levine, 2009). If the profits are normally distributed then the

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[5] Total risk is a measure of firm risk using market data
[6] Insolvency risk is a measure of firm risk using accounting data

inverse of the probability of insolvency will be z = (ROA+Equity/sdROA) where sdROA is the standard deviation of Return on Assets (Laeven and Levine, 2009). Z indicates the number of standard deviations that a firm's ROA has to drop below its expected value before equity is depleted. It measures the distance from insolvency (Roy, 1952) and gives the overall health of the company. A higher Z score indicates that the firm is more stable and less insolvency risk.

Asset return risk is used as a third alternative risk measure which represents the variance of the asset returns[7]. Following Flannery et al (2008) and Pathan (2009), volatility of asset returns or Asset Return Risk was computed the ratio of market value of equity to market value of total assets times the standard deviation of the daily stock returns. This was annualised by multiplying the resulting value by the square root of the approximate number of trading days in the year which is 250.

4.4. Control Variables

Other variables that affect firm risk are used to control for the differences in the sample so that the actual relationship between the independent and dependent variable can be determined. Five variables are included to control for size of the company (market capitalisation of the firm); Growth opportunities (capital expenditures over sales); financial leverage (total debt over assets); Lagged firm performance (lagged ROA); Industry dummies and year dummies.

Firm size is used to control for difference in sizes of the firms and is measured as market capitalisation of the firm in billions of pounds. It is used as a control variable since large firms may have better access to capital markets and borrow at better conditions (Ferri and

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[7] Asset return risk is a measure of Firm Risk using accounting data and market data

Jones, 1979) and therefore have a larger leverage ratio (Titman and Wessels, 1988). Due to this larger firms would be able to diversify and invest more. Due to the large value of assets, even a wrong choice of investment may not affect the volatility of its stock price. Therefore it is predicted that larger firms will be associated with less Firm Risk.

Myers (1977) argues that high growth firms prefer relatively lower levels of debt in order to avoid the adverse effects of the under investment problem. Such firms use equity to finance growth. It is predicted that if the firm has more growth opportunities then it would be associated with more Firm Risk. With regards to financial leverage, firms with higher financial leverage will be associated with less Firm Risk due to the burden of repayment or risk of insolvency[8].

Cheng (2008) used lagged firm performance as a control variable since it can be possible that the firms' change risk taken depending on the previous performance of the firm. If a firm does not meet the targeted firm performance in the prior year, managers in an attempt to meet targeted performance figures for the current year will take more risk in terms of investment choices.[9] Therefore it is predicted that low performance of the prior year will be associated with higher Firm Risk.

4.5. Data Analysis

To analyse the relation between board attributes discussed and firm risk[10] a linear regression model was developed. The hypotheses were tested using the econometric model shown below[11].

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[8] Previously used as control variables by Cheng (2008) and Linck, Netter, and Yang (2008)
[9] See Cyert and March (1963) in their book on the behavioural theory of the firm.
[10] Three alternate measures of firm risk that are used are Total Risk, Asset Return risk and Insolvency risk

ln(Firm Risk taking)$_{it}$ = α + α_1 ln(Board size) $_{it}$ + + α_2(Non-executive directors) $_{it}$ + α_3(Presence of women) $_{it}$ + α_4 (powerful CEO) $_{it}$ α_5(Board Ownership) $_{it}$ + α_6(lagged performance) $_{it-1}$ + α_7(firm size) $_{it}$ + α_8(growth opportunities) $_{it}$ + α_9(financial leverage) $_{it}$ + (industry dummies) + (year dummies) + ε_{it}

- where i stands for the firm and varies from 1 to 270

- t is the year and varies from 2005 to 2010

- α is the constant that does not vary over time

- $\alpha_{1-}\alpha_9$ are the coefficients in the regression

- ε_{it} is the residual variable that varies with time

- Natural log of Firm risk-taking and Board size are used.

The estimation method used was Generalised Least Square Random effects method (using STATA) due to the following reasons:

- Board attributes which are time invariant cannot be estimated with fixed effect regression as they would be wiped out in 'within transformation' process of the variables in this estimation method. Fixed Effect estimation requires significant within firm variation for the board variables values so as to produce consistent and efficient results. According to Wooldridge (2002) if the independent variables do not vary much over time then estimates will not be precise.

