

Board Composition and Voluntary Risk Disclosure During Uncertainty

Abstract

This study examines the relationship between board composition and voluntary risk disclosure during uncertainty for a sample of UK listed companies. A strand of the disclosure literature focusing on the impact of the board on corporate disclosure argues that board composition influences the extent and quality of corporate disclosure, but they have largely used data from stable periods and rarely on risk disclosure. Instead, using agency theory, we examine the impact of board composition on risk disclosure during corporate uncertainty for a sample of UK listed companies for the period 2006-2015. We used content analysis to derive our measure of risk disclosure and measure board composition based on its size, independence, meeting frequency and gender diversity. Our regression analyses controlled for the extent of firms' agency costs, firm risk level and the impact of mandatory risk disclosure regulation amongst other control variables. Consistent with our hypotheses, we find that board size and board independence are positively associated with firms' risk disclosure during uncertainty but board meeting frequency and gender diversity seem inconsequential for risk disclosure. Firms' risk disclosure is positively associated with risk level and mandatory risk disclosure. Our results are robust to alternative model specifications and endogeneity concerns. We highlight the implications of our findings for management practice and regulations.

Keywords: Risk disclosure; board composition; agency theory; uncertainty; UK.

Introduction

This study examines the relationship between board composition and voluntary risk disclosure during uncertainty for a sample of UK listed companies. A significant body of literature exists on the effectiveness of the board in corporate monitoring. A strand of this literature focusing on the impact of the board on corporate disclosure argues that board composition influences the extent and quality of corporate disclosure (Yekini et al., 2017; Mangena et al., 2016). Although extant risk disclosure studies have explored risk disclosure quality (Beretta and Bozzolan 2004; Miihkinen, 2012), risk disclosure orientations e.g. forward looking vs. historical (Dobler et al., 2011), good vs. bad news (Linsley and Shrides, 2006), the role of the board in risk disclosure during uncertainty is under-researched (Ntim et al., 2013). Yet, Gul and Leung (2004) note that firms' disclosure policy emanates from the board whilst Abraham and Cox (2007:231) argue that 'the annual report is prepared by the board, so that the governance arrangements of the board of directors can be expected to influence disclosure policy'. Despite these, there is limited studies on the impact of the board on risk disclosure during uncertainty. This study addresses this gap by providing empirical evidence on the relationship between board composition and the extent of voluntary risk disclosure during uncertainty.

Consistent with Solomon et al. (2000: 449), this paper defines risk as the 'uncertainty associated with both a potential gain or loss'. This definition implicitly recognises that risk relates to current and future uncertain events that could affect the achievement of a company's objective (Ntim et al., 2013). Furthermore, the study considers risk in its broadest sense to encompass all the types of risks a company faces, broadly categorised into financial and non-financial risks¹. There are several reasons to expect that corporate boards could affect corporate

¹ Consistent with previous studies (Linsley and Shrides, 2006; Ntim et al., 2013), financial risk is any type of risk associated with financing, including credit risk, liquidity risk, asset-backed risk, foreign investment risk, equity risk, foreign exchange risk, interest rate risk, market risk. Non-financial risks include operational and business

risk disclosure. Firstly, board of directors as the custodian of a company has statutory oversight functions on the management, arising from the Companies Act (2006) and the listing requirements for listed companies. These functions include the disclosure of appropriate level of information that reflects the activities, associated risks and performance of the company to its various stakeholders (Turnbull Report, 1999). Extant studies have shown that investors are interested in knowing about the risks associated with their investment decisions and this is crucial in their expected return on investment and for risk diversification (Abraham and Cox, 2007; Linsley and Shrivess, 2006; Hermanson, 2000). Consequently, it is plausible to expect that the board will be actively involved in the disclosure of appropriate level of information that allows current and potential investors to build a reasonable expectation of the likely risks and rewards associated with their investments.

Secondly, many stakeholders look up to corporate boards to provide confidence and assurance especially during period of uncertainty such as the financial crisis. On this point, Francis et al. (2012) argue that corporate boards are one of the most important internal corporate governance mechanisms in a firm to protect stakeholders' interests through their oversight on management. These oversight functions are more important during period of uncertainty due to greater firm exposure (Ahmed et al., 2019; Erkens et al., 2012). Ahmed et al. (2019) show that directors' previous crisis experience is crucial for firms' outcomes during the financial crisis. Similarly, Hermalin and Weisbach (1998) suggest that boards are more independent, and management negotiating power was weaker during downturn, meaning that boards have higher monitoring roles during period of uncertainty. Hillman et al. (2000)

continuity risks. Operating risk could lead to increase or decrease in operational capacity but not the interruption of business activity. Risk is categorised as operational risk if it affects product cycle, health and safety, environment, customer satisfaction, business performance. Risk that could cause product/service failure and brand name erosion is classified as business continuity risk. Business continuity risk can lead to the temporary or and permanent interruption in business activity. This could be the closure of a segment, a plant or associated facilities.

reinforce this point, suggesting that firms change the composition of their board during uncertainty such as moving from regulated to unregulated market structure. They further note that “environmental jolts such as deregulation change the nature of the interdependencies and resource needs faced by the firm, thus altering the needs with respect to the extra-governance roles of directors” (Hillman et al., 2000, p. 252).

However, whilst most of the boards’ oversight functions are not observable, their corporate communication functions can be understood through their disclosure practices both in terms of the mandatory and voluntary disclosures². Therefore, the recent financial crisis, which many authors have described as unprecedented in the recent global financial history (Erkens et al., 2012; Gupta et al., 2013; Francis et al., 2012), presents rare opportunities to assess the effectiveness of corporate boards in dealing with corporate uncertainty through their impact on corporate risk disclosure. Moreover, most of the existing studies on the effects of board composition on risk disclosure are based on data before the financial crisis. The few studies (Allini et al., 2016; Elshandidy and Neri, 2015; Martikainen et al., 2015) that have used data covering the financial crisis period have different motivations, and did not explicitly address the role of the board in risk disclosure during uncertainty. Furthermore, unlike Elshandidy and Neri (2015), the analysis in this paper is based on a sample of UK FTSE 100 companies covering 2006-2015. In this sense, the paper focuses on 2007-2010 as the peak of the crisis period (Erkens et al., 2012; Gupta et al., 2013; Ahmed et al., 2019) and also explores the post crisis period.

This paper uses agency theory to generate fresh evidence on the impact of corporate boards on risk disclosure during uncertainty. We measure risk disclosures based on the content

² We defined mandatory risk disclosures as information that firms exhibit within or in excess of but still related to, the risk regulation under Intentional Financial Reporting Standard and UK Generally Accepted Accounting Principles, and voluntary risk disclosure as any other information about risk appearing in the narrative sections of corporate annual reports (Elshandidy and Neri, 2015: 332).

analysis of the narrative risk reports in the Business Review section of the annual reports. We use a series of panel regression models with risk disclosure as our dependent variable and board composition (board size, independence, meeting frequency and gender diversity) as our key independent variable. Our models controlled for firms' underlying risk levels, the extent of agency costs in a firm and the potential impact of mandatory risk disclosure regulation on the extent of firms' voluntary risk disclosure. Since boards in Anglo-Saxon corporations function through board level committees, we also controlled for the impacts of these committees on risk disclosure. We subject our findings to a series of robustness checks and use the generalised method of moments (GMM) approach to address the potential endogeneity concerns in the study (Larcker and Rusticus, 2010; Larcker and Rusticus, 2007).

To preview our main results, findings from our regressions support our theoretical positions and our main hypotheses. Specifically, we find statistically significant positive relationship between board size and the extent of corporate voluntary risk disclosure. Agency theory considers board size as a fundamental source of boards' resource that is important in mitigating agency problems especially during uncertainty. This is because it reflects boards' monitoring capacity and the ability to facilitate access to important resources through crucial network and strategic advice. We also find statistically significant positive relationship between board independence and corporate voluntary risk disclosure. It seems that independent non-executive directors consider voluntary risk disclosure seriously and ensure that appropriate level of risk information is disclosed in the annual report. Our results show that both board gender diversity and board meeting frequency are not consistently associated with voluntary risk disclosure. We find that firms that report the use of mandatory risk disclosure are more likely to make voluntary risk disclosure. Finally, we report a number of findings that complement established results in respect of the control variables.

Our study makes several contributions to the literature. Firstly, we contribute directly to the emerging but less researched risk disclosure literature. Although both Elshandidy et al.'s (2018) and Tahat et al.'s (2019) reviews show that risk disclosure research has developed significantly over the past 20 years, yet they both agree that several aspects have enjoyed limited attention in the extant literature. Our study focuses on voluntary risk disclosure during periods of corporate uncertainty. Secondly, whilst previous studies have explored the role of the board in risk disclosure, limited studies have examined this in the context of corporate uncertainty such as the financial crisis. Our study provides clarity on the board composition features that are associated with corporate voluntary risk disclosure in this period. This advances previous studies (Barakat and Hussainey, 2013; Abraham and Cox, 2007) that have explored the role of the board in voluntary risk disclosure in stable periods.

Finally, although the UK shares many important similarities with the US, Guest (2008) argues that they are different in their corporate governance approaches, meaning that findings in the US markets are not necessarily applicable in the UK. Corporate governance approach in the UK is based on a number of core principles that place high expectations on board leadership in promoting corporate accountability and transparency (Cumming et al., 2017). This makes the boards' fiduciary duties more critical and thus the quality of board matters more in the UK setting. According to Guest (2008), the UK has a distinctive corporate governance arrangement from the US for example, in the "enforcement of directors' legal duties, board structure and, the role of institutional investors and the nature of corporate governance reforms" (p.52). Thus, this study contributes to the international context of the risk disclosure literature by providing new evidence on the impact of corporate boards on voluntary risk disclosure during uncertainty from a different context.

The rest of the study is presented in five sections. Section 2 presents the background to the study, focusing on the corporate governance and risk disclosure frameworks in the UK and an

international comparison of risk reporting frameworks. Section 3 presents the theory, previous studies and hypotheses development. Section 4 presents the data and the study design. Section 5 presents the results and section 6 discusses and concludes the study.

