

Brunel University London



**The Impact of Board of Directors on Stock Comovement, Stock
Return Performance and Cybersecurity Risk of US Firms**

A thesis submitted for the degree of

Doctor of Philosophy

By

Ambrose Nnaemeka Egwuonwu

Brunel Business School

Brunel University

June 2022

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June 2022

Signature of supervisor:

Date: 30 June 2022

Abstract

The doctoral thesis consists of three empirical chapters that aim to validate key questions about the board structure in the S&P 500 and its consequences. This research provides novel empirical evidence on this topic.

The literature review is drawn from multiple corporate governance and social psychology theories, including Agency, Stewardship and Resource dependency theories which enable a deeper understanding of board effectiveness. According to agency theory, the agency problem between principals and agents (i.e. shareholders and managers, respectively) undermines value maximisation. The board of directors, it has been argued, is an efficient corporate governance mechanism for resolving the agency problem between shareholders and management. Several factors make the study of the board of directors and its consequences important and empirically worthwhile: (i) limited body of literature investigating board of directors' structures as a collection of practices, (ii) regulators across the globe are showing greater interest in advocating for increased diversity in boardrooms; and (iii) increased attention from regulators on the incorporation of information security strategy into strategic discussions at the board-level.

The first empirical chapter (Essay 1) investigates the influence of corporate governance monitoring and incentive alignment provisions as a bundle on stock price comovement. Additionally, it seeks to determine whether this relationship is moderated by the US national governance quality (NGQ). Using a dataset of 329 S&P 500 companies from 2009 to 2017, the study finds statistically significant evidence of the quid pro quo hypothesis, in that monitoring mechanisms and incentive alignment provisions as a bundle of corporate governance mechanisms weaken comovement of stock prices. Also, the study evidences a complementary relationship between NGQ and firm board monitoring. Instrumental variable tests that exploit exogenous variations in board-level monitoring strength and levels of incentive alignment amongst directors indicate that these relations are causal. In summary, the results suggest that a combination of governance mechanisms in boardrooms is required for board effectiveness.

The second empirical chapter (Essay 2) investigates whether differences in diversity reflected by the heterogeneity of board members' political ideologies predict a firm's resilience. Data on individual political donations were utilised to assess the political ideology of 11,741 directors from 328 S&P 500 firms. The empirical study results suggest that the SARS-CoV-2-induced plunge in equity returns was milder among firms with more heterogeneous boards, reinforcing the notion that ideologically diverse boards are related to better firm performance. In our study, we present initial evidence demonstrating the wide-ranging effects of ideological diversity in corporate boardrooms. Specifically, we explore how such diversity (*ideological board diversity*) materialises in the equity price performance of firms' during times of uncertainty.

In the last empirical chapter (Essay 3), the study focuses on the influence of board leadership structure (CEO duality) and the moderating role of female directors, IT expertise and market competition on firms' effectiveness in information security management. This research draws on *corporate governance* (agency, stewardship and resource dependency) theories to conduct an exploratory empirical study on the association between the board structure and the possibility of information security breaches. Using a sample of 3,779 firm-year observations from the S&P500 from 2009 to 2018, the results show that CEO duality could reduce the possibility of security breaches, while the proportion of women on board could exacerbate the risk of security breaches.

Furthermore, the study finds that product market competition, female representation in the boardrooms and the presence of IT expertise moderates the relationship between CEO duality and the risk of cybersecurity breaches. Also, as corporate governance practitioners continue to advocate for more IT expertise on the board, the findings of this study suggest that duality can mitigate the need for IT expertise at the board level. The study provides valuable insight into how external corporate governance influence from the product market operates as an alternate governance mechanism for cyber security monitoring.

Declaration

Except where adequate recognition has been made, this doctoral thesis does not contain any previously published information by anyone, to the best of the author's knowledge.

No university has accepted this thesis for the award of any other degree or diploma.

Signature:

Date: 30 June 2022

Dedication

To the best parents, my most precious wife, children and wonderful siblings for always being there for me directly and indirectly.

Acknowledgements

I would like to express my gratitude to Dr. Monomita Nandy and Dr. Olayinka Uadiale for providing me with their supervision, guidance, encouragement, and unwavering support during my PhD studies. I am deeply grateful to Dr. Arthur Egwuonwu for his continuous reassurance, optimism, and advice throughout my academic journey. My parents, Chief Ambrose Nnaemeka and Mrs. Grace Ngozika Egwuonwu, have been a constant source of support and prayers, and I owe them a special mention for their unwavering commitment to my success. I would also like to acknowledge my wife, Bridget Egwuonwu (nee Gassama), my siblings, and my children for their motivation and unwavering support. Their love and smiles have been a driving force behind my success. I would like to extend my gratitude to Dr. Ahmed Elamer for his previous comments on my work. Additionally, I am thankful to my examiners, Dr. Haoyu Li (Brunel University) and Dr. Ernest Ezeani (Manchester Metropolitan University), for their invaluable feedback and advice, which I believe will serve me well beyond this thesis. I would like to thank Adedapo Ademosu, Ferenkeh, and Marie Marah for their encouragement and support. My sincere appreciation goes to Dr. Amama Shaukart for providing me with my first teaching opportunity. I am also indebted to Dr. Chima Mordi and Mrs. Sue Hardman for their mentoring, encouragement, and motivation. Finally, I would like to acknowledge and express my appreciation to all the administrative staff at Brunel Business School for their support and assistance.

Publications Arising from Empirical Essays

Referred Journal Article

Egwuonwu A, Lodh S, Nandy M. Stock comovement and governance bundles: Does the quality of national governance moderate this relationship? *Int J Fin Econ*. 2021; 1–19.

<https://doi.org/10.1002/ijfe.2548>

Note: Permission granted from all the co-authors to include the above publication in this thesis and I would like to thank them for their valuable contributions.

