Board Structure and Corporate Risk Taking in the UK Financial Sector

Saeed Akbar*, PhD
Professor in Accounting and Finance
Hull University Business School
Cottingham Road
Hull,
HU6 7RX
United Kingdom
Tel: +44 (0)1482 46 3066
Fax: +44 (0)1482 46 3484
Email: s.akbar@hull.ac.uk

Dr Buthiena Kharabsheh
Assistant Professor
Yarmouk University
Jordan
Email: kharabsheh2000@hotmail.com

Dr Jannine Poletti-Hughes
Lecturer in Accounting and Finance
University of Liverpool Management School
Chatham Street
Liverpool
L69 7ZH
United Kingdom
Tel: +44 (0)151 795 3101
Fax: +44 (0)151 795 3004
Email: J.Poletti-Lau@liverpool.ac.uk

Dr Syed Zulfiqar Ali Shah
Associate Professor
Warwick Business School
University of Warwick
Coventry, CV4 7AL
United Kingdom
Tel: +44 (0) 24 76528955
Fax: +44 (0) 24 76150376
Email: Zulfiqar.Shah@wbs.ac.uk

*Corresponding Author

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ABSTRACT

This paper examines the relationship between board structure and corporate risk taking in the UK financial sector. We show how the board size, board independence and combining the role of CEO and chairperson in boards may affect corporate risk taking in financial firms. Our sample is based on a panel dataset of all publicly listed firms in the UK financial sector, which includes banks, insurance, real estate and financial services companies over a ten year period (2003-2012). After controlling for the effects of endogeneity through the application of the dynamic panel generalized method of moments estimator, the findings of this study suggest that the presence of non-executive directors and powerful CEOs in corporate boards reduces corporate risk taking practices in financial firms. The negative relationship can be explained within the agency theory context, where managers are regarded as more risk averse because of the reputational and employment risk. An increased power concentration is therefore expected to enhance the risk aversion behaviour of directors. The findings however, do not show any significant effect of board size on corporate risk taking in financial firms. As this study covers recommendations of the UK Corporate Governance Code on the role of corporate boards in managing firms' risk, the empirical evidence could be useful for corporate governance regulation and policy making.

Keywords: Corporate Governance, Financial Sector, Board Structure, Risk, Endogeneity

1. INTRODUCTION

The recent financial crisis of 2007-2009 has revealed several weaknesses in corporate governance mechanisms in different countries. The crisis initially started in the financial sector in the US, UK and other developed economies and led to substantial losses in financial institutions worldwide in a few months' time. In response to the severe effects of the crisis, in 2008, the US government interfered to insure more than $700 billion of the financial institutions' assets whereas the UK government announced a £500 billion rescue package (Erkens, Hung, & Matos, 2012). The UK rescue package led the government to bail out many high profile financial institutions, such as; Northern Rock, Bradford and Bingley, Alliance and Leicester, HBOS and Royal Bank of Scotland, among others (Akbar, Rehman, & Ormrod, 2013). For instance, Northern Rock was initially supported by an emergency loan from the Bank of England, and by February 2008 it had gone into state ownership (Hall 2008).

Internal corporate governance mechanisms are generally responsible for crafting and implementing strategic decisions in most organisations. In the aftermath of the crisis, there has been consensus in the literature with regards to the inadequate performance of the board of directors which has been regarded as one of the main reasons for the crisis (e.g., Andres & Vallelado, 2008; Boyd, Haynes, & Zona, 2011; Erkens et al., 2012; Hardwick, Adams, & Zou, 2011; Ingley & van der Walt, 2008). The board of directors has also been blamed for not protecting the shareholders' rights and for focusing on the short term rather than the long-term objectives of their organisations (Erkens et al., 2012). Improving the quality of risk management mechanisms and disclosure by firms has therefore remained on the agendas of regulators in different countries. Similarly, Ntim, Lindop, and Thomas (2013) document that stakeholders' and regulators' efforts in relation to improving risk reporting and management practices produced positive impact on the quality of risk disclosure and risk management in their sample organisations.

As the capital structure of financial institutions is characterized by high leverage, their executives are often motivated to take more risk (Smith & Jensen, 2000). Executives in the financial sector were also accused of taking excessive risk which has been regarded as one of the major causes of the financial crisis (Kirkpatrick, 2009). Similarly, due to the asset substitution effect, there is an increased tendency for excessive risk taking in highly leveraged firms (Sepe, 2012). As the debt equity ratio increases, low-risk investments are

substituted with high-risk ones which capture all the possible upside potential (Magnan & Markarian, 2011; Sepe, 2012). High remuneration and incentives to managers also intensified the risk taking attitude of executives which contributed to development of the recent financial crisis (Kirkpatrick, 2009).

Consequently, most corporate governance codes around the world emphasise on the importance of the board of directors in managing the risk of firms. In the UK, the Corporate Governance Code (2010) strongly focuses on board of directors and risk when describing good corporate governance. Section (A.1) in the code states that "*…the board's role is to provide entrepreneurial leadership of the company within a framework of prudent and effective controls which enables risk to be assessed and managed*" (UK Corporate Governance Code 2010, p. 9). In addition, more information on firms' risk management practices and their long-term horizon has also been added to the revised UK Corporate Governance Code (2010). The revised code has given consideration to the long term horizon and future success of firms as the main focus of the board of directors, and has mentioned the term long term horizon of firms several times in its content.

Given the importance of the board of directors in firms' operations, examining the relationship between board structure[1] and corporate risk taking is an important issue at the present time. In particular, considering the immense importance of the financial sector in the global economy, the relationship between board structure and corporate risk taking practices in this sector requires a detailed investigation. Furthermore, the operating systems and the way revenue is generated in this sector is different, due to which this sector is more exposed to risk than other sectors. In addition, due to several unique characteristics of financial firms, such as; different operating mechanisms (Macey & O'Hara, 2003); the presence of more opaqueness and greater information asymmetry (Andres & Vallelado, 2008; Caprio & Levine, 2002) and, greater leverage (Nam, 2004), their corporate governance practices are different from firms in the non-financial sector (see also, Srivastav & Hagendorff, 2016). Arun & Turner (2004) also indicate that the role of the board of directors is more complicated and challenging in the financial sector.

[1] In this study, board structure refers to board size, independence and CEO/chairperson duality. These variables are considered the most debated in the corporate governance literature. See Adams et al. (2010) and Hermalin and Weisbach (2003) for a full review.

Financial institutions have deposits from people and other channels that together with debtholders and shareholders are overseen by the board of directors (Macey & O'Hara, 2003; Prowse, 1997). Thus, the involvement of more parties leads to more complex agency problems than those which are normally observable in non-financial firms (Andres & Vallelado 2008). Furthermore, Pathan (2009) argues that because of the important role that financial institutions play in the stability of the economy, the board of directors as a control governance mechanism is more important in the financial sector than the non-financial sectors. It is also evident that due to the credit and financial relationships, failure of one financial institution could lead to several failures in other institutions (Gordon & Muller 2011; Staikouras, Staikouras, & Agoraki, 2007). However, despite all this evidence, most of the published research in this area is based on non-financial sectors with only a limited number of papers covering the relationship between board structure and corporate risk taking in financial firms.