Corporate Governance (CG) and Risk Disclosure Framework in the UK

Corporate governance is now a significant mechanism for corporate control following a number of corporate misbehaviours at the turn of the century. Prior to this, the UK witnessed several corporate failures in the late 1980s to early 1990s including those of Polly Peck, BCCI and Barings bank which contributed to the formation of the Cadbury committee and the publication of the Cadbury report (1992). A succession of corporate governance reports followed the Cadbury report which together are now referred to as the UK's corporate governance code (Financial Reporting Council, 2018). The fundamental underlying feature of the UK's CG framework is its flexibility, and the 'comply or explain' principle aptly captures this (Shrives and Brennan, 2015; Arcot et al., 2010; Mallin et al., 2005). At the heart of this approach is the expectation that the market and especially investors can take a reasoned decision based on the disclosures by firms indicating their compliance or explanations of non-compliance with the corporate governance requirements (Shrives and Brennan, 2015; Arcot et al., 2010). This ostensibly implies that investors can consider their risk exposures in view of the disclosures by firms (Shrives and Brennan, 2015; Mallin et al., 2005). The code is emphatic about the centrality of information dissemination in an efficient capital market and expects the board leadership to engender a culture of transparent and honest reporting. This is crucial in preventing a repeat of the corporate misbehaviours that were the precursors to the development of the corporate governance arrangement in the first place (UKCG, 2018).

Internal controls, risk management and corporate risk disclosure

The Turnbull report (1999) is a formal attempt to provide an internal control and risk management framework in the UK (Zaman, 2001; Solomon et al., 2000). The report prescribes that, in determining a company's internal control policies, the board of directors should consider 'the nature and extent of the risks facing the company' and 'the extent and categories of risk which it regards as acceptable for the company to bear' (The Turnbull Report, 1999, para.17). Similarly, 'Principle 'O' of the UK's corporate governance code (2018:10) provides that:

"The board should establish procedures to manage risk, oversee the internal control framework, and determine the nature and extent of the principal risks the company is willing to take in order to achieve its long-term strategic objectives."

Provisions 28-31 of the same document contain further explanations of this principle by enumerating the roles of the board in respect of internal control and risk management. These include the annual review and reporting on the effectiveness of the firm's internal control procedures. Provision 29 notes that the annual review should cover all material controls including financial, operational and compliance control. These provisions reiterate boards' formal responsibilities for an effective internal control and risk management procedure, and reporting their effectiveness in the annual report. However, it did not provide any particular framework for such assessment and disclosure.

Hermanson (2000) addresses this concern in the US, broadly suggesting that various user groups find reporting on internal control and risk management useful for decision making. Solomon et al. (2000) in the context of the UK, surveyed institutional investors to explore their attitude to risk disclosure especially in relation to their investment portfolio decisions. The authors report that institutional investors find risk disclosure useful in their portfolio decision making. Recent studies have also come to a similar conclusion about the usefulness of internal

control and risk management information, and the demand for comprehensive, forward-looking useful information by various stakeholders, especially investors (Shrives and Brennan, 2015; Elshandidy and Neri, 2015; Mallin et al., 2005). Prior to these, in response to incessant corporate failures, there had been a considerable move in the early 1990s to mandate the disclosure of more narrative reporting that includes narrative risk disclosure through the proposed Operating and Financial Review (OFR).

The Accounting Standard Board (ASB) in the UK launched the OFR statements in 1993 and a revised version in 2003. Companies were required to disclose their principal risks and their approaches to mitigating them. The OFR was later replaced by a requirement for an enhanced 'Business Review' report by directors, backed by the Companies Act (2006). The Business Review section of the annual report remains the principal location for the disclosure of voluntary narrative risk information by listed firms and it is the disclosure contained in this section of the annual report that forms the main source of the dependent variable in this study. The content of the Business Review section is not fixed and firms can disclose as much information as they want in whatever format so long as it provides adequate information on the nature of the risks a firm faces and the approaches to mitigating them. Furthermore, there is no requirement for the content of the Business Review to be audited and the report is often signed off by the Chief Executive Officer of a firm. However, it is necessary to note that unlike voluntary risk disclosure, mandatory risk disclosure is shaped by national and international financial reporting bodies through their introduction and repeal of accounting reporting standards. Existing risk related accounting standards include IFRS7 on Financial Instrument Disclosure and IAS 37 on Provision, Contingent Liabilities and Contingent Assets amongst others. Mandatory risk disclosures are according to these reporting standards and are presented in the financial statements and in the notes to the accounts.

Risk Disclosure Frameworks in Different Contexts

International comparison of corporate risk reporting show important differences across significant risk reporting contexts. In this sense, three distinct approaches have been identified (Elshandidy et al., 2015). First, where risk disclosure is mandatory and auditors have to provide a positive assurance (i.e. audit opinion based on audit planning and procedures, that the disclosure is fairly and faithfully represented and that it does not contain deliberate material misstatement and error) on its content as is the case in Germany and Finland (Bozzolan and Miihkinen, forthcoming). Second, where voluntary risk disclosure is encouraged, as is the case in the UK (Elshandidy and Neri, 2015), and lastly where a combination of voluntary and mandatory risk disclosure approaches exist as is the case in the US and Japan (Campbell et al., 2014; Fukukawa and Kim, 2017; Elshandidy et al., 2018).

In Germany, risk reporting is backed by the GAS5 published by the German Accounting Standards Board (GASB) and auditor have to provide a positive assurance on its content. This standard deals specifically with risk reporting, providing guidance on risk reporting items and their descriptions. Although listed companies are expected to follow the International Financial Reporting Standards, they must comply with their national reporting standards where there is no specific reporting standard that addresses a reporting issue. In this sense, the GAS5 provides a specific risk reporting framework. Similarly, the Finnish Accounting Practice Board published a detailed standard on risk reporting in 2006 that Finnish listed companies must use to report their risk, covering the risk items, the locations and the extent of risk information that listed companies should provide. Companies were required to provide this disclosure in the ‘Operating and Financial Review’ section of the annual report and auditors have to provide positive assurance on its content.

However, the risk reporting requirements in the US is different because it combines both elements of mandatory and voluntary risk disclosures. Listed companies in the US must follow

the US GAAP in reporting risks in their financial statements and notes to the accounts. In addition to these, the Securities and Exchange Commission (SEC) published the Financial Reporting Release 48 (1997) that deals specifically with risk reporting relating to the use of financial instruments by listed companies. Similarly in 2005, it published the guidelines on ‘risk factor’ which listed firms must use to explain “the most significant factors that make the company speculative or risky” (Regulation S–K, Item 305(c), SEC 2005). These are in addition to the requirements of section 7A which requires firms to make quantitative and qualitative market risk disclosures. Furthermore, US firms are encouraged to provide their narrative risk disclosure in the Management Discussion & Analysis (MD & A) section. Companies can use this section to provide as much voluntary narrative risk disclosure as they want with considerable flexibility about the nature and extent of information provided (Campbell et al., 2014). Elshandidy et al. (2018) note that one of the unintended consequences of the risk disclosure framework in the US is the focus on mandatory risk disclosure research compared to other contexts such as the UK with more focus on voluntary risk disclosure. Our study examines the role of the board in voluntary risk reporting during corporate uncertainty in a unique context.

Theory, Previous Studies and Hypotheses Development

Agency theory, corporate governance and disclosure practices

Agency theory postulates that the separation of ownership and control of the firm creates conflict of interest amongst the contacting parties in the corporate environment (Jensen and Mecking, 1976). Information asymmetry arising from this separation exacerbates this conflict, leading to sub-optimal decisions and dysfunctional behaviours by management, thereby increasing firms’ agency costs. Corporate risk disclosure and governance mechanisms are important in mitigating agency costs by reducing information asymmetry and aligning

managements' interests closer to those of the shareholders (Abraham and Cox, 2007; Ntim et al., 2013)³.

The dimensions of corporate governance mechanisms have received substantial attention in the extant literature (Misangyi and Acharya, 2014; Ward et al., 2009; Eisenhardt, 1989) broadly identifying internal (e.g. board of directors) and external corporate (e.g. market for corporate control) governance mechanisms. A section of this literature focuses on whether the effectiveness of governance mechanisms should be considered individually or rather as a bundle of mechanisms (Misangyi and Acharya, 2014; Ward et al., 2009; Aguilera et al., 2008; Rediker and Seth, 1995). A related discourse raises the question regarding the complementarity or substitutability of governance mechanisms. Complementarity implies that governance mechanisms reinforce one another while substitutability refers to where they replace one another (Misangyi and Acharya, 2014). Rediker and Seth (1995: 86) were the first to raise the question about the 'bundles of governance mechanisms' in mitigating agency problem. They note how extant research seems to conceptualise corporate governance mechanisms working in resolving the "shareholder–manager agency problem independent of each other". Although as Aguilera et al. (2008) also note, governance mechanisms should function as a "system of interdependent elements" (p. 482).

Empirical evidence on the complementarity or substitutability of governance mechanisms is limited (Misangyi and Acharya, 2014). Studies (Hoitash et al., 2009; Hassan et al., 2017; Gul et al., 2011) have examined the interrelationship between the board and its ad hoc committees such as the audit, nomination and remuneration committees. In this sense, Hassan et al. (2017) report that audit committee's effectiveness substitutes for the board's oversight

³ Stakeholder theory, however, argues that other interests beyond just the shareholders are also important consideration in corporate decision making (Yekini et al., 2017; Ntim et al., 2013; Mangena et al., 2016). Whilst we recognize this perspective, we maintain that agency theory remains a very relevant theoretical framing to understanding corporate disclosure behaviour

functions. They argue that the board delegates part of its oversight functions to the board committees such as the audit and remuneration committees in a firm. Thus, whilst the entire board has overall responsibility for corporate oversight on management, board composition in Anglo-Saxon corporations enhances the active involvement of the board's committees.

Previous studies and hypotheses development

Board size and risk disclosure

The UK corporate governance code (2018) emphasises the importance of adequately resourced boards in terms of the number of directors and their skills, but also cautions against excessive multiple directorship (UKCG, 2018; Mallin et al., 2005). Agency theory considers board size to be important for board functions. It is important for board's monitoring functions and crucial for their advisory and oversight roles on management (Abraham and Cox, 2007; Ntim et al., 2013; Elshandidy et al., 2013). Availability of adequate number of directors could be immensely beneficial to the firm as it allows variety of skills and competences in dealing with the myriad of issues the firm may confront, including corporate disclosure.