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List of Abbreviations

2SLS	Two-Stage Least Square
ATT	Average Treatment Effects on the Treated
CEO	Chief Executive Officer
CG	Corporate Governance
COO	Chief Operating Officer
CSR	Corporate Social Responsibility
DEF 14A	Definitive Proxy Statement
DGEI	Datastream Global Equity Index
DJIA	Dow Jones Industrial Average
ESG	Environmental Social and Governance
FCF	Free Cash Flow
FEC	Federal Election Commission
FTSE	Financial Times Stock Exchange
GEE	Generalised Estimating Equation
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
IPO	Initial Public Offering
IT	Information Technology
ITG	Information Technology Governance
IV	Instrumental Variable
KMO	Kaiser Meyer Olkin Test
NGQ	National Governance Quality
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PMC	Product Market Competition
PS	Propensity Score
PSM	Propensity Score Matching

QCA	Qualitative Comparative Analysis
RDT	Resource Dependency Theory
RI	Return Index
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus-2
SEC	Securities and Exchange Commission
SIC	Standard Industrial Classification
S&P 500	Standard and Poor's 500
TMT	Top Management Team
TRI	Total Return Index
UK	United Kingdom
US	United States of America
USA	United States of America
VIF	Variance Inflation Factor
WHO	World Health Organisation

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Chapter 1

Introduction ¹

1. Introduction

This chapter is the overview and introduction of the thesis. Specifically, Section 1.1. sheds light on the study background by underlining the importance of corporate governance for firms and their various stakeholders. Section 1.2. highlights the research aim, objectives and questions addressed in the three empirical studies. Section 1.4. briefly discusses the motivation and significance of the study by highlighting the importance of the board of directors and their effects on firm outcomes. Section 1.5. briefly discusses the research methodology, including research philosophy, data, key variables, estimation methods, and endogeneity concerns in the three studies, Section 1.6. outlines the overview of findings; Section 1.7. highlights the research contributions and Section 1.8. highlights the structure of the remainder of the thesis.

1.1. Background

Over the past two decades, numerous large corporations have appeared to fail in the global financial markets. The collapse of significant American and British companies, including BP, Enron, Equifax, Lehman Brothers, and the Volkswagen Emissions Scandal, has brought the topic of corporate governance to the forefront. Therefore, scholars, observers, regulators, and investors have begun to discuss and debate corporate governance (Boyd, 1995; Daily & Dalton, 1994; Dalton et al., 1998). The term “corporate governance” (CG) is not globally defined. Shleifer & Vishny (1997) define CG as how suppliers of capital to firms assure themselves of getting a return on their investments.

¹ This thesis examines the association between board structure and corporate outcomes, specifically, stock market comovement, share price resilience amid the SARS-CoV-2 epidemic and the occurrence of cybersecurity breaches, respectively. Each area of examination constitutes an essay.

Corporate governance is a method by which businesses are managed and governed, according to the US Sarbanes-Oxley Act. The board of directors is, therefore, primarily responsible for corporate governance². Accountability, direction, control, and evaluation are resounding themes in the majority of definitions of corporate governance.

A system of internal and external checks and balances that ensures that companies fulfil their accountability to shareholders and act in a socially responsible manner in all areas of their business activities is the broad definition of corporate governance, according to Solomon and Solomon (2004) as opposed to, the scope of the definition of corporate governance that refers to whether the business should run in the sole interest of the shareholders or in the benefit of those who will be influenced by it (e.g. people, customers, the general public, government establishments and others). The restricted definition is preferred from the viewpoints of accounting and financial literature, the one that will be used for this dissertation is the restricted one. Further, corporate governance difficulties have existed since Adam Smith's significant writings, despite the phrase being used explicitly in the 1960s. By examining the division of ownership and control in the 1930s, Berle and Means (1932) and Dodd (1932) provided insight into corporate governance. Also, the rise of professional managers and modern corporations (Chandler, 1962) further exacerbates the separation of ownership and control. Since all possible eventualities cannot be contracted, managers must use discretion when dealing with future eventualities. In this situation, managers can act in the interest of shareholders or in their interest. Hence corporate governance mechanisms, such as the board of directors, are required to ensure that managers act in the interest of shareholders. Agency problems arise from the separation of ownership and control and the limited liability of the modern corporation. As firms grow, the need for capital and professional managers to run these large firms results in further separation of ownership and control and the accompanying agency costs. Managers (agents) do not always act in the best interest of the shareholders (principals).

² Donaldson(1990, p.376) views corporate governance as a “structure whereby managers at the epicentre of the organisation are controlled through the board members, its associated structures, executive initiative, and other schemes of monitoring and control”.

Agency costs arise because shareholders attempt to monitor managers and use incentives and contracts to align managers' and shareholders' interests (Solomon & Solomon, 2004). The potential conflicts of interest between managers and shareholders can arise from managers' resistance to being replaced by a more competent successor, the difference in risk borne by shareholders and managers and the diversion of *free cash flow* (FCF) for the benefit of managers. Managers and shareholders may face different degrees of risk. The above is particularly true when companies are not closely controlled. In such companies, shareholders usually have a diversified portfolio of stocks; in comparison, managers face undiversified risk.

Managers have significant human capital tied up in the firm and often a significant equity interest. Hence, managers are expected to be more conservative in their decision-making since they have much more at stake. Managers' conservative decision-making may conflict with shareholders' goal of profit maximisation. Therefore, managers may be unwilling to take on a worthwhile project from the shareholders' point of view because they have a lot to lose if the project fails (Denis, 2001). On the other hand, incentive-based compensation, such as stock options, can induce unnecessary risk-taking behaviour by managers. With stock options, managers can benefit significantly from high-risk projects that succeed while facing limited downside risk if the project fails. This is particularly true if executives have limited equity interests in the firm. Hence, incentive compensation schemes can increase the alignment of interests between managers and shareholders or increase risk-taking by executives.