- This study has a sample period 'T' of six years and the number of firms in the sample is 270 (N). Baltagi (2005) mentions that when the N is large and T is small in panel data set, fixed effect estimation will be inconsistent. Also Fixed effect estimation would lead to a large loss of degrees of freedom.

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[11] The empirical model that was used in this study is similar to the model used by Adams, Almeida, and Ferreira (2005), Cheng (2008) and Pathan (2009).

The Table 2 shows the descriptive statistics for the board attributes, risk measures and control variables. The mean board size is 9 board members, mean percentage of non-executive independent directors is 62 per cent, the mean value for presence of women is 51% and the mean value of existence of a powerful CEO is 19.2 % and the mean value of Board ownership is 5.96%.

Table 3 shows the Pearson's pair-wise correlation matrix between the independent variables. All the correlation coefficient between the variables is below 0.48 which is between Firm size and Board size. Therefore multicollinearity between the regressors is not of concern. The correlations are consistent with the predictions.

5. Results

Table 4 presents the results of the Generalised least squares random effects estimation of the empirical model. The Pre-sign indicates the prediction as made in the hypothesis. The results of the regression using Total risk, Asset return risk and insolvency risk as the dependent variable are shown in the table. The overall model fit with Total risk is 58.19%, Asset Return Risk is 58.65% and insolvency risk is .45%. From Table 4 it can be seen that the direction of the relationship between the independent and alternative dependent variables is consistent. Therefore the results are discussed using Total risk which is most often used by firms and regulators alike as a significant risk measure.

Board size is negatively related to all measures of risk which means that a large board relates to less managerial risk-taking. If the board size increases by one standard deviation (2.39) then Total risk will decrease by (ln2.39*.0875/ln0.399=-0.0829) 8.29 per cent where 0.399 is the mean total risk. Previous studies by Cheng (2008) used a sample of 2980 US firms over the period 1996 to 2004 and Pathan (2009) used a sample of 212 Bank Holding companies in

the US over the period 1997 to 2004, to find that board size was inversely related to the firm risk. The interpretation of the results is that a larger board would make less extreme decision since there would be more compromises made in a larger board and vice versa a small board could increase firm risk. This is the first study that has associated board size to firm risk using a UK data sample. The empirical findings of this study show that a large board reduces firm risk. This result is consistent across countries and it can be argued that judgements made by a large group would be the average of individual prior judgements (Kogan and Wallach, 1966). This result can inform large UK firms in using board size as an internal risk control mechanism.

In this study the findings show that the proportion of non-executive directors on the board reduces firm risk but is not significantly related to risk-taking. Lewellyn et al (2012) used a US based data sample of the sub-prime lending industry and found that non-executive directors did not significantly influence risk-taking. The result was the same for Cheng (2008) for US firms but on the other hand Pathan (2009) found that for bank holding firms in the US an independent board significantly negatively influenced risk-taking. Pathan (2009) proposed that non-executive directors represented the shareholders aim of maximising returns and therefore backed risky projects. Even though the average board in UK firms has more than 50% of the board who are non-executives they do not have a significant effect on risk-taking. The monitoring role of non-executive directors to provide a challenge to the executive decisions made at board level is not significant. This may be because the part time non-executive directors have not much relevant information to mount a challenge to the executive directors in decisions made at board level.

The results of the analysis show that the presence of a woman on the board is inversely related to firm risk though the relation is not significant. Wilson et al (2011) who were quoted in the Davies report found that in newly formed firms in the UK, the proportion of women on the board reduced the risk of bankruptcy. There has been no other study which examines gender diversity on boards and their influence on risk-taking. This study cannot back up the findings of Wilson et al (2011) since it shows no significant effect of the presence of women on the board influencing risk-taking in large UK firms. Only 50% of the firms have at least one woman on the board, most of the women on boards are non-executive directors. Since there is strength in numbers, it may be that for women to provide a challenge at board level there needs to be higher proportion of women on boards to have any significant effect on monitoring the managers.