However, large board size could be counterproductive as they could be bogged down due to size, and decision making may become sluggish due to inefficiency. Studies such as Song and Windram (2004) and Yermack (1996) argue that smaller boards are more effective because they allow faster decision making compared to large boards. Previous studies report mixed findings on the effects of board size on voluntary disclosure. For example, Elzahar and Hussainey (2012), Cheng and Courtenay (2006) find no association between board size and the level of risk disclosed. On the other hand, Mallin and Ow-Yong (2012) report positive relationship between board size and risk disclosure. Ntim et al. (2013) also report positive relationship in their study of risk disclosure by listed companies in South Africa. Based on our discussion above and the emphasis by the UK CG on board leadership and clear division of

board responsibilities, our theoretical expectation is that large board with the right balance of skills and resources would have significant positive impact on risk disclosures. Our first hypothesis is:

H₁: There is a positive relationship between board size and the volume of voluntary risk disclosure.

Board independence and risk disclosure

One of the principal recommendations of the UK corporate governance code (2018) is that corporate boards should contain an appropriate combination of executive and independent non-executive directors. This is to enhance the protection of the interest of the shareholders and to mitigate agency problem. Previous studies (Fama and Jensen, 1983; Yekini et al., 2015) argue that independent non-executive directors enhance corporate disclosure by ensuring the disclosure of value relevant and accurate information. Empirical findings on the relationship between risk disclosure and board independence is inconclusive. For example, Elzahar and Hussainey (2012); Abraham and Cox (2007); Allini et al. (2016) all report no relationship between board independence and the level of risk disclosure. However, other studies (Ntim et al., 2013; Martikainen et al., 2015) report positive relationship, arguing that independent boards enhance the disclosure of strategic and forward-looking information. Yet, Eng and Mak (2003) report a negative relationship between board independence and risk disclosure. Theoretically, we expect a positive relationship between board independence and risk disclosure because independent non-executive directors are better monitor of corporate actions. This is because although they are not involved in the daily running of the firm, they nonetheless bear legal responsibilities for its behaviours as part of the custodians of the firm. It is therefore also in their interest, for reputational reasons, that the company makes appropriate corporate disclosure (Fama and Jensen, 1983). Our second hypothesis is:

H₂: *There is a positive relationship between board independence and the volume of voluntary risk disclosure*

Board meeting frequency and risk disclosure

The UK corporate governance code (2018) emphasises commitment and the ability of independent non-executive directors to allocate sufficient time to the company in the discharge of their responsibilities. Board meeting frequency is indicative of its agility and the diligence in the board's discharge of its oversight functions on management (Vafeas, 1999; Yekini et al., 2017; Abbott et al., 2003). Although the code did not specify the number of meetings a board should have in a year, it requires that companies should disclose the frequency of their meetings. This includes information on the meetings of the board committees such as the audit, nomination and risk management committees. Frequent board meetings allow directors to provide guidance and essential advice on the content and strategic implications of corporate risk disclosure.

Empirical evidence on the relationship between board meeting frequency and risk disclosure is scanty and mainly indicates positive relationship. For example, Chen et al. (2006) in their study on the relationship between ownership, corporate governance and the incidence of fraud in Chinese listed companies report positive relationship between board meeting frequency and fraud risk. Similarly, Allegrini and Greco (2013) in their study on the effects of corporate governance on disclosure in Italian listed firms report a positive relationship between board meeting frequency and risk disclosure. Thus, efficient board indicated through frequent board meetings could be associated with increased corporate risk disclosure, leading to our third hypothesis below:

H3: *There is a positive relationship between board meeting frequency and the volume of voluntary risk disclosure*

Board gender diversity and risk disclosure

The UK's corporate governance code (2018) warns against groupthink and emphasises the importance of board diversity. The benefits of board diversity to the firm include enhanced creativity and the avoidance of group thinking which could be counter-productive (Gul et al., 2011; Ntim et al., 2013). However, its drawbacks may include reduced group cohesion and increased conflict of interests (Adams and Ferreira, 2009; Gul et al., 2011; Allini et al., 2016). Recent risk and gender difference literature reports findings on the relationship between gender and several issues in risks, including risk perception (Yordanova and Tarrazon, 2010), risk attitude (Sylvia et al., 2010), and risk type (Gustafsson, 1998). Existing evidence generally indicates the presence of gender effects on risk related issues. For example, Yordanova and Tarrazon (2010) find that women and men differ in their risk propensity, perception and behaviour. Sylvia et al. (2010) find that women take risk but in a more sensitive way than men in the context of probability of losses than gains. Regarding type of risks, Gustafsson (1998) notes that men think more about economic and financial risks while females think more about health and safety risks.

There are limited studies on the relationship between board gender diversity and risk disclosure and they report conflicting results. For example, Ntim et al. (2013) report a positive association, whilst Allini et al. (2016) find a negative relationship. The inconclusive nature of these findings precludes a definitive theoretical conjecture on the relationship between risk

disclosure and gender diversity on the board. Consequently, we formulate the non-directional hypothesis below:

H4: There is a relationship between board gender diversity and the volume of voluntary risk disclosures

Data and Research Design

Data

This study focuses on a sample of FTSE 100 companies for 2006-2015. Several studies (Erkens et al., 2012; Gupta et al., 2013; Francis et al., 2012) suggest that the period of the financial crisis is relatively unprecedented in scale and the uncertainty it evokes. Although opinions are divided on the timeline of the financial crisis, there is seemingly a consensus that it started in 2007/2008 and was at its peak by 2009/2010 (Ivashina and Scharfstein, 2010; Adelopo et al., 2018; Ntim et al., 2013). We therefore use these periods so as to tease out the impact of board composition on risk disclosure during this uncertainty. We use the FTSE100 index because it is representative of the spread of industries and the largest firms in the UK. The FTSE 100 is a market capitalisation weighted index that represents firms' market value and is ranked from 1-100 (Abraham and Cox, 2007). We classify the companies on the FTSE using the Industrial Classification Benchmark (ICB) structure and code index. We include the firms in the financial sector to provide opportunity for additional analysis. Our sample contains companies on the London Stock Exchange with relevant data from January 2006 till the end of 2015 which results in 74 non-financial firms and 17 financial firms. After all deductions due to missing data for the variables used in the study we have 840⁴ firm-year observations for our analysis.

⁴ We used different proportion of the total sample depending on the nature of the analysis. Each regression table indicates the total observation based on the output from the Econometric software used.

We hand collect data on corporate risk disclosure from the annual reports of the companies and measure the volume of risk disclosure based on the total number of voluntary risk disclosure sentences in the Business Review section of the annual report. We use this section because it is the only part of the annual report that is specifically devoted to narrative analysis and report of risks. We did not consider risk disclosure in the financial statements part of the annual reports because they are mandatory disclosure requirements (Elshandidy and Neri, 2015). We use the annual report as opposed to other avenues of corporate disclosure such as conference calls, earning releases, brochures etc. because it is the only statutorily required report and considered most reliable and often used source of information for most stakeholders of the firm including investors and analysts (Yekini et al., 2015; Yekini et al., 2017). We access firms' annual reports from their websites and collect data for the other variables in the study using FAME⁵. Table 1 below defines the variables and their sources.

We use content analysis to derive our dependent variable. Content analysis 'is a systematic and objective means of describing and quantifying phenomena' (Elo and Kyngas, 2008; 108). According to Krippendorff (2004:18) content analysis is "*for making replicable and valid inferences from texts ... to the contexts of their use*". A number of recent studies in accounting and finance (Yekini et al., 2015; Adelopo, 2011; Guthrie et al., 2004; Ntim et al., 2013) use content analysis in their empirical investigations to derive both the dependent and independent variables. Some studies use sentence (Hackston and Milne, 1996; Deegan et al., 2000), and others use word count (Yekini et al., 2015). We use sentence in this study because it provides a better sense of the analysis than word. We recognise the subjectivity inherent in content analysis irrespective of the mode of coding used. However, we follow Milne and Adler

⁵ FAME stands for Financial Analysis Made Easy is a database of financial and industry information for thousands of listed and private companies in the UK and Ireland <https://fame.bvdinfo.com/version-20161215/Home.serv?product=fameneo>

(1999)'s suggestions that maintaining very clear and tested decision rules and comparability over time lead to consistency in coding thereby improving accuracy and believability of the investigation (Yekini et al., 2015). Three experienced researchers did the coding over several months, and inter-coder scores calculated based on the method outlined in Krippendorff (1980, pp. 138–139) was over 85% which give some re-assurance of the validity of our approach. The next section presents further explanations on the measurements of the variables.

Variables measurement and regression model

Our main dependent variable is the natural log of the Total Disclosure Score (LNTDS). We categorise a sentence as risk information if it informs the reader about the existence of risk now or in the future or if it mentions risk management process. The use of the word “risk” does not have to appear in the sentence for it to be considered as a risk disclosure (Linsley and Shrivess 2006). We do not consider the length of a sentence in deciding whether it relates to risk or not, instead we are concerned only about the core meaning discernible from the sentence.

We disaggregate total risk into types, which were thought to be relevant to any firm, these were mainly financial and non-financial risks as previously defined (Linsley and Shrivess, 2006; Ntim et al., 2013). If a firm uses different words to classify its risks, we classify this disclosure, based on our experience, into the appropriate risk types. If a sentence discloses more than one category of risk, we classify it in the category where it had laid more emphasis (Linsley and Shrivess 2006). We control for the impact of risk disclosure regulations related to the use of IFRS7 by using a dummy variable that takes the value ‘1’ if a firm makes IFRS7 disclosure and 0 if otherwise. We present examples of firms’ risk disclosures in appendix 1 and provides further descriptions of the variables below after our model specification:

< Insert Table 1 about here >

Regression model

The study uses the panel random effect model specified below to test the hypotheses. It uses the Hausman and Breusch-Pagan Lagrange Multiplier tests to decide the appropriate model to rely on in the analyses. The Hausman test compares the coefficient estimates from the fixed and random effects models and assumes that in both models there is no correlation between the error term and any of the explanatory variables. Thus, in large samples, the estimates of the coefficients are consistent. When this assumption is violated, random effect estimates are no longer consistent whilst fixed effect estimates are, and converge to the true values of the parameters. Failure to reject the null hypothesis of no correlation between the error term and the explanatory variables therefore supports the use of the random effect model (Hill et al., 2012; Baltagi, 2012). In the model below:

$$y_{it} = \mu_i + \beta_e X'_{eit} + \beta_c X'_{cit} + \varepsilon_{it} \quad (1)$$

y_{it} is the dependent variable, representing risk disclosure of the i th firm at time t and the vectors X'_e , and X'_c represent our main explanatory and control variables respectively as defined in Table 1 above. ε_{it} represents the error term, with its standard assumptions (i.e. $E(\varepsilon_{it}) = 0$); $var(\varepsilon_{it}) = \sigma_{it}^2$). Where $\mu_i = \bar{\mu}_1 + u_i$, and $\bar{\mu}_1$ and u_i are the population mean, intercept and the random effect element in the model respectively. u_i has the same standard assumptions of the error term above. Hence the random effect model is restated in (2) as:

$$y_{it} = \bar{\mu}_1 + \beta_e X_{eit} + \beta_c X_{cit} + v_{it} \quad (2)$$

Where $v_{it} = u_i + \varepsilon_{it}$, and both error terms are not correlated with any of the explanatory variables. Our full model is stated below:

$$\begin{aligned}
RISK_{it} = & \beta_0 + \beta_1 BS_{it} + \beta_2 PNED_{it} + \beta_3 BM_{it} + \beta_4 PBODIV_{it} + \beta_5 LNLEV_{it} + \beta_6 CRATIO_{it} \\
& + \beta_7 SEC1_{it} + \beta_8 SEC2_{it} + \beta_9 AGC_{it} + \beta_{10} MDR_{it} + \beta_{11} TBQ_{it} + \beta_{12} ROA_{it} + \beta_{13} LNMCAP_{it} \\
& + \beta_{14} AGE_{it} + \beta_{15} ACM_{it} + \beta_{16} ACS_{it} + \beta_{17} RCS_{it} + \beta_{18} RCM_{it} + \varepsilon_{it}
\end{aligned} \tag{3}$$

Where RISK is the dependent variable which is natural log of the Total Disclosure Score (LNTDS). TDS is the sum of the financial and non-financial voluntary narrative risk disclosures as previously defined. BS is the number of directors on the board in a year. PNED is the percentage of independent non-executive directors to the total number of directors on the board. BM is the number of board meetings in a year. PBODIV is the percentage of females on the board of directors in a year. LNLEV is leverage, it is used to proxy for firm's financing risk level and it is defined as the natural log of total long-term debt divided by equity. CRATIO is the ratio of current assets to current liabilities and it is used to proxy for firm's liquidity risk. SEC1 is another measure of firm's risk level and it is a dummy variable equal to 1 if a firm is in the financial sector and 0 if otherwise. SEC2 is our fourth measure of risk level and it is a dummy variable equal to 1 if a firm is in a high impact sector and 0 otherwise. Following Ben-Amar and McIlkenny (2015) and Heras-Saizarbitoria et al. (2015), high impact sectors include Mining, Aerospace and Defence, Oil & Gas, Tobacco, Pharmaceutical, Construction, Chemical, Engineering and manufacturing, and packaging. We used the ratio of total turnover to total asset as a proxy for firms' agency costs (AGC) (Ang et al., 2000; Rashid, 2015). This measure captures managers' efficiency in assets utilization. We used a period lagged value of this variable (AGC_{t-1}) to capture boards' agency costs monitoring engagement. We also construct sub samples where firms with high agency costs (above the median value) take the value '1' and low agency costs firms (below the median value) take the value '0'. MDR represents mandatory disclosure regulation and it is a dummy variable, equal to 1 if a firm

reports the use of IFRS7 on financial instruments and 0 if otherwise. TBQ is Tobin's Q and it is a market-based measure of performance, it is calculated as the ratio of market value of equities to net worth, where net worth is given by total assets minus liabilities. ROA is accounting based measure of performance and it is the return on total assets given as profit after tax divided by total assets. LNMCAP is the measure of firm size and it is the log of the value of total shares in issue multiply by share price at year end. AGE is firm age defined as number of years since listed on the Stock Exchange. ACM is the total number of audit committee meetings in a year. ACS is the size of the audit committee, measured as the number of independent non-executive directors on the committee. RCS is the size of the risk committee, measured as the number of independent non-executive directors on the committee, and RCM is the number risk committee meetings in a year. The next section presents the empirical results.

Empirical results

Descriptive statistics

Table 2 below presents the descriptive statistics for TDS as well as the two risk categories: Financial risk (FR) and Non-Financial Risks for each of the ten year sample period. We winsorize all the independent variables suspected of having high extreme values at 0.01 to reduce the effect of the potential outliers (these were mainly data for leverage and current ratio before they were used in the calculations of these variables), and use log transformation for TDS, size and leverage. The distribution of TDS ranged from a minimum of 0.00 to a maximum of 282.00 with a mean of 41.31. The results are similar to the 45.00 sentences reported in Wang and Hussainey (2013) but different to the 78 sentences reported by Linsley and Shrivs (2006) but they looked at the narrative in the entire annual report. The results also show that the disclosure increased continuously over time. For example, the mean for the TDS was 27.93,

41.52, 44.53 and 46.64 in 2006, 2009, 2012 and 2015 respectively. We find similar trend in the two risk categories. For instance, the Financial Risk (FR) ranges from minimum of 0.00 to maximum of 241.00 with an average of 24.39. The average FR was 17.15 in 2006 and it increased to 26.42 in 2009 but declined to 25.37 by 2015. The Non-Financial Risks increased from 10.68 to 15.11 from 2006 to 2009 and to 21.34 in 2015.

<Insert Table 2 about here>

Table 3 below reports the descriptive statistics for both independent and control variables used in the study. Board size ranged between 5 and 21 with an average of 11 directors on the board. The board on average comprised of 67% independent non-executive directors and this is higher compared to the findings reported in other UK based studies such as Wang and Hussainey (2013) who reported 51% of board independence. The difference in their sample composition which focuses on the FTSE All share index may account for their lower value for the independent non-executive directors. On average, boards met 9 times in a year. Gender diversity- PBODIV- ranged from 0% to 50% with an average of 16% female directors on the board. The values for other variables including LNLEV, CRATIO, TBQ, ROA, LNMCP, AGE, ACM, ACS, RCS and RCM show some variations making regression analysis suitable.

<Insert Table 3 about here>

Correlation analysis

Table 4 presents the correlation matrix for the independent variables in the study. The table indicates a generally low correlation between the independent variables which is an indication that multicollinearity is unlikely to adversely affect the results. We also compute the variance inflation factor (VIF). According to Hair et al. (1995) a VIF score of 10 or above may suggest

the presence of multicollinearity. Our average VIF was 2.34 and none of the variables have VIF higher than 4.06(un-tabulated).

<Insert Table 4 about here>

Multivariate regression analyses

Table 5 below presents the main results of our stepwise regressions. Our dependent variable in all the regressions in Table 5 is LNTDS. Each column represents a regression model based on the full model in equation 3 above with modifications reflected in the variables reported in each column. We started with a simple model on board composition and risk level variables (i.e. Board composition and risk level). We followed this by exploring the impacts of agency costs and mandatory risk disclosure regulations, and then the full model. For each model in Table 5, we present the regression results for the peak of the crisis (2007-2010) and for the entire sample (2006-2015) and include the post-crisis in Column 3. Each table reports the coefficients and the t-statistics in parentheses. We use year and industry dummies in all the regressions. Our industry dummies are for sectors outside those categorized as financial (SEC1) and high impact sectors (SEC2). The adjusted R^2 ranged from 21% to 84%. The addition of new variables into the models led to improvements in the adjusted R^2 justifying their inclusion. F-statistics in all the models are statistically significant at 1% level, indicating that the models are suitable for testing the hypotheses in the study. We use the full models in Table 5 to test the study hypotheses and it is the basis of the explanations provided below.

Board composition (size, independence, meeting frequency and gender diversity) and risk disclosures

The regression outputs in Table 5 show consistent results in the relationship between the board composition variables and risk disclosure. Board size shows a statistically significant positive relationship with voluntary risk disclosure in all the regressions, indicating that larger boards are associated with more risk disclosure. These are significant at 5% level. Similarly, the table shows a statistically significant positive relationship between board independence and voluntary risk disclosure. This implies that increase in the number of independent non-executive directors on the board is associated with increase in voluntary risk disclosure. This relationship is statistically significant at 5% level, except for the entire period where it is marginally significant. Both board meeting frequency and board diversity are not statistically significant in the full models. These results imply that both board meeting frequency and board diversity do not affect the extent of voluntary risk disclosure both during the crisis and for the entire sample. These results allow us to accept hypotheses H₁ and H₂, but they do not support hypotheses H₃ and H₄.

<Insert Table 5 about here>

Control variables

Furthermore, the full models in Table 5 show mixed findings in respect of the control variables. We use four variables to proxy for firms' risk level (LNLEV, CRATIO, SEC1, and SEC2). The outputs of the full models in Table 5 show that three of the four variables have statistically significant positive relationship with risk disclosure. Only SEC2 is consistently insignificant at all the conventional levels. These results indicate that risky firms (i.e. firms with high financing risk, high liquidity risk and operating in the financial sector) are more likely to make voluntary risk disclosure compared to less risky firms.

The results also show a statistically significant positive relationship between our measure of agency costs and risk disclosure. The results indicate that firms with high agency costs problem are associated with high voluntary risk disclosure. The relationship is statistically insignificant for the post-crisis period. Although we found consistent positive association between voluntary risk disclosure and mandatory disclosure regulation (MDR), these are not always statistically significant. Similarly, the results did not show consistent statistically significant positive relationship between firm performance and risk disclosure as anticipated. Consistent with our expectation, the results show a statistically significant positive relationship between firm size and risk disclosure. This implies that larger firms are associated with more voluntary risk disclosures compared to small firms. Similarly, older firms seem to be associated with more risk disclosure. Both audit committee size and meeting frequency are not statistically associated with risk disclosure unlike risk committee size which shows statistically significant positive relationship with voluntary risk disclosure. This implies that higher number of independent non-executive directors on the risk committee is associated with more risk disclosure but risk committee meeting frequency did not show consistent positive association with risk disclosure. We subject our results to a number of robustness tests in the next subsection.

Additional analyses

Endogeneity concerns

The problem of endogeneity in the broader accounting and finance research has been highlighted in previous studies (Ntim et al., 2013; Ullah et al., 2018; Larcker and Rusticus 2010). Endogeneity affects the reliability of empirical findings and can lead to wrong conclusions. This is because the independent variables are not truly exogenous; and are partly determined internally in the model, thus, indicating the violation of a fundamental assumption

that underpins the consistency of the regression model. This implies that $Cov(x,u) \neq 0$, meaning that the value of the 'x' will not converge to its true value in large sample and more importantly, the standard error and therefore the hypothesis testing are all adversely affected (Ullah et al., 2018; Larcker and Rusticus 2010). Omitted variable bias, measurement error, and reverse causality are some of the main sources of endogeneity identified in the literature (Ullah et al., 2018). Table 6 below presents the results of our efforts to mitigate the effects of endogeneity problems in this study.