Jensen (1986) was the first to identify the agency costs of FCF. He argued that managers could use FCF to pursue value-destroying projects rather than return the FCF to shareholders. Managers may mistakenly believe the project is worthwhile or wish to maximise assets under management (Denis, 2001). Managers acquire authority and reputation as assets under control grow, and their salary typically rises as a function of the size of the organisation. Additionally, managers may spend *free cash flow* to work on *little* projects that frequently have a negative value. Therefore, instead of paying out FCF to shareholders, managers waste money by pursuing these projects.

The issues with agencies that arise as a result of the division of ownership and control may be resolved in a number of ways. These include, manager oversight, and incentive programmes that balance managers' and shareholders' interests.³ The corporate governance literature extensively debates the effectiveness of these potential solutions. In particular, monitoring and aligning interests occur through various corporate governance mechanisms that may help alleviate agency problems. For example, external governance mechanisms such as national governance quality and product market competition and internal mechanisms such as monitoring, and incentive-based compensation can align the interests of managers and shareholders. The debate is ongoing, and we hope this thesis will help understand the critical role that corporate governance plays in mitigating conflict of interest between owners and managers and ultimately in improving firm performance outcomes.

1.2. Corporate Governance Mechanisms

1.2.1. National Governance Quality

The most fundamental external processes are known as National Governance Quality (NGQs). Press, scholars and professionals are paying more and more attention to regulations and rules. In the US, one such regulation required the Securities and Exchange Commission to disclose the pay of senior executives. Due to this, there is an expanding body of scholarship that views executive salary as both a source of and a potential remedy for agency issues. An increasing number of people are calling for legal and regulatory reforms as a result of US corporate disasters like Enron and WorldCom, as well as the global financial crisis. National governance structures are designed and employed to address agency problems (Aguilera, 2005; La Porta et al., 2000). They consist of formal constraints (e.g., regulations and laws, economic and political regulations and procedures, and other clear restrictions on bank behaviour) and informal

³ Jensen & Meckling (1976) provide a comprehensive account of shareholders and agents relate to mitigate agency costs.

rules containing unwritten but relatively critical social norms, conventions, codes of ethics, and values (Kaufmann et al., 2011; Schiehl et al., 2014; Yoshikawa, Zhu, & Wang, 2014). Thus, national governance structures can motivate economic actors to comply with laws and regulations. Many nations have passed regulations to safeguard minority shareholders. This is especially true in nations where corporations with total control are the most common type. Shleifer and Vishny (1997) contend that the underlying agency problem is different from the conventional agency problem in many large organisations around the world (between managers and shareholders). However, it is the struggle between controlling stockholders and outside investors, therefore in this research we explore NGQs as a determinant of agency problems and the extent to which it explains firm performance outcomes.

1.2.2. Product Market Competition

A practical set of corporate governance measures has been introduced and widely adopted to tackle the well-known agency conflicts resulting from the separation of ownership and control (Fama & Jensen, 1983; Jensen & Meckling, 1976). Despite the existence of conventional corporate governance practices, significant evidence indicates their inadequacy in protecting the rights and interests of minority shareholders (e.g. Bebchuk & Fried, 2005). Notwithstanding this fact, numerous companies can thrive and generate profits in both domestic and international markets due to the powerful influence exerted by product market competition on their operations (Scharfstein, 1988; Schmidt, 1997). Competition in the product market can also be viewed as a governance mechanism that compels managers to avoid conflict with shareholders. Extreme competition has the potential to decrease managerial inefficiency and make managers increase firm efficiency (Alchian, 1950; Stigler, 1958). Nickell (1996) finds that when competition is measured using the numbers of competing firms or the rent levels monopolists take, the competitive process becomes linked to a considerably higher growth rate in total factor productivity. In addition, extreme competition can aid in monitoring and appraising managers (Hart, 1983; Holmstrom, 1982; Nalebuff & Stiglitz, 1983) as managers are persuaded to increase the firm's profits (Fee & Hadlock, 2004; Giroud & Mueller, 2010).

Guadalupe and Pérez-González (2006) posit that extreme competition in the product market limits the degree of private control gains that corporate insiders extract. To summarise, the arguments propose that intense competition in the product market will limit managers from engaging in activities that contradict the interests of shareholders (Hart, 1983).

1.2.3. Board of Directors

The board of directors acts as an internal mechanism for corporate governance and has the following fundamental responsibilities. These are to choose, compensate, and evaluate the performance of senior management; vote on critical operational initiatives (such as major capital investments); vote on significant financial decisions (such as distributing dividends and buying back shares); and offer professional guidance to management (Kim & Nofsinger, 2004).

Additionally, the board's oversight function is another vital duty of directors. Their fiduciary obligation entails supervising managers to guarantee that they operate in the best interests of shareholders. The board of directors, however, frequently acts as a "rubber stamp" for CEOs. Some of the most notorious business failures, including Enron and WorldCom, are evidence of this. Similarly, when CEOs control the nomination process and influence the choice of directors, the board of directors can be ineffective monitors because potential directors will be more likely to support the CEO (Becht et al., 2003). Most recent regulations and exchange rules focus on board effectiveness and independence. US governance rules (see, e.g. Sarbanes-Oxley Act) and corporate governance guidelines are aimed at improving the independence and effectiveness of the board in the US. The Cadbury report (1992) in the UK contains similar recommendations. Findings on the effectiveness of independent directors are mixed. Several studies provide evidence of a negative relationship between the number of outside directors and company performance in the US (Agrawal & Knoeber, 1998; Klein, 1998; Yermack, 1996).

On the other hand, other studies provide evidence of a positive relationship between outside directors and firm performance (Fama, 1980; Fama & Jensen, 1983; Rosenstein & Wyatt, 1990). Hermalin and Weisbach (2003) survey the literature on the board of directors and highlight some of the common findings.