A powerful CEO on the board was found to be associated positively with all risk measures which is to say that a powerful CEO at the apex of the firm increases firm risk. The presence of a powerful CEO increases firm risk by 4.43%. Previous studies show a mixed relationship between powerful CEOs and firm risk. Cheng (2008) found that in the US corporations there was no significant relation between a powerful CEO and firm risk whereas in US bank holding firms Pathan (2009) found that a powerful CEO was related to less firm risk. He explained that this result was in accordance with agency theory where the executive would opt for less risky projects in protecting their wealth in terms of job, salary, and other perquisites. Llewellyn et al (2012) in their study of sub-prime lending firms in the US found that powerful CEOs increase firm risk. They propose that powerful CEOs of sub-prime lending firms in the US contributed to the global financial crisis by engaging in risky lending practices. Adams, Almeida, and Ferreira (2005) using a sample of Fortune 500 firms also found that powerful CEOs are more likely to make extreme decisions. This study has found

that in large UK firms a powerful CEO increases firm risk, which could be due to the aspiration level of the CEO. This result rejects the explanation of agency theorists that executives may only be risk-averse. The results of this finding informs regulators to encourage firms to comply with the guidelines regarding not having duality of CEO-Chairman position at the helm of the firm and having non-executives holding the position of Chairman.

This study found that higher executive equity ownership is related positively and significantly with Total risk. If the proportion of equity ownership on the board increases by ten per cent then the total firm risk increases by 1.4%. Saunders et al (1990) found that during the period 1979-1982 in US banks where managers held a higher proportion of equity there was significantly higher risk-taking behaviour. The finding of this study show that in UK corporations a higher proportion of equity held by board executives is associated with higher risk-taking behaviour. Executive directors with a higher proportion of holding have the incentive to increase firm risk to try and maximise returns for themselves.

The results also show that larger firms are associated significantly with less risk particularly Total risk. This result shows that for very large firms a wrong choice in investment may not affect the volatility in the stock price. The results show that higher growth opportunities are related with greater firm risk across all risk measures. This result shows that if there are opportunities for growth for firms they take the risk. Firms with higher financial leverage take less risk; this is due to the fact that firms are facing the burden of repayment and therefore taking lesser risk.

The previous performance of the firm was found to be inversely related to firm risk. If the previous performance of the firm was poor and not as expected, managers would attempt to meet the targeted performance for the current year by taking on more risk in terms of investment choices.

Overall the results show that a large board decreases firm risk, whereas a board with a powerful CEO and high executive board ownership would increase firm risk.

6. Conclusion

This empirical study has provided evidence of the relation between board composition and managerial risk-taking in UK firms. Using a sample of 270 FTSE 350 UK firms between the years 2005 to 2010, the results show that an increase in board size can significantly reduce firm risk. The presence of women on the board is consistently negatively related to firm risk, this could be due to the fact that women have an input in better monitoring of management, though the association is not significant. Independent directors are associated with less firm risk but the this relation is insignificant. On the other hand a powerful CEO and higher executive equity ownership significantly increases firm's total risk. This finding supports the behavoural theory of the firm that executives may be risk-seeking as opposed to agency theory.

The policy implications of the findings are that it can inform regulators in the use of board attributes as internal risk control mechanisms. Regulators can strengthen the guidelines regarding powerful CEOs at the helm of the firm, since they increase stock volatility. The current practise of rewarding executives with firm equity was based on the notion that it would align the interest of executives with shareholder interest of maximising returns. This

study has shown that a higher proportion of equity held by executives can increase risk-taking. It can inform firms that reducing the proportion of stock ownership by executive directors could reduce firm risk. Firms can increase the size of the board to reduce firm risk. Investors can use the board attributes to assess their investment risk.

The findings are reliable since the results are robust across different measures of firm risk and valid since the sample that was selected did not have any survivorship bias. The limitation of this study is that the results can be generalised to only large UK firms. The findings of this study show that board composition has a significant impact on managerial risk-taking. The study fills a gap in UK governance literature and shows that board attribute association with risk-taking are different in the US and UK.

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Tables

Table 1: Definition of the variables

This table provides the measures for the independent and control variables used in the empirical model. There are three dependent variables which are used alternately in the empirical model for robustness checks.