Omitted time-variant variable

We include additional corporate governance and firm specific variables to further account for the relationship between risk disclosure and board composition. In this sense, we include the number of executive directors on the board (EXEC) and Book to market ratio (BTM). The results in Columns 1 and 4 of Table 6 are comparable to the results in the full model in Table 5. Our main results in Table 5 is qualitatively better, our main conclusions in respect of the hypotheses tested are unchanged.

Measurement of the variable

Our dependent variable may be sensitive to the measurement of the independent and control variables used. Thus, for robustness, we replace PNED with the actual number of independent non-executive directors (NED), PBODIV with Gsity and LNMCAP with the natural log of total asset (LNTA). Columns 2 and 5 in Table 6 present the results of these analyses. Our main results in Table 5 remain qualitatively better, and our conclusions in respect of the hypotheses tested remain unchanged.

<Insert Table 6 about here>

Reverse causality

Reverse causality implies a situation where the dependent variable is correlated with one or more independent variables in such a way that there is feedback effect between the dependent and independent variables. Consistent with previous studies (Ullah et al., 2018; Larcker and Rusticus 2010), we control for reverse causality using the GMM model. We specify a generalised method of moments (GMM) approach below that includes two periods lag of the dependent variable as part of the explanatory variable (Ntim et al. 2013; Larcker and Rusticus 2010).

The dynamic econometric model used in the study is of the form:

$$y_{it} = \alpha + \delta y_{i,t-2} + \beta_e X'_{eit} + \beta_c X'_{cit} + v_{it} \quad (4)$$

$$v_{it} = u_i + \varepsilon_{it}; \text{ where } u_i \sim iid N(0, \sigma_u^2) \text{ and } \varepsilon_{it} \sim iid N(0, \sigma_\varepsilon^2)$$

Where y_{it} is the dependent variable i.e. the natural log of total risk disclosure of the i th firm at time t , α is the intercept. $y_{i,t-2}$ is the two-period lagged dependent variable representing risk disclosure of the i th firm in the previous years. δ captures the speed of adjustment of disclosure to equilibrium. X'_{eit} and X'_{cit} are vectors of explanatory and control variables respectively, with β_e and β_c as vectors of coefficients, and v_{it} is the disturbance term comprising of u_i which is the unobservable firm specific effects i.e. fixed effect and ε_{it} which is the idiosyncratic error term. The error terms are independent and identically distributed.

The presence of lagged dependent variables in the model implies that least square estimates and the normal estimations of fixed or random effect panel models produce biased and

inconsistent estimates of the parameters (Flannery and Hankins, 2013; Nickell, 1981). This is because of the correlation between the individual effect and the lagged dependent variables. Arellano and Bond (1991) suggest the use of a generalized method of moments (GMM) estimator for dynamic panel models. They argue that the lagged exogenous variables' values at level are legitimate instruments for the first differenced lagged dependent variable. However, Blundell and Bond (1998) showed that lagged variables do not provide optimal solutions especially when a panel contains limited time (T) and large cross-section (N) as we have. Instead, they suggest a system estimator that explores more moment conditions on the lagged difference and levels, using the lagged first difference of the exogenous variables as instruments in the levels equation.

Two critical factors in the consistency of the system GMM estimators are the validity of the assumption of no autocorrelation of the error terms, and the validity of the instruments. It is important to note that whilst the presence of first order autocorrelation in the difference residuals does not constitute a problem, the presence of second order autocorrelation implies the violation of the assumption of no autocorrelation and the estimates are not consistent. The study used the Sargan test of over-identifying restriction to confirm the suitability of the instruments. The system GMM estimators also control for unobservable firm heterogeneity. Overall, the GMM model deals with potential endogeneity in an estimation.

Columns 3 and 6 in Table 6 above report the estimation with GMM model for the peak of the crisis and the entire sample. The results are qualitatively like our main results in Table 5 above, for example, both BS and PNED are significant and positively linked with the LNTDS, whereas BM and PBODIV remain statistically insignificant, suggesting that our findings are robust. To check the validation of our results, we conducted both AR (2) Test and Sargan Test. The results of AR (2) are insignificant suggesting residuals in the equations are not serially correlated. Sargan Test are used to test over-identifying restrictions and the result of Sargan

Test does not reject the null hypothesis that instruments are uncorrelated with the error term, indicating that the instruments are valid.

Governance bundles

Regarding the effectiveness of governance mechanisms, Rediker and Seth (1995: 86) suggest that they work to reinforce one another, and Aguilera et al. (2008) note that they should function as a “system of interdependent elements” (p. 482). To explore the impact of board governance bundle on voluntary risk disclosure, we develop a composite measure- GOVINDEX as the total of all the governance variables and used it in a regression model as the main independent variable. Column 1 in Table 7 shows the result of this analysis. It indicates a statistically significant positive relationship between board governance bundle and voluntary risk disclosure at the peak of the crisis. Thus, despite the inconsistent relationship noticed with respect to some corporate governance mechanism (including board meeting, board diversity, audit committee and risk committee meetings and size) it seems that working together, the board level governance is overall associated with more risk disclosure. This reinforces the idea of governance as a bundle of interdependent elements (Misangyi and Acharya, 2014; Ward et al., 2009; Aguilera et al., 2008).

<Insert Table 7 about here>

Agency costs, board composition and risk disclosure

Although the results in Tables 5 and 6 show statistically significant positive relationship between risk disclosure and the lagged values of firms’ agency costs levels, it is important to explore these results further to clarify the association between risk disclosure and board composition based on the level of firms’ agency costs. In this study, ‘high agency’ firms have

agency costs values higher than the median scores and ‘low agency’ firms have agency costs values lower than the median score. About half of the sample firms have high agency costs above the median value of 0.76. The regression outputs in Columns 2 and 3 of Table 7 show consistent positive and statistically significant relationship between board composition (board size and independence) and risk disclosure for both high and low agency costs firms with stronger results for the high agency costs firms. These results reinforce our decision to use agency theoretical underpinning and showed that board composition mitigates firms’ agency costs.

Voluntary risk disclosure and mandatory risk disclosure regulation

Previous studies (Elshandidy et al., 2018; Elshandidy et al., 2013) have highlighted the confounding nature of voluntary and mandatory risk disclosure. Columns 4-6 of Table 7 present additional analysis regarding the overlap between mandatory and voluntary risk disclosure. Both Pre and post IFRS7 regressions show that board size and board independence are positive and statistically associated with voluntary risk disclosure and reinforce our main findings in Table 5.

Financial and non-financial sectors

It is important to establish that the results presented in Column 3 of Table 5 is not driven by the financial sector. We therefore partitioned the sample into financial and non-financial sector and explored the relationship between board composition and voluntary risk disclosure for these sub-samples. Columns 1 and 2 of Table 8 below present the results of this analysis. Both sub-samples show statistically significant positive relationship between board size and board independence and risk disclosure, consistent with our main findings in Table 5.

Financial risk disclosure and non-financial risk disclosures

Finally, we explore the effects of board composition on voluntary financial and non-financial risk disclosures separately for the firms in the sample. Columns 3 and 4 of Table 8 present the results of this analysis. It shows that the results for both types of risks mirror the results in Table 5 for our full models with some few exceptions. For example, for non-financial risks board size is not significant for the entire period although both board size and independence are significant for the crisis period supporting the main findings from this study.

<Insert Table 8 about here>

Discussion and Conclusion

This study examined the impact of board composition on voluntary risk disclosure for a sample of UK listed companies for 2006 to 2015. The study controlled for firms' risk level, agency costs level, mandatory risk disclosure requirements and other control variables. The main results presented in Table 5 show that there is statistically significant positive relationship between board size and the volume of voluntary risk disclosure. These findings support agency theoretical proposition which suggests that the board enhances oversight and monitoring that reduce firms' agency costs. The positive relationship between board size and risk disclosure is consistent with the findings in some previous studies including Abeysekera (2010), Mallin and Ow-Yong (2012) but conflicts with Elzahar and Hussainey (2012) who found no relationship between disclosure and board size. The study also reports statistically significant positive relationship between board independence and voluntary risk disclosure. This suggests that independent non-executive directors pay attention to firms' risk disclosure and that they encourage more risk disclosure. This finding is consistent with the board providing effective monitoring of management and preserving firm value through increased corporate risk

disclosure. Our findings are consistent with previous studies (Lim et al., 2007; Mallin and Ow-Yong, 2012; Cheng and Courtenay, 2006) reporting positive relationship between board independence and disclosure. Both board meeting frequency and board gender diversity do not show consistent significant relationship with voluntary risk disclosure during uncertainty. These results conflict with findings in Allegrini and Greco (2013) in respect of board meeting frequency, and Ntim et al. (2013) in respect of board gender diversity. These findings contribute to the risk disclosure literature by showing that board size and board independence impact corporate voluntary risk disclosure during uncertainty.

Furthermore, extant studies have reported mixed findings on the relationship between risk level and risk disclosure. This is probably due to the multiple ways of measuring firms' risk level. We used four proxy for risk level in this study and mainly found positive and statistically significant relationship between risk level and risk disclosure when we measure risk level based on leverage, current ratio and whether a firm is in the financial sector or not. Our findings are consistent with extant studies such as Miihkinen (2012), Ntim et al. (2013) and Elshandidy et al. (2013), but conflict with other studies such as Lajili and Zeghal (2005) and Dobler et al. (2011) who did not find any significant relationship between the two variables. Risk level based on high and low impact sectors is not associate with risk disclosure. The absence of statistically significant findings between high/low impact sector and risk disclosure may be due to the fact that firms prefer to make their risk disclosures elsewhere and not necessarily in their annual reports. By considering the impact of risk level on risk disclosure, and showing that firms' risk disclosure is sensitive to their risk level during the crisis period, this study advances the extant risk disclosure literature which has primarily focused on disclosure during stable periods.