First, smaller boards and boards with a more significant proportion of outside directors' result in management acting more in line with shareholders' interests. Second, smaller boards and boards with more "independent" directors are more likely to remove poorly performing managers. Third, CEO compensation packages are also more sensitive to performance in firms with smaller boards. Fourth, boards with a more significant proportion of outside directors make better acquisition-related decisions. Nonetheless, the majority of evidence suggests that the ratio of outside directors to total board members has no relationship with firm performance. Regarding the characteristics of firms and their boards of directors, larger and older firms with lower levels of insider ownership tend to have more outside directors.

On the other hand, closely held firms have boards that are dominated by insiders, according to Hermalin and Weisbach (2003). Put together, research has yet to empirically consider board of directors' structures as a collection of practices functions concurrently as a bundle and the degree to which the relationship predicts firm's performance outcomes.

1.2.4. CEO-TMT Compensation

In the last few decades, executive pay has experienced a substantial surge in the US and most other countries. The primary drivers of this trend include the bullish market during the 1980s and 1990s, the widespread adoption of stock options, the use of benchmarking to establish compensation packages, and prevailing market standards. (Becht et al., 2003). In contrast to stock options, which is the percentage of compensation received in contingent, long-term forms, total pay is simply the total of all compensation received by an executive (including the CEO).

According to the agency theory incentive-based pay should lead to a net gain in shareholder wealth (Baysinger & Hoskisson, 1990; Jensen & Murphy, 1990). As a direct effect of executive labour division, pay for CEOs and TMT members may converge. However, firm performance and its relationship to the amount of pay earned by firm executives is included in the majority of executive compensation packages nowadays due to the difficulty in managing huge organisations.

Numerous studies (see e.g. Devers et al, 2007; Gomez-Mejia and Wiseman, 1997; Junarsin, 2011; Lin et al, 2011; Van deer Laan et al, 2010 and others). were conducted to determine whether there is a relationship between CEO pay and firm performance, and how this relationship influences the firm as an economic entity and its viability in the current market. Therefore, the degree to which top managers' and shareholders' interests are aligned will depend on how remuneration is established (Jensen & Murphy, 1990). Furthermore, equal compensation for CEO and TMTs may have a significant impact on executives' views of *procedural fairness* (Kim and Mauborgne, 1996 as seen in Carpenter & Sanders, 2002), which in turn may have an impact on the degree of behavioural integration among TMT members. Such potential effects of executive compensation alignment are crucial because behaviourally integrated TMTs enable businesses to adapt more quickly to shifting competitive environments (O'Reilly, Snyder, & Boothe, 1993) and subsequently result in greater firm performance. (Hambrick, 1995).

These results have important implications for incentive alignment (pay schemes), which are used as a tool in corporate governance to balance the interests of managers and shareholders. Nevertheless, research has yet to empirically test the CEO-TMT pay as a bundle and its performance effects. Therefore, in this research we explore how CEO-TMT pay and the degree to which their relationship influence firm performance outcome. Overall, given the vital role of corporate governance mechanisms in alleviating agency problems, this research focuses on both external and internal mechanisms e.g. board of directors monitoring (independent directors, ideology, diversity & CEO duality) and incentive alignment mechanisms (pay), on key corporate outcomes—specifically, stock return comovement, stock market crash risk and cyber security threats.

1.3. Research Aim and Objectives

Based on the above narrative, this study aims to examine the impact of corporate governance on stock price, and cyber security risks of US firms. The following are the objectives of this investigation: 1) to examine the impact of corporate governance on Stock comovement of US-listed firms: 2) to provide evidence from the recent infectious disease outbreak (SARS-CoV-2) and examine the effect of directors' ideologies on stock price performance amidst the pandemic: 3) to investigate the relationship between board structure (leadership configurations) in the boardroom and the likelihood of cyber security risks.

The above objectives can be depicted in the following research questions:

- RQ1: Can CG monitoring mechanisms and incentive alignment provision as a bundle affect the level of information flow into firms' share prices (comovement)?
- RQ2: Can national governance quality (NGQ) affect the level of information flow into firms' share prices (comovement)?
- RQ3: Does the Board of directors' ideological diversity influence the share price of firms in the S&P 500 amidst SARS-CoV-2 exposure and sentiment? And, to what extent does the board of directors' ideological diversity have a moderating power on the share price SARS-CoV-2 exposure/sentiment nexus?
- RQ4: Are firms targeted due to a lack of board oversight and policies related to governance? And does market competition help firms respond to a data breach?

To answer these questions, this study developed a set of hypotheses, and these hypotheses were developed in the three empirical chapters of this study.

1. H1: the effect of monitoring mechanisms as a bundle can scale back the comovement of stock prices *ceteris paribus*.

2. H2: the effect of TMT and CEO incentive alignment as a bundle can scale back the comovement of stock prices *ceteris paribus*.
3. H3: NGQs' moderating effect on governance monitoring mechanisms will reduce comovement of stock prices *ceteris paribus*.
4. H4: NGQs' moderating effect on incentive alignment provisions will minimise stock price comovement *ceteris paribus*.
5. H5: Board ideological diversity may help (hinder) firms in dealing with pandemic-induced uncertainties; therefore, a negative (positive) association between ideology diversity and equity market return relating to SARS-CoV-2.
6. H5a: Board ideological diversity moderates the relationship between SARS-CoV-2 exposure and market return, i.e. as ideology diversity increases in the boardroom, the more robust (weaker) the market return.
7. H5b: Board ideological diversity moderates the relationship between SARS-CoV-2 net sentiment and market return, i.e. as ideology diversity increases in the boardroom, investors' net sentiments about SARS-CoV-2 exposure are weakened, therefore, improving equity market return.
8. H6: Firms in which the CEO also serves as the chairman of the Board of Directors are negatively (positively) linked with the probability of cyber security breaches *ceteris paribus*.
9. H7: The presence of women in the boardroom, may moderate the effect of CEO DUALITY on the likelihood of cybersecurity breaches *ceteris paribus*.
10. H8: Boards with IT expertise may moderate the effect of CEO DUALITY on the likelihood of cybersecurity breaches *ceteris paribus*.
11. H9: Product market competition may moderate the effect of CEO DUALITY on the probability of cyber security breaches *ceteris paribus*.