Variables	Measures
Independent Variables	
Board Size	The number of directors on the firms board
Non-executive directors	The percentage of non-executive independent board directors
Presence of Women	Dummy variable that is 1 when there is at least one woman on the board
Powerful CEO	Dummy variable which takes the value 1 if there duality of CEO-chairman position, CEO is founder or Chairman is an executive.
Board Ownership	Equity ownership of all the executive board members as a percentage of the outstanding shares
Dependent Variables	
Total risk	The standard deviation of the daily stock returns in each year
Asset Return risk	The standard deviation of the daily stock returns times the ratio of the market value of equity to market value of total assets times square root of 250
Insolvency risk	Z score=(Return on Assets+(Equity/Total Assets)/(Standard Deviation of Return on Assets))
Control Variables	
Lagged Performance	The return on assets for the firm for the previous year
Firm Size	The market capitalisation of the firm in millions
Growth opportunities	Capital expenditures by sales
Financial leverage	Total debt over assets
Industry dummies	Seven dummy variables that are either 1 or 0 for each of the seven industries
Year dummies	Six dummy variables that are either 0 or 1 for each of the six years from 2005 to 2010

Table 2: Descriptive statistics

This table presents the descriptive statistics of all the variables used in the empirical model from the data sample of 270 firms between the years 2005 to 2010. Min stands for the minimum value, max for the maximum value and SD stands for the standard deviation. Board size is the total number of board members, natural log is used. Non-executive directors are the percentage of non-executive directors on the board. Presence of women is represented by a dummy variable and is given the value 1 when there is at least one woman on the board. Powerful CEO is a dummy variable which takes the value 1 if there duality of CEO-chairman position, CEO is founder or Chairman is an executive. Board executive ownership is the equity ownership of all the executive board members as a percentage of the outstanding shares. Total risk is the standard deviation of the daily stock returns in each year Asset return risk is the standard deviation of the daily stock returns times the ratio of the market value of equity to market value of total assets times square root of 250. Insolvency risk is the inverse of z-score which is measured as Z score=(Return on Assets+(Equity/Total Assets)/(Standard Deviation of Return on Assets)). Lagged performance is the accounting profit for the firm in the previous year and is measured as return on assets. Firm size is measured as market capitalisation of the firm in millions of pounds. Growth opportunities are measured as capital expenditures over sales and financial leverage is calculated as total debt over assets.

Variables	Mean	SD	min	1st Quartile	Median	2nd Quartile	Max
Independent variables							
Board Size (No)	8.98	2.39	5	7	9	10	19
Non-executive directors (%)	62.61	11.83	28.57	55.56	62.5	71.43	93.33
Presence of Women	0.51	.50	0	0	1	1	1
Powerful CEO	0.192	0.394	0	0	0	0	1
Board Ownership (%)	5.96	14.13	0	0.11	0.36	2.58	90.5
Dependent Variables							
Total risk	0.399	0.203	0.135	0.261	0.346	0.473	1.62
Asset Return risk	0.391	0.189	0.134	0.259	0.345	0.468	1.54
Insolvency risk	3.83	22.98	-2.57	0.736	2.08	3.85	618.56
Control Variables							
Lagged Performance	7.63	12.31	-175.74	3.39	6.59	10.78	175.92
Firm Size (billions)	5.316	15.604	.010	.490	.981	2.607	138.68
Growth opportunities	11.38	57.61	0.016	1.829	3.468	7.482	1555.21
Financial leverage	4.80	39.01	-217.86	1.86	2.55	3.66	1010.32

Table 3: Correlations matrix

This table shows the Pearson's pairwise correlation between all the independent variables used in the empirical model. Board size is the total number of board members, natural log is used. Non-executive directors are the percentage of non-executive directors on the board. Presence of women is represented by a dummy variable and is given the value 1 when there is at least one woman on the board. Powerful CEO is a dummy variable which takes the value 1 if there duality of CEO-chairman position, CEO is founder or Chairman is an executive. Board executive ownership is the equity ownership of all the executive board members as a percentage of the outstanding shares. Lagged performance is the accounting profit for the firm in the previous year and is measured as return on assets. Firm size is measured as market capitalisation of the firm in millions of pounds. Growth opportunities are measured as capital expenditures over sales and financial leverage is calculated as total debt over assets. **. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed).