By using data that covers the financial crisis period and on the UK market, this study contributes to the international disclosure literature with recent evidence that shows that corporate governance regulations matter for corporate risk disclosure. Furthermore, by directly

measuring firms' agency costs and controlling for this in our analyses, we provide additional insights on the relationship between board composition and voluntary risk disclosure under different agency costs situations. We also show that mandatory risk disclosure regulation is capable of influencing firms' voluntary risk disclosure behaviour. We found that firms that make mandatory risk disclosure are more likely to make voluntary risk disclosure. In terms of other governance mechanisms, our findings of a consistent positive relationship between governance bundle (GOVINDEX) and corporate risk disclosure, despite insignificant relationship between individual corporate governance measures and risk disclosure show that, consistent with Aguilera et al. (2008), it is the effectiveness of all corporate governance measures that matter rather than the focus on individual governance measure.

Regulatory and managerial implications of our findings

Corporate board continues to form a central part of many countries' corporate governance architecture because of their importance especially considering the increasing distrust between corporations and their stakeholders in the aftermath of the financial crisis. Whilst regulators' focus on board composition is rightly placed, it is imperative that boards comprise of adequate number of directors with diverse expertise to ensure corporate boards can respond adequately to uncertainty. Although individual board member's effectiveness is important, it is the effective functioning of the board as a team that could lead to better oversight on the management. Thus, beyond substitutability or complementarity of governance mechanisms, it is the right mix of the governance bundle that seems more important for effective oversight on management (Rediker and Seth 1995; Ward et al., 2009).

Our findings also have implications for management practice in that it shows that board composition matters for corporate behaviours such as risk disclosure. Management should recognise that corporate disclosure is one of the few observable functions of non-executive directors and they take it seriously judging from the positive relationship between independent

non-executive director and corporate risk disclosure in our study. It seems that independent non-executive directors prefer more voluntary risk disclosure than less. Probably because poor risk disclosure could have adverse effects on their individual reputational value and human capital (Jensen and Mecking, 1976). Moreover, whilst recognising the merit in the previous studies (Song and Windram 2004; and Yermack 1996) that cautioned against large board size, it is imperative to highlight that board size is a reflection of board ability to reduce corporate agency costs.

Future studies could explore how staggered boards impact the extent of risk disclosure in the UK context. It may also be useful to consider alternative governance metrics beyond the popular board size, independence and meeting that have been addressed in the extant literature as well as alternative measures of auditors' involvement in risk disclosure. In this sense, studies such as Martikainen et al. (2015), Bozzolan and Miihkinen (forthcoming) and Fukukawa and Kim (2017) may serve as good starting point for future studies. It is important to note that despite all our efforts to control and deal with the potential endogeneity issues in our study, it is possible that it still persists due to the confounding nature of the internal and external governance mechanisms that firms use, and the overlap between mandatory and voluntary risk disclosure. In this sense, future studies could employ difference-in-difference or quantile regression as potential alternative econometric approaches to mitigate these concerns.

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Table 1. Variable definition and sources

Variables	Definition	Sources	Expected sign
Dependent Variables			
Financial risk (FR)	Financial risk is any type of risk associated with financing, including credit risk, liquidity risk, asset-backed risk, foreign investment risk, equity risk, foreign exchange risk, interest rate risk and market risk.	Annual Report	
Non-Financial Risk (NFR)	This comprises of both operation and business continuity risks. A risk was categorised as operational risk if it could lead to increase or decrease in operational capacity but not the interruption of business activity. A risk is categorised as operational risk if it affects product cycle, health and safety, environment, customer satisfaction, business performance. Risk that could cause product/service failure and brand name erosion is classified as business continuity risk. This type of risk can lead to the temporary or and permanent interruption in business activity. This could be the closure of a segment, a plant or associated facilities.	Annual Report	
Total Disclosure Score (TDS)	The sum of the two risk disclosure types (FR+NFR)	Annual Report	
Independent Variables			
Board composition			
Board Size (BS)	Number of directors on the board in a year	Annual Report	+
Board Independence (PNED)	Percentage of independent non-executive directors to total number of directors on the board	Annual Report	+
Board Meeting (BM)	Number of board meetings in a year	Annual Report	+
Board Diversity (PBODIV)	Percentage of females on the board of directors in a year	Annual Report	+/-
Control Variables			
Firm leverage (LNLEV)	Natural log of total long-term debt divided by equity	FAME	+
Current ratio (CRATIO)	Ratio of current assets to current liabilities	FAME	+
SEC1	This is a measure of risk level and it is a dummy variable equal to 1 if a firm is in the financial sector and 0 if otherwise	Annual Report	+

SEC2	This is another measure of risk level and it is a dummy variable equal to 1 if a firm is in high impact sector and 0 otherwise. Following Ben-Amar and McIlkenny (2015) and Heras-Saizarbitoria et al. (2015), high impact sectors include firms in Mining, Aerospace and Defence, Oil & Gas, Tobacco, Pharmaceutical, Construction, Chemical, Engineering and manufacturing, and packaging.	Annual Report	+
Firm agency cost (AGC)	We used the ratio of total turnover to total asset as a proxy for firms' agency costs (Ang et al., 2000; Rashid, 2015). This measure captures managers' efficiency in assets utilization. We take a period lagged value of this variable to capture boards' agency costs monitoring engagement. We also construct sub samples where firms with high agency costs (above the median value) takes the value 1 and low agency firms (below the median value) takes the value 0.	FAME	+
Mandatory Disclosure Regulation (MDR)	Dummy variable equal to 1 if a firm reports the use of IFRS7 on financial instruments and 0 if otherwise.	Annual Report	+
Firm performance (TBQ)	TBQ is Tobin's Q and it is a market-based measure of performance. It is calculated as the ratio of market value of equities to net worth, where net worth is given by total assets minus liabilities.	FAME	+/-
Accounting performance (ROA)	The return on total assets given as profit after tax divided by assets	FAME	+/-
Firm size (LNMCAP)	Value of total shares in issue multiply by share price at year end	FAME	+
Firm age (AGE)	Number of years since listed on the Stock Exchange	FAME	+
Audit committee meeting (ACM)	Total number of audit committee meetings in a year.	Annual Report	+
Audit committee size (ACS)	Number of independent non-executive directors on the audit committee	Annual Report	+
Risk committee size (RCS)	Number of independent non-executive directors on the risk committee	Annual Report	+
Risk committee meeting (RCM)	Number of risk committee meetings in a year	Annual Report	+

Note: This table defines all variables used in our models.

Table 2. Summary descriptive statistics of all risk disclosure

	All	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Disclosure Score (TDS)											
Mean	41.31	27.93	32.53	40.36	41.52	41.32	42.08	44.53	46.14	45.29	46.64
Median	36.00	25.50	29.50	35.50	35.00	36.50	38.00	40.00	43.00	41.00	41.00
Maximum	282.00	153.00	184.00	270.00	259.00	261.00	208.00	255.00	282.00	218.00	215.00
Minimum	0.00	0.00	0.00	0.00	6.00	9.00	11.00	14.00	10.00	16.00	13.00
STD	31.42	20.35	23.34	34.85	33.69	29.55	26.68	34.67	36.55	30.99	30.95
Financial Risk (FR)											
Mean	24.39	17.15	20.53	25.67	26.42	25.19	24.39	25.48	25.86	24.74	25.37
Median	19.00	14.00	17.00	21.00	20.00	21.50	21.00	20.00	21.00	20.00	21.00
Maximum	241.00	98.00	137.00	241.00	232.00	175.00	135.00	175.00	176.00	171.00	160.00
Minimum	0.00	0.00	0.00	0.00	3.00	6.00	5.00	4.00	4.00	4.00	1.00
STD	23.23	13.86	18.12	29.20	28.72	20.95	19.05	24.43	25.26	22.48	21.50
Non-Financial Risk (NFR)											
Mean	16.93	10.68	11.9	14.69	15.11	16.13	17.69	18.98	20.37	20.64	21.34
Median	15	9.5	11	12.5	14	14	16	16	17	19	18
Maximum	113	63	65	81	74	101	79	103	112	81	85
Minimum	0	0	0	0	0	3	2	3	3	4	4
STD	12.99	9.59	9.94	12	11.67	13.28	11.63	13.92	14.85	12.28	13.71

Note: This table shows descriptive statistics for all risk disclosure measures. All variables are defined in Table 1. Appendix 1 provides examples of these risks.

Table 3. Summary descriptive statistics of independent and control variables

Variable	Mean	Median	Maximum	Minimum	STD
Panel A: Independent Variables					
BS	10.95	11.00	21.00	5.00	2.51
PNED	0.67	0.67	1.00	0.22	0.15
BM	8.82	8.00	30.00	4.00	2.99
PBODIV	0.16	0.15	0.50	0.00	0.10
Panel B: Control Variables					
LNLEV	3.50	3.71	5.15	-4.61	1.10
CRATIO	1.27	1.14	7.94	0.06	0.80
SEC1	0.17	0.00	1.00	0.00	0.37
SEC2	0.66	1.00	1.00	0.00	0.47
AGC _{t-1}	0.49	0.76	1.00	0.00	0.50
MDR	0.73	1.00	1.00	0.00	0.45
TBQ	1.15	0.87	9.78	0.01	1.03
ROA	7.52	7.19	55.75	-54.44	8.20
LNMCAP	15.98	15.69	18.85	13.03	1.20
AGE	29.98	23.00	78.00	0.00	21.84
ACM	5.30	5.00	17.00	2.00	2.24
ACS	4.89	5.00	13.00	3.00	1.41
RCS	1.58	0.00	27.00	0.00	2.89
RCM	5.39	6.00	13.00	0.00	2.97

Note: This table shows descriptive statistics for the independent and control variables. All variables are defined in Table 1.