This study therefore aims to examine the relationship between corporate board structure and risk taking behaviour in UK financial institutions. In particular, we show how the board size, board independence and combining the role of CEO and chairperson in boards may affect corporate risk taking in financial firms. The focus on these three structural variables is motivated by the mixed and inconclusive evidence on how these variables are related to the corporate outcomes. In this regard, Adams, Hermalin, and Weisbach (2010) argue that the endogenous nature of the board structure variables leads to several problems in the estimation methods which interfere in measuring the actual effect of governance practices. In particular, board size and independence are the main variables that might be endogenously determined in such relationships (Wintoki, Linck, Netter, 2012). We therefore control for all three types of endogeneity in our study through the application of dynamic panel generalized method of moments estimator. We also consider the important role of the risk committees with respect to the decisions related to risk taking by the board of directors.

We contribute to the literature on board structure and firms' risk management in three different ways. First, to the best of our knowledge, this is the first study in the UK that examines the relationship between board structure and corporate risk taking in the financial sector. Despite the fact that the financial sector is heavily regulated, this sector was severely hit by the recent financial crisis which led to substantial losses which also has long term implications for other sectors. In the UK, a new regulatory framework for the financial sector

was introduced on 1 April 2013. In addition, the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA) were introduced to work hand in hand with the Bank of England to ensure the financial stability of financial institutions. In particular, the Prudential Regulation Authority has introduced a new risk assessment framework, which aims to protect financial institutions from failing. It is therefore likely that close and intense government monitoring will moderate the role of the board of directors in determining corporate risk taking.

Second, prior studies have extensively examined the relationship between board structure and corporate performance (e.g., Coles, Daniel, & Naveen, 2008; Eisenberg, Sundgren, & Wells, 1998; Guest, 2009; Yermack, 1996). However, with regards to corporate risk taking existing evidence is very limited and mainly based on the US data (Cheng, 2008; Kim & Buchanan 2008; Pathan, 2009). We argue that due to institutional differences and several other differences between the two countries the corporate risk taking behaviour of the board of directors' in the UK financial firms might differ from the US. Furthermore, although the corporate governance structures are similar in both countries, the UK has been characterised as weaker than the US in monitoring and disciplining of company directors. This can provide company directors with opportunities to place their own interests over and above the interests of shareholders that would result in higher agency costs in UK companies. We therefore argue that these differences are important in exploring the role of board composition on corporate risk taking in the UK.

Third, there is evidence in the existing literature which indicates that corporate board structure is endogenously determined and that findings of most published studies are affected by endogeneity (e.g., Hermalin & Weisbach, 1988, 1991, 1998, 2003). This study therefore addresses the endogeneity issue by following Wintoki et al. (2012) and applies the dynamic panel generalized method of moments estimator (system-GMM) as the method of estimation. We argue that traditional estimation methods such as ordinary least squares (OLS) or fixed effects are unable to control the endogeneity problems whereas through the application of system-GMM we control for three types of endogeneity i.e., unobserved heterogeneity, simultaneity and dynamic endogeneity, and present more consistent results. In addition, we test the robustness of our results by considering the effects of the presence of a risk committee in corporate boards in the sample firms. This analysis is based on the assumption that the presence of a risk committee on corporate boards would affect the risk taking behaviour of financial firms.

Using a panel dataset based on FTSE All-Share Index Financial Firms over a ten year period 2003-2012 (2760 firm year observations), this study finds the evidence suggesting that board structure is associated with corporate risk taking in the UK financial sector. A negative and significant relationship is found between the presence of independent non-executive directors on boards and corporate risk taking behaviour. This finding is consistent with the monitoring hypothesis; as limited availability of information to non-executive directors impedes effective assessment of firms' operations relevant for decision-making (Boone, Field, Karpoff, & Raheja, 2007; Linck, Netter, & Yang, 2008; Raheja, 2005). We show that CEO power (i.e., combining the two positions of CEO and chairperson) lowers firm risk which is consistent with the existing literature in this area (Kim and Buchanan, 2008; Pathan, 2009). This negative relationship can be explained within the agency theory context, where managers are regarded as more risk averse because of the reputational and employment risk (Amihud & Lev, 1981; Eisenhardt, 1989; Jensen & Meckling, 1976). Therefore, with more power concentration, it is expected that it would increase the directors' risk aversion behaviour. We however, did not find any significant relationship between board size and corporate risk-taking in financial firms. The results also show a significant relationship between the presence of risk committees on boards and all the risk measures used in this study. This finding specifies the important role of risk committees, and supports the regulation about the inclusion of risk committees on the boards of financial firms.

The rest of this paper is organized as follows. In section 2 we briefly discuss previous literature and outline the research hypotheses. Section 3 presents details of the data collection process, variable measurements and estimation methods. Section 4 provides details of the empirical results and related discussions. Finally, section 5 concludes this paper by presenting a summary of the overall findings, main contributions and implications of the study. This section also acknowledges the research limitations and outlines avenues for future research.

2. LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

Under the framework of the agency relationships it has been argued that due to reputational and employment risks managers are risk averse (Jensen & Meckling, 1976; Fama, 1980). However, managerial incentives, particularly those tied to corporate performance, might encourage managers to take more risk (Baysinger & Hoskisson, 1990; Jensen & Murphy, 1990). Hence, in order to align the interests of managers to those of shareholders different incentives are offered to managers for increasing corporate value (Jensen & Meckling, 1976).

In the financial sector, however, large monetary incentives led to the excessive managerial risk taking, which has been recognised as one of the main causes of the 2007-2009 financial crisis (Kirkpatrick, 2009; Minton, Taillard, & Williamson, 2014; Pathan, 2009).

Several observers have therefore regarded that performance based incentives to executives of financial institutions were much larger than those provided in the non-financial sector. This was one of the reasons that could partially explain the excessive risk taking behaviour of executives in the financial sector. In this context, a recent report by the OECD indicates that these massive monetary incentives led the managers to focus on short-term as opposed to long-term profits of their organisations (Kirkpatrick, 2009). Furthermore, while commenting on the behaviour of executives in the financial institutions, Sepe (2012, p.346) argues, that "*....contrary to the conventional representation of managers as risk-averse agents, the banking sector's reliance on highly leveraged compensation schemes led managers to undertake increasingly outsized bets-tail risk in the jargon of finance. When the market turned sour, these reckless bets led to massive losses*".