1.4. Significance and Motivation of the Study

Studying the structure of the board of directors is crucial because of the significant impact of the board's effectiveness and functionality (Cochran et al., 1985; Kesner, 1987), by examining the composition, roles, and responsibilities of the board members, one can gain valuable insights into how the board operates and makes decisions.

Understanding the board's structure can also provide clues as to how power is distributed among the directors, how conflicts of interest are managed, and how the board interacts with management and other stakeholders. Therefore, it is essential for scholars, practitioners, and stakeholders alike to delve into the intricacies of the board's structure to enhance corporate governance and performance. In this study, board structure refers to board independence (including diversity and CEO/ Chairperson duality) and incentive alignment (pay) since these variables are the most important and most debated in corporate governance studies (Adams et al., 2010; Hermalin & Weisbach, 2003; Wintoki et al., 2012). However, the literature indicates that other aspects, for example directors' characteristics, such as directors' tenure, age, and directors' skills, primarily financial and information technology (IT) are also expected to be associated with corporate performance outcomes. Specifically, directors with long-term tenure have more knowledge and expertise and can improve performance (Payne et al., 2009). The director's skills and knowledge may also affect the corporate performance outcome since these abilities may help better evaluate investment opportunities (Minton et al., 2014). The theoretical arguments provided by Jensen and Meckling (1976) and Haugen and Senbet (1981) indicate how managerial stock and stock option holdings may influence financing choices and investment decisions. The three structural variables that are the subject of this study are board independence, diversity, and dual CEO/Chairperson responsibilities. The mixed and ambiguous results on how these variables are related to business performance served as the basis for choosing these variables. According to Adams et al. (2010), the endogenous nature of board structure factors causes a number of issues with the estimate method, making it challenging to determine the true impact of governance practice.

The non-executive directors are considered to be objective experts and care for their reputation in the labour market (Eisenhardt, 1989; Jensen & Meckling, 1976; Kesner, 1987). More importantly, the non-executive directors are usually considered independent from the firm management (Hart, 1995) and are expected to work in line with shareholder interests and effectively monitor managerial actions (Lim et al., 2007). However, since the independence from management is unobservable, this leads to the question of whether those directors are genuinely independent.

The unobservability of directors' independence also leads to mixed and inconclusive results regarding their effect on corporate outcomes (Adams et al., 2010; Hermalin and Weisbach, 1991, 1998, 2003). Another important aspect of board structure that affects board effectiveness is the CEO/Chairperson duality. According to agency theory, combining the positions of the board chair and CEO may negatively affect corporate value (Jensen, 1993). The reason behind that is the power being concentrated in the CEO's hands, which may result in a less effective board (Kim & Buchanan, 2008). A strong CEO may control the board, which could result in less effective oversight from the other board directors (Jensen, 1993). The empirical evidence on how combining or splitting these responsibilities may affect business value is equally contradictory and unsatisfactory. Furthermore, analysing the effects of the board structure on corporate outcomes and coming to consistent conclusions are made more difficult by the dynamics of the board of directors and the endogenous character of its structure. Recently, regulators have called for increased female representation on corporate boards (Baixauli-Soler et al., 2014). Most of these calls support the equal opportunities that should allow females and minorities to join corporate boards (Campbell & Minguez-Vera, 2010). Prior literature documents that the board of directors' effectiveness is enhanced with greater diversity (Carter et al., 2003).

The prevalence of female board members offers heterogeneous views and perspectives that lead to a better decision-making process. Concerning risk and uncertainties (idiosyncratic, crash risk or cyber security), gender differences in risk-taking behaviour and the widespread belief that females are more risk averse are well documented in the

literature (Croson & Gneezy, 2009). While this belief may be true for females in the general population, the story may differ for females in high leadership positions (Adams & Funk, 2012). Scholars also argue that levels of governance effectiveness depend on a bundle of internal and external governance mechanisms (Jensen, 2010; Rediker & Seth, 1995; Williamson, 1983), in which external solid governance mechanisms may be substituted (or complement) for weak (or strong) internal governance mechanisms. To illustrate the effects of various corporate governance mechanisms in empirical studies, scholars pursue two approaches.

The first approach involves scholars concentrating on each benefit or risk that impacts firm performance and analysing the corresponding individual (internal or external) corporate governance mechanism (Deyoung & Nolle, 1996; Grove et al., 2011; Michel & Hambrick, 1992; Thomsen & Pedersen, 2000). In addition, scholars provide insights into each corporate governance mechanism by focusing on explaining one mechanism at a time. Extant literature focuses to a large extent on external directors (Horiuchi & Shimizu, 2001; Kor & Sundaramurthy, 2008; Mishra & Nielsen, 2000), external director tenures (Michel & Hambrick, 1992), director share ownerships (Low, 2009; Morck et al., 1988), board expertise (Booth & Deli, 1999; Van Ness et al., 2010), board homogeneity (Berger et al., 2014; Core et al., 1999), and ownership structures (Miyajima & Kuroki, 2008; Thomsen & Pedersen, 2000). At the industry or country level, these studies find mixed evidence on board characteristics and ownership structures in association with company performances or risk-taking, indicating that agency costs differ between different types of mechanisms across companies and countries and the interactions between different types of mechanisms. Drawing on these diversified methodologies, this study assesses the effects of corporate governance on the S&P500 non-financial firms by focusing on the interactions between internal and external governance mechanisms as a bundle and secondly assessing and explaining one governance mechanism at a time.