Table 4. Correlation matrix

	BS	PNED	BM	PBODIV	CRATIO	LNLEV	SEC1	SEC2	AGC _{t-1}	MDR	TBQ	ROA	LNMCAP	AGE	ACM	ACS	RCS	RCM	
BS	1.00																		
PNED	-0.08	1.00																	
BM	0.11	0.18	1.00																
PBODIV	0.06	0.25	-0.04	1.00															
CRATIO	-0.09	-0.07	-0.11	-0.11	1.00														
LNLEV	0.07	0.13	0.14	-0.03	-0.36	1.00													
SEC1	0.25	0.02	0.22	0.00	-0.08	-0.08	1.00												
SEC2	0.21	0.14	0.16	-0.12	0.15	-0.12	0.33	1.00											
AGC_{t-1}	-0.25	0.01	-0.07	0.05	-0.02	0.07	-0.42	-0.20	1.00										
MDR	0.08	0.08	-0.04	0.10	-0.06	0.06	0.07	0.03	0.04	1.00									
TBQ	-0.14	-0.14	-0.20	0.11	0.27	-0.34	-0.32	-0.22	0.25	-0.01	1.00								
ROA	-0.10	-0.13	-0.19	-0.02	0.13	-0.14	-0.28	-0.15	0.28	0.01	0.56	1.00							
LNMCAP	0.55	0.32	0.08	0.19	-0.14	0.13	0.07	0.27	-0.14	0.12	-0.07	0.01	1.00						
AGE	0.01	0.11	0.14	-0.04	0.01	0.10	-0.03	0.26	0.06	0.05	-0.15	-0.09	0.05	1.00					
ACM	0.42	0.25	0.40	0.14	-0.05	0.09	0.35	0.25	-0.15	0.05	-0.21	-0.09	0.40	0.11	1.00				
ACS	0.24	0.27	0.09	0.13	0.03	0.09	0.01	0.08	0.02	0.01	-0.01	-0.01	0.23	0.11	0.18	1.00			
RCS	0.25	0.19	0.25	0.10	-0.06	0.03	0.53	0.25	-0.25	0.06	-0.21	-0.18	0.21	-0.10	0.32	0.26	1.00		
RCM	0.12	0.06	0.04	0.05	-0.09	0.10	0.13	0.06	0.03	0.04	-0.14	-0.10	0.11	-0.05	0.18	0.07	0.17	1.00	

Note: This table shows the Pearson correlation between all the independent variables. All variables are defined in Table 1.

Table 5. Regression results

Dependent variables	1		2		3		
	Board composition and Risk Level		Agency costs and mandatory disclosure		Full model		
	At the peak of the crisis	Entire sample	At the peak of the crisis	Entire sample	At the peak of the crisis	Post-crisis	Entire sample
	2007-2010	2006-2015	2007-2010	2006-2015	2007-2010	2011-2015	2006-2015
BS	0.07*** (6.39)	0.06*** (8.04)	0.07*** (9.17)	0.05*** (10.66)	0.04*** (3.89)	0.01*** (4.13)	0.03** (1.96)
PNED	0.75*** (4.10)	0.99*** (8.47)	0.77*** (3.44)	0.87*** (6.40)	0.51*** (4.41)	0.41*** (2.92)	0.30* (1.91)
BM	0.01 (1.22)	0.01 (1.36)	0.01** (2.40)	0.01** (2.27)	0.01 (1.59)	0.08 (1.13)	0.01 (1.42)
PBODIV	-0.06 (-0.21)	0.41*** (2.48)	0.18 (0.88)	0.40** (2.35)	0.15 (0.57)	0.04 (0.28)	0.31 (1.12)
LNLEV	0.13*** (4.47)	0.13*** (7.30)	0.04*** (12.70)	0.01*** (15.10)	0.12*** (6.29)	0.07*** (4.95)	0.09*** (5.15)
CRATIO	0.04 (1.30)	0.06*** (2.82)	0.03 (0.58)	-0.01 (-0.15)	0.08* (1.90)	-0.01 (-0.79)	0.04** (1.96)
SEC1	0.37*** (4.91)	0.38*** (8.08)	0.37*** (6.57)	0.38*** (10.34)	0.33*** (8.84)	0.31*** (6.17)	0.34*** (5.94)
SEC2	0.07 (1.13)	0.09** (2.34)	0.11*** (3.30)	0.13*** (8.16)	-0.08 (-1.89)	-0.01 (-0.21)	-0.03 (-0.75)
AGC _{t-1}			0.07** (1.93)	0.05** (2.34)	0.10*** (3.25)	0.01 (1.28)	0.06** (1.96)
MDR			0.02 (0.51)	0.05 (1.59)	0.06 (0.66)	0.07*** (2.88)	0.03 (1.19)
TBQ					-0.03 (-0.83)	-0.06** (2.65)	-0.05** (-2.49)
ROA					0.001 (1.18)	0.00 (0.54)	0.001 (1.84)
LNMCAP					0.11*** (5.21)	0.13*** (8.54)	0.12*** (6.19)

AGE					0.001***	0.001***	0.01***
					(8.79)	(4.89)	(5.23)
ACM					0.004	-0.01	0.001
					(0.63)	(-0.06)	(0.33)
ACS					-0.06**	-0.01	-0.02**
					(-2.41)	(-0.63)	(-2.18)
RCS					0.05***	0.02***	0.03***
					(4.95)	(4.57)	(4.48)
RCM					-0.08	0.02*	0.01
					(-1.00)	(1.68)	(0.13)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ²	30%	32%	33%	33%	36%	47%	43%
F Value	18.7***	49.3***	17.3***	43.1***	12.5***	20.6***	31.6***
Observations	330	840	329	839	329	399	839

Note: This table presents the main regression results of board composition on risk disclosure. t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 6. Additional analyses I

Dependent Variable	1 Omitted variables 2007-2010	2 Measurement error 2007-2010	3 Reverse causality 2007 -2010	4 Omitted variables 2006-2015	5 Measurement error 2006-2015	6 Reverse causality 2006 -2015
BS	0.06*** (4.79)	0.04*** (3.24)	0.03*** (2.92)	0.03*** (4.25)	0.01 (1.07)	0.11** (2.19)
PNED	0.46*** (3.02)		0.24** (3.80)	0.40*** (3.11)		0.07* (1.79)
NED		0.03 (0.68)			0.03** (2.37)	
BM	0.001 (1.15)	0.002 (0.36)	-0.01 (-1.57)	0.001 (1.53)	0.002 (0.67)	-0.02 (-0.88)
PBODIV	0.32 (1.38)		-0.25 (-0.02)	0.35* (1.92)		-0.01 (-0.46)
LNLEV	0.16*** (6.42)	0.10*** (3.87)	0.09*** (3.72)	0.10*** (7.62)	0.07*** (5.69)	0.01 (1.01)
CRATIO	0.07** (2.13)	0.07** (2.34)	0.03 (1.44)	0.03 (1.26)	0.03 (1.23)	0.01 (1.47)
SEC1	0.33*** (7.17)	0.22*** (2.80)	0.25*** (3.08)	0.35*** (8.97)	0.23*** (6.75)	-0.76* (-1.88)
SEC2	-0.01 (-0.19)	-0.07** (-1.99)	0.05 (0.91)	-0.01 (-0.67)	-0.04 (-1.59)	0.30 (1.44)
AGC _{t-1}	0.10*** (2.85)	0.13*** (2.83)	0.16*** (3.08)	0.05* (1.89)	0.09*** (3.56)	0.02*** (4.50)
MDR	-0.05 (-0.43)	0.01 (0.77)	0.03 (0.90)	0.03 (1.21)	0.02 (1.05)	0.03 (0.90)
TBQ		0.05 (1.50)	-0.04 (-1.40)		0.01 (0.73)	-0.12*** (-5.96)
ROA	0.001** (0.97)	0.02 (1.22)	0.001 (0.07)	0.00 (0.03)	0.02 (1.58)	0.001 (1.62)
LNMCAP	0.09*** (3.45)		0.09*** (4.06)	0.11*** (8.40)		0.18*** (6.52)

LNTA		0.12***				0.11***	
		(4.86)				(12.48)	
AGE	0.001***	0.001***	0.001	0.001***	0.001***	0.001	0.001
	(9.48)	(9,27)	(1.51)	(7.45)	(7.85)	(0.72)	
ACM	0.003	0.001	0.01	0.002	-0.001	0.03***	
	(0.25)	(0.39)	(1.25)	(0.39)	(-0.26)	(2.76)	
ACS	0.001	-0.05*	-0.04***	-0.003*	-0.05	-0.03***	
	(0.77)	(-1.75)	(-3.67)	(-1.66)	(-1.29)	(-2.62)	
RCS	0.05***	0.05***	0.01	0.03***	0.05***	0.04	
	(4.16)	(3.65)	(1.01)	(4.91)	(4.48)	(0.43)	
RCM	0.001	-0.01	0.05	0.001	0.01	0.00	
	(0.04)	(-0.09)	(0.84)	(1.26)	(0.85)	(0.10)	
Gsity		-0.04			-0.04		
		(-0.144)			(-0.144)		
EXEC	-0.06***			-0.04***			
	(-3.38)			(-2.94)			
BTM	0.0001			0.0001			
	(0.78)			(0.56)			
TDS _{t-1}			0.03***			0.25***	
			(3.80)			(5.33)	
TDS _{t-2}			0.03***			-0.05***	
			(2.71)			(-2.80)	
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ² /AR(2)	37%	39%	40%	42%	44%	0.65	
F Value/Sargan test	12.9***	12.6***	0.06	29.5***	30.3***	0.51	
Observations	329	329	328	839	839	838	

Note: This table presents the results of additional analyses including omitted variables, measurement error and reverse causality. Gsity is the number of females on the board. LNTA is the natural log of total assets. EXEC is the number of executive directors on the board. BTM is book to market ratio, defined as the ratio of book value of equity (total assets minus total liabilities) to market value of equity (stock price times the number of shares outstanding). TDS_{t-1} & TDS_{t-2} are lag values of the total disclosure scores. All other variables are defined in Table 1. t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 7. Additional analyses II

Dependent Variable	1	2	3	4	5	6
	Governance bundles	High agency costs firms	Low agency costs firms	Pre-IFRS	Post-IFRS	Extended IFRS Effect
	2007-2010	2007-2010	2007-2010	2006	2007-2008	2007-2015
BS		0.50*** (2.71)	0.05** (2.52)	0.06*** (18.2)	0.06*** (8.10)	0.02*** (4.27)
PNED		0.50** (1.98)	0.43** (2.14)	1.21** (2.27)	0.34** (2.51)	0.36*** (4.15)
BM		-0.23 (-1.18)	-0.05 (-0.48)	-0.02*** (-4.58)	-0.01 (-0.28)	0.001 (1.61)
PBODIV		0.02 (0.21)	0.21** (2.59)	-0.16 (-0.50)	-0.08 (-1.62)	0.13 (1.39)
GOVINDEX	1.15*** (3.73)					
LNLEV	6.13*** (4.22)	0.16 (1.02)	0.06 (1.49)	0.24*** (5.84)	0.15*** (12.86)	0.09*** (8.25)
CRATIO	4.13*** (2.48)	0.26** (2.33)	-0.07 (-1.51)	0.21*** (4.77)	0.06*** (2.79)	0.04*** (2.68)
SEC1	33.6*** (7.16)	0.24 (1.61)	0.33*** (3.59)	0.52*** (11.87)	0.38*** (7.19)	0.35*** (8.02)
SEC2	-3.63 (-1.06)			-0.08 (-1.18)	0.05 (1.37)	0.04*** (3.15)
AGC _{t-1} /AGC	1.80 (0.62)			0.05*** (5.59)	0.13*** (3.29)	0.06** (2.34)
MDR	1.07 (0.36)	0.02 (0.67)	-0.04 (-0.75)			
TBQ	-1.79 (-0.80)	-0.02 (-0.73)	-0.08 (-1.42)	0.12 (0.87)	-0.04* (-1.68)	-0.05*** (-2.84)
ROA	0.22 (1.17)	-0.001 (0.71)	-0.01 (-0.19)	-0.001 (-0.46)	0.008** (2.59)	0.02*** (5.81)
LNMCAP	6.19*** (4.80)	0.04 (0.71)	0.07* (1.65)	0.06*** (4.18)	0.09*** (12.77)	0.12*** (10.96)