In addition, due to the complexity of instruments used, opaqueness in the transactions and the ability of managers to manipulate and adjust the risk structure, the financial sector is characterised by greater information asymmetry. This would justify the government intervention of placing tighter regulations in different countries for protecting the interests of not only shareholders but also all other stakeholders (Arun & Turner 2004; Becht, Bolton, & Röell, 2011; Grove, Patelli, Victoravich, & Xu, 2011; Macey & O'Hara 2003). However, there are both positive and negative consequences of the government interventions. Although, it may serve as a governance mechanism that minimises the agency problems in the first instance, it may also result in negative consequences, such as, moral hazard problems that emerge from the deposit insurance system. As a result, shareholders will be less engaged in monitoring activities, whilst managers will be encouraged to engage in more risky investments (Nam, 2004; Staikouras et al., 2007). Furthermore, intense government regulation weakens other external governance mechanisms such as, hostile takeovers, competition etc. (Levine, 2004; Prowse, 1997).

While commenting on the implications of intense regulations, Prowse (1997) documents that intense government regulations in the financial sector have made some of the hostile takeovers costly which is one of the reasons of firms' avoidance of those regulations. Increased government regulations may also limit competition among financial institutions

which would negatively affect economic stability. Similarly, restrictions on concentrated ownership and identity of bank owners for instance, would also reduce competitiveness (Levine, 2004). As a result, internal governance mechanisms such as board structure and disciplining managerial behaviour might help in mitigating the agency problems in organisations (Andres & Vallelado, 2008; Pathan, 2009; Staikouras et al., 2007). Consistent with this argument, Pearce and Zahra (1992) report that the effectiveness of the board of directors mainly depends on the corporate board structure of firms. Adams et al. (2010) document that board size, independence and CEO power are of particular importance in mitigating the agency problems in organisations. Similarly, Belghitar and Clark (2015) show that monitoring mechanisms, such as board size and board composition play an effective role in reducing agency costs in large firms. Likewise, Barakat and Hussainey (2013) argue that by taking outside directors on their corporate boards European banks could enhance their own risk disclosure mechanisms. We therefore discuss relevant literature on board structure, size, independence, and CEO power below.

2.1 Board Size and Corporate Risk Taking

In line with the assumptions of the agency theory, the number of directors serving a corporate board is relevant to the outcome of the board decisions. In addition, smaller boards are generally viewed as more efficient and productive because there are less communication and coordination problems (Jensen, 1993; Lipton and Lorsch, 1992). It has also been documented in the literature that although increasing the number of directors on corporate boards may offer more human capital, the cost may be higher than the benefit (De Andres, Azofra, & Lopez, 2005). There is also empirical evidence in support of this argument which suggests that firms with smaller boards have better corporate performance as compared to firms with larger corporate boards (Eisenberg et al., 1998; Yermack, 1996).

The effect of board size on corporate risk taking can also be explained from the perspective of the agency theory. Jensen (1993), points out that due to communication and coordination problems in larger boards, the decision-making process is time-consuming and slow. More importantly, due to difficulties in reaching consensus in larger boards, decisions on extremely important matters are usually not done in time. This implies that those firms which uses larger board may experience less risk taking practices (Cheng, 2008). The negative effect of larger boards on corporate risk taking is also supported in economics and social psychology studies which assume that the decisions in large groups reflect all the heterogeneous opinions

of its entire members and as a result, the final outcome is usually viewed as a group compromise. In such circumstances, the situation generally results in the rejection of radical decisions as they involve riskier projects (Kogan & Wallach, 1964; Moscovici & Zavalloni, 1969; Sah & Stiglitz, 1986; Sah & Stiglitz, 1991).

In the US, Cheng (2008), suggests that larger boards have a negative effect on three measures of performance, namely monthly stock returns, annual accounting return on assets (ROA), and Tobin's Q. Similarly, evidence of a negative relationship between board size and different firm characteristics is provided by Pathan (2009) and Wang (2012), which is consistent with the US findings. Moreover, using a questionnaire survey as their research instrument, McNulty et al. (2013) report a negative relationship between board size and financial risk in their sample of UK firms which is also consistent with previous research findings in this area. A negative relationship between board size and corporate risk taking is therefore expected, which take us to our first hypothesis as follows.

H_1: There is a negative relationship between board size and corporate risk taking in the UK financial sector.

2.2. Board Independence and Corporate Risk Taking

In the existing literature, one proxy of board independence is the existence of independent non-executive directors on corporate boards (Guest, 2010). Similarly, Jensen and Meckling (1976) suggest that agency conflicts can be controlled and minimised by increasing the number of non-executive directors on the boards. The presence of non-executive directors is expected to be effective in monitoring as they are independent from management and would be interested in protecting their own reputation in the labour market (Fama, 1980). Under the reputation hypothesis, non-executive directors would support investments in less risky projects which will help firms in avoiding losses and would thus protect the image of their firms (Pathan, 2009). Also, on the basis of the monitoring hypothesis, it is assumed that the presence of non-executive directors on corporate boards is expected to reduce corporate risk taking. This hypothesis assumes that as a result of limited information available to firm's executives, the information asymmetry increases and as a result, the cost of information will be higher for non-executive directors (Boone et al., 2007; Linck et al., 2008; Raheja, 2005).

There is also empirical evidence that support the above arguments suggesting a negative relationship between the presence of non-executive directors on boards and corporate risk taking (e.g., Brick & Chidambaran, 2008). Similarly, Pathan (2009) while studying a sample of 212 large US bank holding companies report a negative relationship between the proportion of non-executive directors and total risk, idiosyncratic risk, systematic risk and assets return risk. We therefore expect a negative relationship between board independence and corporate risk taking in the UK financial sector and form our second hypothesis as follows.

H_2: There is a negative relationship between board independence and corporate risk taking in UK financial firms.

2.3 CEO/Chairperson Duality and Corporate Risk Taking

In the context of the agency relationships the separation of CEO and chairperson positions is desirable because the dual role may have negative consequences on the monitoring function of the corporate board which eventually might negatively impact firms' shareholders (Jensen, 1993; Lipton & Lorsch, 1992). Moreover, Jensen (1993) argues that excessive power is concentrated in the CEO when she/he is also the chair of the board of directors which encourages self-interested managerial behaviour, impeding effective monitoring. However, it has also been argued in other research papers that as a result of the managerial risk-aversion attitude duality will lead to lower corporate risk taking (Demsetz & Lehn, 1985; Jensen & Meckling 1976). In line with these assumptions, Kim and Buchanan (2008) analysed data of the largest US firms for the year 2002 and found a negative effect of CEO/chairperson duality on income stream risk, which was the main risk measure in their study and measured as the standard deviation of return on assets. In addition, the findings of Pathan (2009) are consistent with the view about the positive effects of duality on firms' operations, suggesting that CEO-Chairman duality reduces bank risk taking in the US. This leads us to our third hypothesis as follows.

H_3: There is a negative relationship between CEO/chairperson duality and corporate risk taking in UK financial firms.