Specifically, the study explores some governance mechanisms as a bundle of practice and examines their implication on how information reflects in stock prices. Roll (1988) argues that the degree to which private information is contained in stock prices is indicated by

the R^2 statistic measure from the market model to determine the level of information about the firm. He contends that public information explains little about stock price movement and that noise or private knowledge could explain the variation. Morck, Yeung, and Yu (2000) say that larger R^2 values show that stock returns move in lockstep with industry and market returns, implying that less firm-specific information is accessible. Several articles have examined the use of R^2 to measure the information content of stock prices. (Amihud, 2002; An & Zhang, 2013; Becker-Blease & Paul, 2006; Boubaker, Mansali, & Rjiba, 2014; Chan & Hameed, 2006; Chan & Chan, 2014; Chelley-Steeley, Lambertides, & Steeley, 2015; Gul, Srinidhi, & Ng, 2011; Kim, Zhang, Li, & Tian, 2014; Piotroski & Roulstone, 2004). Piotroski & Roulstone (2004) give evidence of the primary informed market actors and propose that their influence varies from one another using firm-level data from the US. They discover that while insiders and institutional investors enhance the amount of firm-specific information incorporated into stock prices, financial analysts decrease it. In an emerging market, Chan & Hameed (2006) find that security analysts create more market-wide information than firm-specific information. Several analyses have investigated the link between the information content of stock prices and CG mechanisms. However, the study of governance practices as a bundle and the comovement of stock prices remains scarce in the literature; thus—We study how multiple governance mechanisms function concurrently within firms and impact subsequent organisational choices and outcomes. Again, few studies examine board monitoring and incentive alignment rules and how they interact with country-level governance.

The above narrative provides another motivation to carry out this research. Empirical research is necessary since firm-level governance and country factors support successful governance. Therefore, we examine and investigate the influence of CG monitoring and incentive alignment provisions as a bundle on stock price comovement and, as a result, determine whether the relationship is moderated by the US national governance quality (NGQ). In addition, with an increased focus on board effectiveness, In December 2009, the Securities and Exchange Commission (SEC) authorised a law that requires firms to enhance their proxy filings.

The disclosure about board diversity became one of the essential new specifications because Luis Aguilar⁴ stressed the significance of director diversity in a speech following the rule's enactment, citing CalPERS⁵

Studies and diversity-focused international reforms prove that pursuing board diversity benefits a firm. Such research, however, is essentially descriptive and needs to account for the endogenous character of board composition; hence, determining how director heterogeneity affects performance is critical. Although management researchers have discovered that diversity is helpful in certain situations, it is still being determined what the benefits will be in the finance setting. This conundrum has contributed to a more significant debate in the US about the efficacy of CG practises (e.g. Bebchuk & Fried, 2004; Daily, Dalton, & Cannella, 2003). However, current disclosure requirements and governance initiatives have expanded the scope of diversity (age, gender, race, and tenure). The SEC is unconcerned about the type of diversity that firms choose to focus on, but it does offer some suggestions about the forms of diversity that should be considered. Prior studies (see, e.g. Adams & Ferreira, 2009; Carter et al., 2003; Erhardt et al., 2003; Farrell & Hersch, 2005; Gul, Srinidhi, & Ng, 2011; Radu & Smaili, 2020) and others have examined the role of board gender diversity, finding mixed results. However, little attention has been paid in the existing literature to how directors deeply held political opinions influence corporate outcomes. This does not imply that scholars have neglected variety in director preferences; instead, these studies have focused on directors' relational motives, which are anchored in fundamental social needs for affiliation and group identification. Political ideologies give a cognitive template for interpreting and assessing situations and form the basis of people's ideas of "how society should be governed" (Jost, Federico & Napier, 2009, p. 309). In light of extensive studies in political psychology demonstrating that ideologies can have a significant impact on decisions in a range of domains outside of formal politics. See Jost, Federico, & Napier, 2009, for a review.

⁴ From 2008 - 2015 Luis Aguilar was Commissioner US Securities and Exchange Commission

⁵ <https://www.calpers.ca.gov/docs/forms-publications/facts-about.pdf>

Following these studies, the authors acknowledged the need for more work to understand how bias can lead to different governance decisions. However, only a few studies have investigated individual differences, mostly due to the difficulty of gathering data on personal values, cognitive models, and personality. Adams et al. (2011) posit that directors may possess different personal values, leading to a preference for shareholder versus stakeholder views, by surveying directors from 288 Swedish firms.

In turn, these values may affect directorial decisions that favour the shareholder or stakeholder, beyond their roles on the board. Masulis & Mobbs (2014) found that independent directors who value their reputation may increase board attendance rates, firm performance, and CEO replacement due to poor performance. Post & Byron (2015) theorised that the different cognitive frame of female directors (i.e., having stricter ethical standards, more risk-averse, and more prepared) promote board monitoring activities and increase firm financial performance. Westphal & Shani (2016) found that self-regulated cognition influences the effect of ingratiation on high-status actors within the organization and may increase the chance of board appointments. Furthermore, directors' identities and identification with the organisation may influence resource provision and monitoring (Zhu & Yoshikawa, 2016). Compare to the other areas in the literature, only a few recent studies have paid theoretical or empirical attention to the difference among individuals and their behavioural processes in a corporate governance setting. While these studies help us understand how differences between decision makers may influence corporate governance, we have very limited knowledge of ideology diversity of board members and its influence on a company's resilience. In line with the agency relationship, cybersecurity breaches exacerbates agency costs and information asymmetry which can facilitate an environment in reducing shareholders value.

Also, the World Economic Forum (WEF) claimed that between December 31, 2019, and April 14, 2020, the SARS-CoV-2 resulted in a 50.1 per cent rise in cyber-attacks, with an associated 30,000 cyber-attacks that were specifically SARS-CoV-2 linked (WEF, 2020).