Independent variables	1	2	3	4	5	6	7	8	9
1. board size	1	$.124^{**}$	$.333^{**}$	.012	-.021	-.004	$.475^{**}$	-.015	$.321^{**}$
2. % NEDs		1	$.159^{**}$	$-.427^{**}$	$-.236^{**}$	.016	$.256^{**}$	-.008	$.149^{**}$
3. Presence of women			1	$-.124^{**}$	$-.156^{**}$	.027	$.214^{**}$	-.034	$.138^{**}$
4. powerful CEO				1	$.364^{**}$	-.037	$-.09^{**}$	.023	$-.06^{*}$
5. % exec holding					1	-.015	$-.074^{**}$	$.111^{**}$	-.048
6. Financial leverage						1	-.011	-.008	-.005
7. Firm Size							1	-.006	$.46^{**}$
8. Growth opportunities								1	-.008
9. lagged performance									1

Table 4: Generalised Least square Random effects estimation of the empirical model

This table shows the results from the estimation of the empirical model using Generalised least square – random effects method. The dependent variables of Total risk, Asset Return risk and insolvency risk (given as 1/z-score) are used alternatively in the empirical model and the results are presented in column 1, 2, and 3 respectively. Total risk is the standard deviation of its daily stock returns over a year. Asset Return Risk (ARR) is computed as the standard deviation of the daily stock returns times the ratio of market value of equity to market value of total assets times square-root of 250 in a year. Insolvency risk is the inverse of z-score; this inversion is done such that the measures are comparable to the other dependent variables. (Higher z shows less insolvency risk, whereas with the other dependent variables the higher value denotes higher risk). Z-score is measured as (ROA+CAR/sdROA). The pre-sign is the predicted relation between the independent and dependent variable. Board size is the total number of board members, natural log is used. Non-executive directors are the percentage of non-executive directors on the board. Presence of women is represented by a dummy variable and is given the value 1 when there is at least one woman on the board. Powerful CEO is a dummy variable which takes the value 1 if there duality of CEO-chairman position, CEO is founder or Chairman is an executive. Board executive ownership is the equity ownership of all the executive board members as a percentage of the outstanding shares. Lagged performance is the accounting profit for the firm in the previous year and is measured as return on assets. Firm size is measured as market capitalisation of the firm in millions of pounds. Growth opportunities are measured as capital expenditures over sales and financial leverage is calculated as total debt over assets. Industry and year dummies are included. The constant value in the regression is also reported. The model fit is also reported. Along with the coefficient the t-statistic is reported in parentheses. The superscripts of *, **, *** indicate statistical significance to 10%, 5% and 1% respectively.

	Pre-sign	Total Risk	Asset Return Risk	Insolvency risk
Board size	-	-0.0875**	-0.0935**	-0.3727
		(-2.06)	(-2.26)	(-0.69)
Non-executive Directors	-	-0.0001	0.0003	-.0073
		(-.16)	(0.31)	(-0.52)
Presence of women	-	-0.0141	-0.0114	-.4871
		(-0.71)	(-0.59)	(-1.18)
Powerful CEO	+	0.0443*	0.0482**	.2364
		(1.80)	(2.01)	(0.79)
Board executive Equity Ownership	+	0.0018**	0.0009**	0.0120
		(1.97)	(2.07)	(0.95)
Lagged Performance	-	-0.0014**	0.0012**	-0.0149
		(-2.31)	(-2.09)	(-1.29)
Firm Size (billions)	-	-0.0041***	-0.0040***	0.0092
		(-5.01)	(-5.08)	(1.32)
Growth Opportunities	+	0.00008	0.00008	.00017
		(0.55)	(0.62)	(0.08)
Financial Leverage	-	-0.0002	-0.0002	0.0008
		(-1.39)	(-1.43)	(0.39)
Year dummies		included	included	included
Industry dummies		included	included	included
No of observations		1434	1434	1433
Model fits: Within R2		0.6834	0.6811	0.0072
Between R2		0.4774	0.4970	0.0032
Overall R2		0.5819	0.5865	0.0045
Wald Chi2 stats (21)		2692.28***	2683.02***	7.75