3. DATA SAMPLE AND METHODOLGY

3.1 Data Sample

This study covers all UK public firms in the financial sector listed on FTSE All-Share Index over a ten year period (2003-2012), and includes banks, insurance, real estate, and financial services companies. The start of the period of analysis is inclusive of the 2003 revision of the Combined Code of Corporate Governance which not only addresses most of the aspects from the previous governance codes but also includes a change with respect to the board independence of UK firms. The revised Combined Code required an increase in the proportion of non-executive directors on boards from a third to at least half of the board size. This indicates the importance and significance of the role of independent directors in the corporate governance structures of UK companies. Since our focus is on all firms in the financial sector, we do not use specific items related to the banks' financial statements (Erkens et al., 2012). In order to include a firm in the sample this study has applied three different criteria. First, for the calculation of the corporate risk measure of individual firms, this study requires all the sample firms to have at least 36 months of consecutive monthly stock market returns data (Cheng, 2008; Florackis et al., 2011). Second, due to the estimation method employed in this paper i.e., dynamic panel generalized method of moments estimator, it is required that financial data of the sample firms is available for at least five consecutive years (Florackis & Ozkan, 2009). Third, we include all those firms for which governance data was available from BoardEx database which is the main database available for UK governance data. In addition, market and accounting data was extracted from Datastream and Worldscope databases, respectively. Our final sample is therefore based on an unbalanced panel containing 276 UK financial firms. Consistent with the majority of previously published research studies in this area, winsorisation is applied to all the financial variables where data points lie above 99% and lower than 1% percentiles (e.g., Shumway, 2001).

3.2 Variable Measurement

Dependent Variables

In order to investigate the effects of board structure on corporate risk taking in the UK financial sector, this study uses different proxies for the risk measures. First, we take idiosyncratic risk as the main proxy of corporate risk taking because it is highly likely that it would be affected by the decisions of the board of the directors (Jin, 2002). We calculate

idiosyncratic risk as the standard deviation of the residuals from the two-index market model. This calculation is consistent with previous studies in this area (e.g., Pathan, 2009; Adams et al., 2005). In mathematical form it is expressed as follows:

$$r_{it} = \alpha_i + \beta_{1i}R_{mt} + \beta_{2i}Interest_t + \varepsilon_{it} \quad \ldots\ldots(1)$$

where, r_{it} represents the monthly stock return[2], R_{mt} denotes the monthly return on the FTSE All-Share index, Interest is the 3-months' risk-free rate and the ε_{it} stands for the residuals.

Second, we use an accounting based risk measure, Z-score as the proxy for measuring firms' insolvency risk (Roy, 1952). Following previous published studies (e.g., Laeven and Levine 2009; Houston, Lin, Lin, & Ma, 2010; Vyas, 2011) the Z-score is calculated according to the following equation:

$$\text{Z-score} = [\text{Average (ROA)} + \text{Average (CAR)}]/\sigma(\text{ROA}) \quad \ldots\ldots(2)$$

where ROA is the return on assets of the financial firms, CAR is the capital asset ratio measured as the ratio of a financial firms' capital and reserves to total assets, and σ (ROA) is the standard deviation of return on assets. It is generally expected that stable firms would have a high Z-score and thus for making the explanations of the signs of coefficients similar we use 1/Z-score as a proxy for the insolvency risk. If the inverse of Z-score is not used then a high Z-score with high ROA would mean less insolvency risk (Pathan, 2009). For estimating all the above values at least five consecutive years' data is needed. Moreover, for controlling the industry effects we have adjusted the Z-score measure by taking the difference between a firm's Z-score and the average Z-score of all firms in that industry in the same year (Cheng, 2008).

The third risk measure we use in this study is the market adjusted idiosyncratic risk which is calculated as the standard deviation of the residuals from the difference between the monthly return of the FTSE All-Share Index and the monthly return of each of the sample firms.

[2] Monthly stock returns are calculated by using the following equation: $r_{it} = RI_{it} / RI_{it-1} - 1$, where r_{it} are the monthly returns of stock i at month t, RI_{it} is the return index for stock i in month t, and RI_{it-1} is the return index for stock i in the previous month.

Independent Variables

As highlighted above, the main governance variables of this study have been extracted from the BoardEx database. First, following Cheng (2008) we measured board size as the natural log of the total number of directors serving on a corporate board. Second, board independence is measured as the number of non-executive directors divided by total number of directors on the corporate board (Guest, 2009, 2010; Chen & Zhang, 2014). Third, CEO power is measured through the use of a dummy variable equal to one if the CEO and chairperson is the same person and zero otherwise (Florackis & Ozkan, 2009; Kim & Buchanan, 2008).

Control Variables

This study uses several control variables in the empirical model. We control for firm size because larger firms have the ability to diversify and are expected to encounter lower risk than small firms (Konishi & Yasuda, 2004). Firm size is measured as the natural logarithm of total assets of the sample firms. There is also evidence in prior literature which suggests that firms with higher leverage are exposed to higher risk (Adams et al., 2005). We therefore include financial leverage as a control variable in our model which is measured as the ratio of total debt to total assets (Ozkan & Ozkan, 2004). Furthermore, as suggested by Wiseman and Gomez-Mejia (1998), it is highly likely that corporate performance would determine the executives' tendency toward corporate risk taking. Keeping this in mind, we control for firm performance and include market-to-book ratio as a measure of corporate performance in our model (Hagendorff & Vallascas, 2011). In addition, since older firms have more experience and are expected to encounter lower risk, we also control for firm age in our analysis (Lewellyn & Muller-Kahle, 2012). Other relevant evidence also suggests that providing ownership incentive to managers would moderate their risk taking behaviour (Jensen and Meckling, 1976). We therefore control for CEO ownership in our model. We also include risk committee as a control variable which according to the UK Corporate Governance Code (2010) is a committee which contains independent directors and is responsible for monitoring and reviewing a firm's internal control and risk management practices. It is represented by a dummy variable which is equal to one if the firm has a risk committee and zero otherwise. Details of variables names and their definitions, measurements and source are highlighted in table 1 below.

Table 1

Variable Definitions, Measurements and Sources

Risk Measures		
Idiosyncratic Risk	*IDO*	The standard deviation of the residuals from two index market model using 60 monthly stock returns with a minimum of 36 months. Source: Worldscope/Datastream
Market Adjusted Idiosyncratic Risk	Adj-*IDO*	The standard deviation of the residuals from the difference between the monthly returns on the FTSE All-Share Index and the monthly returns of each firm. Source: Worldscope/Datastream
Insolvency Risk	Z-Risk	1/[average (return on assets)+average (capital assets ratio)]/σ (return on assets). Source: Worldscope/Datastream
Industry Adjusted Z-Risk	Adj-Z-Risk	The difference between the firm's Z-score and the average Z-score of the firms in the same industry in the same year. Source: Worldscope/Datastream
Board Structure Variables		
Board Independence	*NED*	Board independence is measured as the number of independent non-executive directors divided by the total number of directors on the corporate board. Source: BoardEx Database
Board Size	*BSIZE*	The natural log of total number of directors on corporate boards. Source: BoardEx Database.
CEO/Chairperson duality	*DUL*	Dummy variable equal to (1) if the positions of CEO and chairperson are combined, (0) otherwise. Source: BoardEx Database.
Control Variables		
Financial Leverage	*LEV*	Total Debt /Total Assets. Item No. WC03255 and WC02999 extracted from Worldscope/Datastream Database.
Firm Size	*FSIZE*	Ln (Total Assets) Item No. WC02999 extracted from Worldscope/Datastream.
Firm Age	*Age*	Number of years since incorporation. Item WC18273 extracted from Worldscope/Datastream Database
Market to Book Value Ratio	*MTBV*	Market to book value of equity. Source: Worldscope/Datastream Database
CEO Ownership	*CEOWN*	The percentage of shares owned by the CEO. Source: BoardEx Database.
Risk Committee	*RC*	Risk committee contains independent directors and is represented by a dummy variable which is equal to one if the firm has a risk committee and zero otherwise. Source: BoardEx Database
Industry	*IN*	A dummy variable for each industry sector
Year	*Y*	A dummy variable for each year