Interpol found 907,000 spam emails, 737 malware-related instances, and 48,000 malicious URLs tied to SARS-CoV-2 in the four months from January to April 2020 (Interpol, 2020). In the second quarter of 2020, the mean ransomware payment was \$178,254 a 60% increase from the first quarter.⁶ As per reports, Google blocked about 18 million malware and phishing emails related to the SARS-CoV-2 virus daily in April 2020. (Kumaran & Lugani, 2020).

Financial market regulators worldwide are increasingly interested in cyber monitoring and macroprudential regulation (Kashyap & Wetherilt, 2019). Cyberattacks pose significant threats to trading and banking systems, with new and unexpected avenues for personal attacks to spread into systemic crises such as *cyber bank runs* (Duffie & Younger, 2019, as seen in Jamilov et al., 2021). Despite the ongoing interest of industry participants and decision-makers, empirical studies on the economics of cyber security are limited.

The gap, however, has been on how directors' structure can mitigate the risk of a breach. Previous studies have revealed that the event of cyber security has an adverse market reaction. (see, e.g. Gordon et al., 2011; Johnson et al., 2017; Kamiya et al., 2020; Telang & Wattal, 2007; Volz and Shepardson, 2017), resulting in increased risk (Romanosky et al., 2014), higher audit fees (Li et al., 2020) and an increase in bid-ask spread (Rosati et al., 2017). It is, therefore, plausible that internal & external corporate governance mechanisms (board structure and competition) influence the risk of a breach.

1.5. Overview of Methodology

The research methodology chapter in this thesis is of utmost importance, as it aims to confirm the robustness of the empirical results. Therefore, this chapter's main objective

⁶ <https://www.coveware.com/blog/q2-2020-ransomware-marketplace-report>

is to deliver a clear and solid research method. In the first place, the research philosophy that is adopted in this study is explained and discussed. Further, this chapter addresses in detail the part related to the data employed in this study. Mainly, it provides a comprehensive explanation of the data collection process, variables' definitions and measurement. From the econometric point of view, this chapter describes the models' specifications and the estimation methods that will be applied in the empirical chapters.

The rest of this chapter is structured as follows: Section 1.5.1. discusses the research philosophy. Section 1.5.2. presents the data collection procedures, sources and the main criteria for sample construction. Section 1.5.2.1. to 1.5.2.5. describes and defines the study variables. This section, in particular, sheds light on the variable measurement procedures consistent with the previous related literature. In Section 1.5.2.6. Endogeneity and analytical strategies that the study adopts in dealing with different econometric problems is discussed. This section also explains the primary estimation method used in the data analysis. The preceding sections concludes the whole chapter.

1.5.1. Research Philosophy

The accuracy and credibility of research largely hinge on the appropriate choice and logical sequencing of its steps and procedures. Each step should be carefully evaluated based on the research's goals, characteristics, and nature before it is selected from various alternatives. Saunders et al. (2012) liken these procedures to the layers of an onion. The authors, identify several layers of the research process, including research philosophy, approach, strategy, time horizon, data collection and analysis methods. This section focuses on the selection of research philosophy, which is linked to the nature and evolution of knowledge as well as how it has developed (Bryman, 2012). The subsequent sections of this chapter address the remaining research procedures. The choice of research philosophy is determined by the ontological, epistemological, and methodological presumptions of the investigation. Blaikie (2000, p.8) defines ontology as the presumptions and claims made about the nature of social reality, including its components, appearance, and how they interact.

The researcher's awareness of the research's social, political, and economic reality can aid in selecting an ontological position for both the research and the researcher, as argued by Marsh & Stoker (2002).

Two primary ontological positions, objectivism and subjectivism, determine researchers' ontological perspectives, according to Saunders et al. (2012). Objectivism asserts that social entities exist externally and independently of social actors, as stated by Saunders et al. (2012, p.676). Thus, objective researchers perceive reality as an external fact with objective and factual aspects that cannot be influenced. In contrast, an opposing ontological position, subjectivism, views social phenomena as products of social interaction and in a constant state of revision (Bryman, 2012). In contrast to subjectivism, objectivism posits that social phenomena exist independently of an individual's perception or interpretation (Burrell & Morgan, 1979). Epistemology, the second branch of philosophy, is primarily concerned with identifying what constitutes good knowledge, including the nature, method, and foundation of knowledge (Blaikie, 2000; Bryman, 2012). Blaikie (2000, p.8) defines epistemology as encompassing "the possible ways of gaining knowledge of social reality, whatever it is understood to be." Research philosophy includes two epistemological positions within this context: positivism and interpretivism (Bryman, 2012; Hussey & Hussey, 1997; Patton, 1990).

According to Remenyi (1998), Positivism advocates for the use of observable social reality in research and seeks to establish law-like generalisations similar to those of the physical and natural sciences. The primary goal of theories, therefore, is to generate testable hypotheses that are subsequently tested to advance these theories. To ensure credibility and prevent duplication, a dependable research methodology must be employed (Gill & Johnson, 2002). The confirmation or refutation of tested hypotheses is expected to contribute to the growth of the examined theories (Bryman, 2012). In contrast, Interpretivism posits that reality is socially constructed and shaped by the observer (Patton, 1990). Concerning the research approach, Saunders et al. (2012) propose two commonly used research approaches: deductive and inductive.

The deductive approach involves the development of hypotheses based on an existing theory, followed by the collection and analysis of data to test these hypotheses. On the other hand, the inductive approach involves the collection and analysis of data first, followed by the development of a theory to justify the results of data analysis. In essence, the deductive approach tests existing theories while the inductive approach builds or generates theories. According to Ticehurst and Veal (1999), positivist researchers typically adopt the deductive approach in their research. Therefore, this study utilises a deductive approach as it relies on previous literature to explore how the board of directors can mitigate agency problems and consequently influence firm performance outcomes.