AGE	0.13*	0.001	0.01**	0.003***	0.03***	0.02***
	(1.84)	(1.31)	(2.06)	(14.70)	(3.41)	(5.81)
ACM		0.00	0.03	0.03	0.02**	0.01
		(0.03)	(1.45)	(1.12)	(2.52)	(0.16)
ACS		-0.09**	-0.07***	-0.02	-0.09***	-0.02*
		(-2.41)	(-2.74)	(-0.67)	(-7.20)	(-1.80)
RCS		0.08**	0.05***	0.09***	0.04***	0.02***
		(2.67)	(2.72)	(2.67)	(3.06)	(4.64)
RCM		0.01	0.01	-0.03	0.01	0.01***
		(0.12)	(0.10)	(-1.63)	(0.66)	(2.83)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ² /AR(2)	39%	48%	34%	35%	39%	42%
F Value/Sargan test	16.03***	10.9***	6.96***	5.97***	7.10***	28.3***
Observations	330	159	169	92	160	640

Note: This table presents the results of additional analyses including governance bundles, High vs Low agency costs firms, Pre-IFRS vs Post-IFRS, Extended IFRS Effect. GOVINDEXT is the composite measure formed from the addition of BS+PNED+BM+PBODIV+ACM+ACS+RCS. TDS_{t-1} & TDS_{t-2} are lag values of the total disclosure scores. All other variables are defined in Table 1. t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 8. Additional Analyses III

Dependent variables	(1)		(2)		(3)		(4)	
	Financial sector		Non-financial sector		Financial risk disclosure		Non-financial risk disclosure	
	2007-2010	2006-2015	2007- 2010	2006-2015	2007-2010	2006-2015	2007-2010	2006-2015
BS	0.13*** (3.17)	0.11*** (7.54)	0.11** (2.79)	0.01** (2.38)	2.95*** (4.63)	0.01* (1.65)	0.65** (2.37)	0.01 (0.49)
PNED	0.35* (1.83)	0.98** (2.22)	1.00** (2.79)	0.02* (1.69)	16.09* (1.72)	0.28** (1.93)	14.85*** (3.70)	0.86*** (5.32)
BM	-0.05 (-0.43)	0.02* (1.91)	-0.006 (-0.67)	-0.009 (-0.71)	0.57 (1.46)	0.01 (1.40)	0.19 (1.13)	0.01 (0.52)
PBODIV	1.65* (1.87)	0.49 (1.08)	0.16 (0.65)	0.20 (1.33)	-4.11 (-0.33)	0.01 (0.01)	-2.35 (-0.44)	0.50** (2.47)
LNLEV	0.20** (2.14)	-0.001 (-0.04)	-0.01 (0.74)	0.06*** (3.54)	3.97*** (3.32)	0.11*** (5.83)	2.27*** (4.43)	0.11*** (4.84)
CRATIO	0.04** (2.06)	0.11** (2.27)	-0.03** (-1.96)	-0.02 (-1.11)	2.81** (2.04)	0.07*** (3.15)	0.72 (1.21)	0.06*** (2.60)
SEC1					25.67*** (6.59)	0.35*** (5.62)	6.70*** (3.99)	0.26*** (3.79)

SEC2					-1.53	0.01	-1.38	-0.03
					(-0.54)	(0.19)	(-1.14)	(-0.77)
AGC(t-1)	1.25***	0.45	0.07***	0.02	2.48	0.09***	2.41**	0.27***
	(5.82)	(1.38)	(2.79)	(1.24)	(1.05)	(2.60)	(2.38)	(6.78)
MDR	0.29**	0.03	0.009	0.03*	1.76	0.10***	0.53	-0.02
	(2.14)	(0.98)	(0.09)	(1.69)	(0.72)	(2.75)	(-0.50)	(-0.55)
TBQ	-0.03	-0.20**	-0.08***	-0.06***	1.59	-0.07***	0.29	0.02
	(-0.32)	(-1.95)	(-3.31)	(-4.17)	(0.50)	(-3.05)	(0.37)	(0.88)
ROA	0.01	0.01	0.006***	0.004	0.17	0.01	0.13**	0.01
	(0.85)	(1.05)	(11.78)	(1.54)	(1.01)	(0.94)	(1.95)	(0.33)
LNMCAP	0.07	0.16***	0.08***	0.11***	1.93	0.133***	1.10**	0.14***
	(1.09)	(2.65)	(2.79)	(8.65)	(1.50)	(6.65)	(1.99)	(6.21)
AGE	0.02***	0.01***	0.004***	0.002***	0.08	0.01*	0.05**	0.03***
	(3.71)	(3.69)	(3.54)	(4.52)	(0.80)	(1.70)	(2.26)	(3.17)
ACM	0.03	0.02	0.02	0.01*	-0.09	0.02**	0.01	-0.01
	(0.88)	(1.14)	(1.05)	(1.65)	(-0.14)	(1.96)	(0.01)	(-0.55)
ACS	-0.10	-0.04	-0.02	-0.06	-1.39	0.01	-1.02***	-0.04***
	(-1.59)	(-1.27)	(-0.97)	(-0.52)	(-1.57)	(0.72)	(-2.60)	(-3.02)
RCS	0.02	0.01	0.04***	0.03***	0.44	0.02***	0.41	0.03***

	(0.29)	(1.21)	(4.17)	(3.85)	(0.67)	(3.23)	(1.44)	(3.50)
RCM	0.12*	0.06***	-0.04	0.02	0.36*	0.76***	-0.33**	-0.26*
	(1.82)	(2.92)	(-0.59)	(0.30)	(1.73)	(3.21)	(-2.14)	(-1.84)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ²	84%	78%	21%	25%	36%	36%	27%	29%
F Value	16.7***	28.5***	4.71***	12.2***	12.11***	28.9***	8.16***	20.7***
Observations	52	130	244	540	330	820	330	820

Note: This table presents the results of additional analyses including financial sector vs non-financial sector, financial risk disclosure vs non-financial risk disclosure. t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001.

Appendix 1. The definition and examples of risk disclosures

Types of Risk	Definition	Examples
Financial Risk (FR)	Financial risk is any type of risk associated with financing, including credit risk, liquidity risk, asset-backed risk, foreign investment risk, equity risk, foreign exchange risk, interest rate risk, market risk.	<p>“Volatility in foreign exchange rates could have a significant impact on the Group’s reported results.” Burberry Plc 2015</p> <p>“A sizeable portion of the Group’s profits and cash flows is generated by a small number of joint venture and equity holdings over which the Group exercises varying degrees of control. “ GNK Plc 2013</p> <p>“The group hedges a substantial portion of its exposure to fluctuations in the sterling value of its foreign operations by designating net borrowings held in foreign currencies and by using foreign currency swaps and forwards. Where a liquid foreign exchange market exists, the group’s policy is to seek to hedge currency exposure on its net investment in foreign operations within the following percentage bands: 80% to 100% for US dollars and euros and 50% to 100% for other significant currencies. As at 30 June 2010, these ratios were 91% and 89% for US dollars and euros, respectively, and between 66 and 75% for other significant currencies. Exchange differences arising on the retranslation of foreign currency borrowings (including foreign currency swaps and forwards), to the extent that they are in an effective hedge relationship, are recognised in other comprehensive income to match exchange differences on net investments in foreign operations. Exchange differences on foreign currency borrowings not in a hedge relationship and any ineffectiveness are taken to the income statement.” Diageo, 2010</p>

<p>Non-Financial Risk: Operational Risk (OR)</p>	<p>Operating risk could lead to increase or decrease in operational capacity but not the interruption of business activity, risk is categorised as operational risk if it affects product cycle, health and safety, environment, customer satisfaction, business performance.</p>	<p>“Acquisitions: A significant portion of the Group’s historical growth has been achieved through the acquisition of businesses and the Group’s growth strategy includes additional acquisitions. Although the Group operates in a number of fragmented markets, which provide future acquisition opportunities, there can be no assurance that the Group will be able to make acquisitions in the future. There is also a risk that not all of the acquisitions made will be successful due to the loss of key people or customers after the acquisition, deterioration in the economic environment of the acquired business or the failure to perform adequate pre-acquisition due diligence or appropriately manage the post-acquisition integration of the business. In the longer term, if an acquisition consistently underperforms compared to its original investment case, there is a risk that this will lead to a permanent impairment in the carrying value of the intangible assets attributed to that acquisition.” BUNZL 2014</p>
<p>Non-Financial Risk: Business Continuity Risk (BCR)</p>	<p>Risk that could cause product/service failure and brand name erosion is classified as business continuity risk. Business continuity risk can lead to the temporary or and permanent interruption in business activity. This could be the closure of a segment, a plant or associated facilities.</p>	<p>“A failure to integrate effectively major acquisitions could impact the business operations and result in unplanned integration or restructuring costs, unsuccessful cultural integration and prevent achievement of anticipated acquisition benefits.” GNK Plc 2013</p> <p>“Major incidents such as natural catastrophes, global pandemics or terrorist attacks affecting one or more of the Group’s key locations could significantly impact its operations.” Burberry Plc 2015</p> <p>“The Board has considered the risks associated with the inability to recruit required talent and the loss of existing talent. The impact of the risk has</p>

increased to reflect the challenge posed by negative perceptions of the sustainability and corporate reputation of a tobacco business and is now listed as a principal risk facing the business”
British American Tobacco 2015