3.3 Research Methodology

In addition to other aims, one of the main objectives of this research is to control for endogeneity in our empirical models. This is necessary because in a dynamic model, a lagged dependent variable will be correlated with the firm fixed effects which will bias the OLS estimators. Although, the influence of fixed effects can be eliminated with the application of the fixed effects models, the transformation to eliminate the fixed effects will still present correlation between the transformed lagged dependent variable and the transformed error term. Moreover, in the case of endogenous explanatory variables, it is expected that the error term will be correlated with the explanatory variables, which is resulting in inconsistent fixed effects and OLS estimators. A solution to overcome these econometric problems is the application of a dynamic panel generalized method of moments estimator (system-GMM) which can also eliminate the fixed effects by a first-differences transformation and correcting for the aforementioned bias (Arellano and Bond, 1991). It is therefore argued that in the presence of endogeneity, the application of system-GMM is more appropriate than other methods of estimation (such as, OLS or fixed effects estimators), where the resulting estimators are regarded as biased and/or inconsistent.

We therefore follow Wintoki et al. (2012) and employ a dynamic panel system-GMM for controlling all three types of endogeneity, i.e., simultaneity, unobservable heterogeneity, and dynamic endogeneity. The first source stems from simultaneity, because corporate risk taking and some of the financial variables are simultaneously determined (e.g., leverage). For example, in order to avoid insolvency, firms' leverage can be adjusted by managers which would hide the actual level of risk faced by the firms.

The second endogeneity source comes from unobservable heterogeneity, where other omitted variables could affect corporate risk taking but are unobservable, such as, the managers' skills and ability. For instance, Hermalin and Weisbach (1988) argue that when firms have managers with high skills then fewer independent directors would be required because the board monitoring function would be decreased.

The third source of endogeneity that may arise in our specification is dynamic endogeneity. According to Wintoki et al. (2012), this type of endogeneity is usually ignored in most governance studies which generally lead to mixed and inconsistent results. In general, Y_{it-1} is endogenous to the fixed effects in the error term, which gives rise to dynamic panel bias. When the current financial variables are affected by past corporate risk taking, a dynamic

endogeneity would arise in the model specification. This positive correlation between a regressor and the error term violates the assumption necessary for the consistency of OLS. In particular, it increases the estimator for lagged corporate risk by attributing predictive power to it, which actually belongs to the firm's fixed effects.

Through the application of system-GMM, we are able to control for all the three sources of endogeneity and argue that our estimations are yielding consistent results. The system-GMM estimation that is applied in our analyses transforms all regressors by differencing, then based on the additional assumption that first differences of instrument variables are uncorrelated with the fixed effects it includes more instruments that aim to improve the efficiency. In other words, it builds a system of two equations, one in levels and one in differences and combines moment conditions for each, where instruments of the endogenous variables are lags in differences and levels, respectively (Roodman, 2006).

This method relies on lags of the dependent and explanatory variables which are used as instruments. We include lags of corporate risk measures (dependent variable) to capture the dynamic effect of past risk taking on current corporate risk of board structure and a firm's financial characteristics.[3]

Following Wintoki et al. (2012), we assume that all the board structure variables and all the firm financial characteristics are endogenous except firm age and year dummies. We use the following model to examine the effect of current board structure on corporate risk taking:

$$Y_{it} = \alpha_1 + k_1 Y_{it-1} + k_1 Y_{it-2} + \sum_{j=1}^{3} \beta_j BOD_{it} + \gamma Control_{it} + \theta X_{it} + \mu_i + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots (3)$$

where, Y_{it} is the dependent variable either Z-risk or idiosyncratic risk, Y_{it-1}, Y_{it-2} are the first and second lags of the dependent variable. In case of Z-risk as the dependent variable, we include the first and second lags in our analysis, whereas in case of idiosyncratic risk as the dependent variable only the first lag is used in our analysis. BOD_{it}, represents, board size, board independence and CEO/chair duality. $Control_{it}$, represents the control variables

[3] To determine how many lags should be included in the model, we follow Wintoki et al. (2012) and regress each current risk measure on three lags of past risk in addition to the firm characteristics that were used as control variables. For idiosyncratic risk, only the first lag is significant, which means including one lag of idiosyncratic risk will ensure that the past effect is captured. For the idiosyncratic risk, lag two and older can be used as instruments in the dynamic panel generalized method of moments estimator (system-GMM). However, when the dependent variable is Z-risk the first and the second lags are significant, which implies that including two lags for Z-risk will be sufficient to capture all the dynamic effect estimated by system-GMM. Furthermore, lag three and beyond would be exogenous and could be used as instruments.

namely, leverage (LEV), firm size (FSIZE), firm age (AGE), market to book ratio (MTBV), and CEO ownership (CEOWN). In addition, X_{it} represents the exogenous variables which include firm age and year dummies, μ_i denotes unobserved firm effect and ε_{it} stands for the residuals.

4. RESULTS AND DISCUSSION

Table 2 presents descriptive statistics of the dependent, independent and control variables used in the empirical analysis. The average Z-score (Idiosyncratic Risk) in the UK financial institutions is 0.12 (0.05), the average board size is around 7 directors, whereas the proportion of non-executives on boards is about 70%. In addition, the CEO/Chairperson duality percentage shows a high level of compliance in separating the CEO position from the chairperson where only 5.3% of the sample firms are combining the two positions. In addition, our control variables have a mean (standard deviation) of; CEO ownership 0.02(0.06), firm size 13.32(2.01), financial leverage 0.13(0.17), market to book 0.95(0.66), and firm age 38.66 (37.80) years. These figures are consistent with some recently published UK studies in this area of research (e.g., Ozkan, 2007; Florackis & Ozkan, 2009; McNulty et al., 2013).

TABLE 2
Descriptive Statistics

	Mean	***St. Dev.***	**Min**	**Median**	**Max**
IDO	0.054	0.027	0.005	0.019	0.311
Z-Risk	0.1211	0.1430	0.010	0.078	0.851
BSIZE	7.268	2.977	2.000	6.000	22.000
NED	0.695	0.227	0.000	0.775	1.000
DUL	0.053	0.113	0.000	0.000	1.000
CEOWN	0.017	0.061	0.000	0.090	1.362
FSIZE	13.318	2.010	10.036	12.885	20.641
LEV	0.125	0.173	0.000	0.047	0.721
MTBV	0.954	0.665	-2.813	0.931	2.217
Age	38.660	37.804	2.000	20.000	139.000

Notes: Table 2 presents descriptive statistics among the variables of this study, where, (IDO) is idiosyncratic risk, (Z-risk) is insolvency risk, (BSIZE) is board size, (NED) is non-executive directors, and (DUL) is CEO/Chairperson duality. Control variables include CEO ownership (CEOWN), firm size (FSIZE), leverage (LEV), growth opportunity (MTBV), and firm age (AGE).

Table 3 presents the correlation matrix among the variables of this study. According to Gujarati (2003), high collinearity among variables may cause econometric problems in those situations where the correlation between the variables is 0.80 or higher. As evident in table 3 none of the values are high enough to cause any potential collinearity problems and it is therefore unlikely to influence our results.

TABLE 3

Correlation Matrix

	Z-Risk	*IDO*	*BSIZE*	*NED*	*DUL*	*AGE*	*LEV*	*FSIZE*	*MTBV*	*CEOWN*
Z-Risk	1.000									
IDO	0.256	1.000								
BSIZE	-0.067	0.138	1.000							
NED	-0.079	-0.280	-0.517	1.000						
DUL	0.004	0.033	0.033	-0.128	1.000					
AGE	-0.110	-0.160	-0.146	0.139	0.038	1.000				
LEV	0.042	0.183	0.124	-0.279	0.036	0.068	1.000			
FSIZE	-0.132	0.073	0.602	-0.272	0.011	0.003	0.142	1.000		
MTBV	0.029	0.022	0.320	-0.313	0.054	-0.164	-0.101	0.139	1.000	
CEOWN	0.037	0.227	0.065	-0.143	0.148	-0.044	0.088	0.004	0.217	1.000

Notes: Table 3 presents correlation matrix among the variables of this study, where, Z-Risk is insolvency risk, (IDO) is idiosyncratic risk, (BSIZE) is board size, (NED) is non-executive directors, and (DUL) is CEO/Chairperson duality. Control variables include firm age (AGE), leverage (LEV), firm size (FSIZE), growth opportunity (MTBV), and CEO ownership (CEOWN).

Table 4 provides the evolution of UK board structure over the 10 years sample period (2003-2012). The noticeable increase in the proportion of non-executive directors implies the compliance of UK financial institutions with the recent corporate governance recommendations. The figures also indicate that the majority of the sample firms move towards the non-duality of CEO and chairperson on their boards. Table 4 also describes that on average there are 7 directors serving on the financial institutions' boards whereas the reported figures also indicate a decrease in board size from 9.5 in 2003 to 6.6 in 2012.

TABLE 4
Evolution of UK Board Structure

Mean (Standard Deviation)											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**All Years**
NED	0.57	0.62	0.75	0.80	0.80	0.82	0.83	0.84	0.85	0.87	0.80
	(0.17)	(0.21)	(0.24)	(0.23)	(0.23)	(0.22)	(0.22)	(0.20)	(0.20)	(0.19)	(0.23)
DUL	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	(0.10)	(0.10)	(0.14)	(0.11)	(0.12)	(0.13)	(0.11)	(0.09)	(0.09)	(0.10)	(0.11)
BSIZE	9.50	9.02	7.80	7.25	7.13	6.93	6.77	6.84	6.88	6.61	7.27
	(3.20)	(3.16)	(3.17)	(3.09)	(2.93)	(2.76)	(2.63)	(2.71)	(2.82)	(2.58)	(2.98)

Notes: Table 4 reports the mean and (standard deviation) for the percentage of non-executive directors (NED), CEO/Chairperson duality (DUL), and board size (BSIZE) over the sample period.

Table 5 (Panel A) shows that the average number of directors on banks' boards is 14.39. This is larger in comparison to other sub-sectors. However, financial firms are more complex and larger in size where the bigger board is generally expected. In addition, there is evidence in the existing literature which suggests a positive relationship between board size and complexity of the firms (Boone et al., 2007; Linck et al., 2008; Raheja, 2005). A noticeable statistics in Table 5 shows that even though financial services has the smallest board size containing around six directors, the majority of those directors are independent with an average figure of around 76%, which is the highest in the whole of financial subsectors. Financial services firms also have the lowest CEO/Chairperson duality percentage, which means that the majority of these firms separate the two roles.

Similarly, figures in Table 5 (Panel B) indicate that larger firms have larger boards where the mean differences are statistically significant at the 1% level ($p<0.01$). This is consistent with prior published studies in this area of research, which suggest that firms' complexity would require more directors on their corporate boards (see e.g., Boone et al., 2007; Coles et al., 2008). Furthermore, small firms in the financial sector are keeping more non-executive directors on their boards whereas the average CEO/Chairperson duality position is higher in large firms.

TABLE 5
Industry Classification and Means Differences for the Board Structure Variables

Panel A			
Industry	***BSIZE***	***NED***	***DUL***
Banks	14.39 (2.96)	68% (9%)	0.7% (0.20%)
Insurance Firms	10.05 (2.52)	62% (11%)	4.0% (20%)
Financial Service Firms	6.33 (2.37)	76% (21%)	0.6% (8%)
Real Estate Firms	7.77 (2.28)	65% (20%)	2.0% (14%)
Panel B			
	Large firms	**Small firms**	***t-statistics***
BSIZE	8.722	5.650	(25.33)***
NED	0.728	0.862	(-11.94)***
DUL	0.014	0.004	(2.0036)**

Notes: Table 5, Panel A reports the mean (standard deviation) for board size (BSIZE), non-executive directors (NED) and CEO/Chairperson duality (DUL) for each industry. Panel B shows, the mean differences of board size (BSIZE), non-executive directors (NED), and CEO/Chairperson duality (DUL) between large and small firms. Firms are sorted according to the market value: firms above the median of market value are classified as large firms whereas those below the median are classified as small firms.

Table 6 reports the results from the estimation of our model. The findings indicate that board size is insignificant under all risk measures. Accordingly, we reject $\boldsymbol{H_1}$ which describes a negative relationship between board size and corporate risk taking, which may be attributed to the number of directors on boards of the financial institutions. In our sample, the average board size for banks, insurance companies, real estate, and financial services companies is 14.39, 10.5, 7.74 and 6.3, respectively. In this regard, evidence in the existing literature suggests that when board size exceeds seven directors then due to communication and coordination problems in larger boards it usually becomes ineffective (Jensen 1993). Our finding regarding board size is consistent with that of previously published studies in other countries (see e.g., Lewellyn & Muller-Kahle, 2012, in the US). The insignificant effect is also consistent with Tao and Hutchinson (2013) who examine the Australian financial sector and report insignificant relationship between board size and corporate risk taking in Australia.

With respect to UK studies, this insignificant effect is inconsistent with McNulty et al. (2013) and Gonzalez and André (2014). While McNulty et al. (2013) report a negative relationship between board size and corporate risk taking in the UK largest non-financial companies, Gonzalez and André (2014) show a positive association between board size and corporate risk taking in the UK. The contrasting results may be due the endogeneity issues because

these two studies have not accounted for of all the three forms of endogeneity in their analysis.

Table 6 indicates a negative relationship between the proportion of non-executive directors on the board under all risk measures which provide support for our hypothesis $\boldsymbol{H_2}$ which states a negative relationship between board independence and corporate risk taking. The negative effect of non-executive directors on risk taking is consistent with the reputation hypothesis, suggesting that NEDs are concerned about their reputation (Fama, 1980; Fama & Jensen, 1983). As a result, selecting less risky investments might be approved for avoiding exposing the firm to higher risk that in turn might increase the likelihood of insolvency. Another explanation for the negative effect of board independence on risk taking might be related to (i) the compliance of directors with government regulations (Pathan, 2009); and, (ii) the restricted monitoring of non-executive directors when information is limited (Boone et al., 2007; Coles et al., 2008; Raheja, 2005). These results are consistent with the findings of prior empirical research papers in this area of research (Brick & Chidambaran, 2008; Gonzalez & André, 2014; Pathan, 2009).

The effect of CEO power is also negative and significant under all risk measures. These findings reveal that combining the position of CEO and chairperson of the board reduces firm's risk. This negative effect leads us to support $\boldsymbol{H_3}$ which states a negative relationship between CEO/Chairperson duality and corporate risk taking. Furthermore, the negative relationship provides support to the agency theory assumptions where managers are assumed to be more risk averse due to reputation and employment risk (Amihud & Lev, 1981; Eisenhardt, 1989; Jensen & Meckling, 1976). This finding is consistent with Kim and Buchanan (2008) and Pathan (2009), who studied the US market in their research projects.

In addition, it is also well documented in the existing literature that taking more debt leads to higher risk (e.g., Erkens et al., 2012; Nakano & Nguyen, 2012). Our results are therefore consistent with previous literature on the relationship between high leverage and risk. Similarly, older firms have less performance variability and can thus avoid risk (Adams et al., 2005; Lewellyn & Muller-Kahle, 2012). With respect to firms' age and the ratio of market to book value we find a negative and significant estimator for all risk measures. This is also consistent with previously published studies in this area of research (e.g., Hagendorff and Vallascas, 2011). Table 6 also indicates that lags of risk measures are significant which justify their inclusions in our model specification. Moreover, the specification tests confirm validity of the application of system-GMM in this research, which show the robustness of our

model estimators. In this regard, Wintoki et al. (2012) argue that serial correlation might exist in the first differences AR (1), but there should be no serial correlation in the second differences AR (2). In light of this, our results indicate no serial correlation in the second differences. Furthermore, the results of Hansen test of over-identification support that the instruments we used in this study are valid. The last test is differences in Hansen test of over-identification, which indicates the exogeneity of the instruments used in level equations. The p-values for this test pass and thus suggest that the instruments we used in this study are exogenous.[4]

TABLE 6
The Effect of Board Structure on Corporate Risk Taking

Dependent variable	***(1)*** ***Z-RISK***	***(2)*** ***IDO Risk***	***(3)*** ***Adj-Z-Risk***	***(4)*** ***Adj- IDO***
Ln(BSize)	0.001	-0.000	-0.006	0.018
	(0.835)	(0.996)	(0.654)	(0.208)
NED	-0.010*	-0.083***	-0.093***	-0.090***
	(0.081)	(0.001)	(0.003)	(0.006)
DUL	-0.061**	-0.030**	-0.043**	-0.055***
	(0.041)	(0.016)	(0.042)	(0.006)
LEV	0 .017*	0 .014	0 .014**	0.020*
	(0.052)	(0.595)	(0.035)	(0.090)
Age	-0.000***	-0.000**	-0.070***	-0.007**
	(0.009)	(0.022)	(0.001)	(0.035)
MTBV	-0.006***	-0.015**	-0.086**	-0.013**
	(0.007)	(0.040)	(0.020)	(0.023)
CEOWN	0.006	0.060	0.124	0.172**
	(0.466)	(0.471)	(0.312)	(0.023)
FSize	0.000	-0.002	-0.054	-0.005
	(0.651)	(0.358)	(0.721)	(0.147)
$Risk_{(t-1)}$	1.203***	0.274***	0.288***	0.141***
	(0.000)	(0.000)	(0.000)	(0.000)
$Risk_{(t-2)}$	-0.332***		-0.245***	
	(0.000)		(0.000)	
Constant	0.016	0.115***	0.091	0.034**
	(0.128)	(0.006)	(0.126)	(0.015)
AR(1) test (p-value)	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.335	0.455	0.455	0.563
Hansen test of over-identification (p-value)	0.130	0.227	0.227	0.368
Diff-in-Hansen tests of exogeneity (p-value)	0.438	0.268	0.268	0.299

Notes: Table 6 presents results of the dynamic panel generalized method of moments estimator using Z- risk, industry adjusted Z-risk, idiosyncratic risk, and market adjusted idiosyncratic risk, as proxies for corporate risk. *P-values* are reported in parentheses. All t-statistics are based on robust standard errors. ***; **; * represent significance at the 1%, 5% and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. Hansen test of over-identification is under the null that all instruments are valid. Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous. See table 1 for variables definitions and measurements.

[4] As a comparative analysis, we repeated all our analysis by using a sample of UK non-financial firms. The results for the sample of our non-financial companies are largely similar to those of the financial sector. For reason of space, results of the non-financial firms are not reported in the paper. These results are however, available from the authors upon request.

4.1 Controlling for the Risk Committee

In order to test the robustness of our results we replicated all the above regressions, where we also controlled for the existence of a risk committee on corporate boards. Including risk committee as a control variable stems from the important role of this committee with respect to the decisions related to risk taking by the board of directors (Klein, 2002). We include a dummy variable which is equal to one if the firm has a risk committee and zero otherwise. The information on risk committee was directly extracted from the BoardEx database. Table 7 reports the findings which indicate that the results on board structure variables remained similar. One noticeable finding in these analyses is that the coefficient on risk committee is positive and significant for all risk measures. There could be two plausible explanations for these findings. First, the existence of a risk committee is likely to improve the effectiveness of firms because risk committees play an important oversight role that reduces the conflict of interest between managers and the shareholders. As a result, managers are expected to start acting in the interest of shareholders. This, in turn, induces the managers to be less risk-averse and take on more risk in order to increase shareholders' wealth. Second, as risk committees contain experts in the field, the corresponding firm would understand the benefits of risk taking from a strategic point of view. Those organisations will therefore fully understand the key risks and related business objectives and would be willing to take the necessary risk (rather than excessive risk) in line with their financial strategy. We therefore believe that due to these characteristics, a positive association is observed between risk committee and all risk measures in this study. These findings thus specify the significant role of risk committees on the corporate boards of financial firms and support the regulation about the existence of risk committees in financial institutions.

TABLE 7

The Effect of Board Structure on Corporate Risk Measures including Risk Committee

Dependent variable	***Z-RISK***	***IDO Risk***	***Adj-Z-Risk***	***Adj- IDO***
Ln(BSize)	0.005	-0.001	-0.004	0.019
	(0.761)	(0.923)	(0.563)	(0.411)
NED	-0.012*	-0.079***	-0.071***	-0.120***
	(0.091)	(0.000)	(0.005)	(0.009)
DUL	-0.072**	-0.028**	-0.027**	-0.021***
	(0.031)	(0.021)	(0.030)	(0.001)
LEV	0 .019*	0.023	0 .017**	0.007*
	(0.051)	(0.239)	(0.033)	(0.008)
Age	-0.006***	-0.003**	-0.003***	-0.009**
	(0.004)	(0.021)	(0.001)	(0.035)
MTBV	-0.008***	-0.015**	-0.088**	-0.013**
	(0.003)	(0.046)	(0.030)	(0.023)
CEOWN	0.007	0.042	0.125	0.052**
	(0.342)	(0.629)	(0.312)	(0.023)
FSize	0.000	-0.004	-0.054	-0.002
	(0.761)	(0.149)	(0.725)	(0.122)
RC	0.021*	0.017**	0.034*	0.042**
	(0.098)	(0.016)	(0.074)	(0.022)
$Risk_{(t-1)}$	1.205***	0.274 ***	0.281***	0.141***
	(0.000)	(0.000)	(0.000)	(0.000)
$Risk_{(t-2)}$	-0.330***		-0.242***	
	(0.000)		(0.000)	
Constant	0.018	0.120**	0.051	0.036**
	(0.129)	(0.023)	(0.226)	(0.015)
AR(1) test (p-value)	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.336	0.356	0.461	0.477
Hansen test of over-identification (p-value)	0.127	0.281	0.291	0.287
Diff-in-Hansen tests of exogeneity (p-value)	0.389	0.311	0.293	0.233

Notes: Table 7 presents the results of the dynamic panel generalized method of moments estimator using Z- risk, industry adjusted Z-risk, idiosyncratic risk, and market adjusted idiosyncratic risk as proxies for corporate risk after including risk committee (RC) in the model. *P-values* are reported in parentheses. All t-statistics are based on robust standard errors. ***; **; * represent significance at the 1%, 5% and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. Hansen test of over-identification is under the null that all instruments are valid. Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous. See table 1 for variables definitions and measurements.

5. CONCLUSION AND IMPLICATIONS

The board of directors is considered to be the main internal governance mechanism in modern corporations. This study examines the link between board structure and corporate risk taking in the UK financial sector. It is important to note that most of the previously published studies in this area use only banks in their sample (see for example, Pathan, 2009), however, for conducting more robust analyses we include all financial institutions in our sample. The outcome of our analyses shows board structure as an important determinant of

idiosyncratic risk. Our findings also indicate that more independent boards would take less corporate risk which is consistent with the reputation and monitoring hypotheses (Fama, 1980; Fama & Jensen, 1983; Raheja, 2005). The results further indicate that combining the positions of CEO and chairperson of the board has a negative effect on corporate risk taking (Kim & Buchanan 2008; Pathan 2009). However, no significant effect of the board size on corporate risk taking was found in the UK financial firms.

The findings of this study thus offer the theoretical rationale of how the board size, independence and CEO/chairperson duality could determine corporate risk taking in the UK financial sector. We argue that due to the importance of risk taking and risk management by financial firms, this study contributes to the existing literature in a number of ways. First, the recent financial crisis originated from the financial sector which resulted in the collapse of several financial institutions. Due to the significant role of the financial sector and the multinational operations of large financial institutions, the crisis had severely affected all industrial sectors worldwide. Investigating the role of board structure in corporate risk taking in the financial sector is therefore a timely and worthwhile contribution to the existing literature. Second, we not only consider all firms in the financial sector but also give due consideration to the endogeneity problem in our empirical analyses through the use and application of the dynamic panel generalized method of moments estimator (system-GMM), and argue that our results are robust to the endogeneity issues. Third, the inclusion of risk committee in our analysis provides further insights into the oversight role of this committee in financial institutions.

On the issue of corporate governance regulation and firms' risk taking this study has several important implications in the UK and other countries. As this study covers recommendations of the UK corporate governance code (2010) on the role of corporate boards in managing firms' risk, the findings of this study would be relevant to regulatory bodies in their work in establishing and further improving future corporate governance regulations. We argue that in the aftermath of the recent financial crisis and the subsequent calls for strengthening the corporate governance mechanisms of financial firms, provision of evidence on the effects of board composition on corporate risk taking in financial firms is an important contribution for the regulators in different countries. These findings will thus help in strengthening future corporate governance regulations not only in the UK but also in other countries and will be useful in safeguarding against any such events in the future.

Our findings in relation to the number of directors on boards, proportion of independent non-executive directors on boards, CEO/chairperson duality, and existence of a risk committee in corporate boards provide useful insights into bolstering corporate governance structures. In addition, by taking all sub-sectors of the financial sector in our sample we argue that our analysis covers the whole of the financial sector and has implications for not only banks but also all other financial institutions. Considering the role and functions of the financial system, it is evident that financial firms not only provide financial services to the consumers, financial, non-financial, and public sector organisations, but also to the whole of the world economy, and thus play a significant role in our society. We therefore argue that the evidence presented in this research on the governance structure of financial firms, the implications of this study are not only relevant to financial firms and the financial system but also to consumers, organisations in all sectors, and the global economy as a whole.

The findings of this research support the assertion that concentration of powers in CEO/chairperson leads to opportunistic managerial behaviour resulting in increasing the risk-averse behaviour of managers. The separation of CEO and chairperson roles could therefore ensure that interests of managers are aligned with those of the shareholders in inducing managers to take actions that would result in maximizing shareholders' wealth. Similarly, our results also favour the inclusion of a risk committee in the board structures as it appears to reduce the risk-aversion behaviour of managers. Finally, in terms of research methods, controlling for the effects of endogeneity is regarded as a very important factor in corporate governance research in recent years. In relation to this, the findings of this study provide support for the application of system-GMM in future corporate governance studies.

Despite its contributions this study has limitations. First, it covers the role of board size, board independence and CEO and chairperson duality in managing risk in financial firms. The study also controls for the existence of a risk committee in corporate boards in the sample firms. However, other board characteristics, such as, directors' educational level, ethnicity, key shareholdings in other companies, and owners' identity, are not covered in this investigation. Future studies could extend our analyses by including these and other personal characteristics of directors to provide additional useful insights to this line of literature. Second, extending the sample period to two or three decades would have provided further strengths to the findings and future corporate governance regulations. Finally, we have adopted quantitative research methods in this research; however, examining the perceptions of financial firms' managers and directors through the application of qualitative methods

could provide interesting and in-depth insights to our understanding of the link between internal corporate governance mechanism and risk taking in financial firms. All these avenues are therefore left to future research.

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