Further, prior works in this area provide a background on this topic, which makes it possible for the researcher to form hypotheses and test existing theories. The argument in this study relies mainly on agency theory and other perspectives considered part of the positive accounting theory. Ontologically, this study takes an objective position, i.e., depending on accounting theory in examining phenomena where the reality is objective, independent of and external to observer influence (Saunders et al., 2012). This study adopts a hypothetic-deductive method based on objectivist ontological and positivist epistemological positions, which are most relevant to this research. The study begins by examining the relationships between specific variables using a theoretical background. Hypotheses are then formulated, and data is collected and analysed to accept or reject these hypotheses. The findings of this analysis are expected to contribute to the development of the examined theory. Another crucial step in the research process is determining the most appropriate research approach, which may be quantitative or qualitative. However, selecting the appropriate ontological position is critical in facilitating this task. Objectivity is a crucial criterion for quantitative approaches, whereas qualitative approaches suggest that achieving objectivity is challenging, if not impossible (Kharabsheh, 2015).

In this study, *en masse*, the research philosophy is grounded on an objectivist ontological standpoint and employs a quantitative research approach that is deemed suitable for testing research hypotheses.

Additionally, the utilisation of the quantitative research approach enables the researcher to be independent of his/her data, which in turn helps to satisfy the positivist epistemological position.

On research methods, previous works on corporate governance has utilised three primary research methods, such as database surveys, interviews and questionnaires. Among these methods, the most commonly used approach is the database survey, while qualitative research methods have been used less frequently. The limited use of qualitative research in corporate governance research may be due to the challenges associated with collecting and evaluating data related to how internal governance mechanisms impact governance quality, as well as concerns about research objectivity in this field (Clarke, 2004). In line with this discussion, a database survey is selected as the research method for this study. In addition, determining the appropriate research paradigm is a critical step. Saunders et al. (2012, p.118) define research paradigm as “a particular way of examining social phenomena that enables researchers to gain specific understandings of these phenomena and develop explanations.”

Further, the research paradigm enables the researcher to offer a clear and rich understanding of his/her research and is selected according to ontological and epistemological positions adopted (Burrell & Morgan, 1979). According to Burrell & Morgan (1979), four main research paradigms are suggested and can be arranged to match four dimensions: functionalist, interpretive, radical humanist and radical structuralist. The main research paradigms are categorised under four philosophical dimensions: subjectivist, objectivist, radical change and regulation. The functionalist paradigm corresponds with the objectivist and regulatory dimensions. According to the functionalist paradigm, a rational and reasonable understanding of a problem within an organisation leads to the development of a logical solution (Bryman, 2012). Further, Burrell and Morgan (1979, p.26) characterized the functionalist paradigm as problem-oriented and focused on delivering practical solutions to real-world issues.

Saunders et al. (2012) identified the ontological position that aligns with the functionalist paradigm as objectivism. Therefore, given the data of this study and the philosophical beliefs of the researcher, functionalism is the appropriate paradigm to use. In summary, this empirical study is based on objectivist, ontological, and positivist epistemological positions, and therefore utilises a *hypothetico-deductive* methodology. This involves developing hypotheses to be tested based on a selected theoretical framework, and a quantitative research approach is deemed appropriate. Also, the database survey methodology is utilised for data collection, specifically longitudinal/panel data, using secondary sources.

1.5.2. Data, Key Variables and Econometric Procedure

1.5.2.1. Sample

The three empirical studies are based on samples from the US.

In essay 1, the sample consists of the top 500 capitalised firms listed on the Standard and Poor's (S&P) 500 from 2009 to 2017, obtained from the Datastream Global Equity Index (DGEI). The study selected 2009 as the beginning of its sample period to mitigate the effect of the financial crisis in the US. Financial variables are sourced from the World scope database. Country-level and NGQ bundles data were taken from the World Bank. The data excludes those firms with missing observations on financial variables, CG monitoring and incentive alignment components and missing data for estimating control variables. The final sample consists of 2,659 firm-year observations excluded firms in the financial services industry (6000–6999) due to their specific and stringent regulatory conditions. Sample firms are sorted based on Fama-French 12 Industry Classification System, and variables are winsorised at the 1st and 99th percentile to offset the effect of outliers. Essay 2 continues with the sample used in essay 1 however extended to cover the period 2009–2021. The study matches the S&P 500 firm codes with codes reported in Hassan et al. (2021) infectious disease and political risk database. Information on financial variables, equity market, and environmental social and governance (ESG) data

from Refinitiv, Worldscope and ASSET4. Data on board ideology was obtained from the US Federal Election Commission (FEC). The final sample consists of 1,850 firm years of data on 328 non-financial US firms. Essay 3 obtained cybersecurity data from the Privacy Rights Clearinghouse from 2009 to 2018 corporate governance and financial data were retrieved from Bloomberg and Refinitiv. There is an exclusion of software and computer industries (3570–3579 and 7370–7379) to eliminate any impact of IT expertise among employees, which is abundant in this sector. Therefore, the final sample consists of 3,770 firm years of data, including 162 cybersecurity breaches.

1.5.2.2. Key dependent variable(s) for the research

The dependent variable in essay 1 is comovement. *Comovement* is defined as the extent to which variation in firm-level stock return can be explained by market and industry returns. Following extant literature (Crawford et al., 2012; Ding et al., 2019; Durnev et al., 2003; Piotroski & Roulstone, 2004), this research measures the levels of Comovement with adjusted R2 from the market model regression to capture the extent to which stock price movement can be explained by both market and industry-wide information. After a log transformation, a lower synchronicity measure implies that market and industry returns can explain a smaller proportion of individual stock returns, suggesting that more firm-specific information has been capitalised into the stock price. In essay 2, The dependent variable for the research is the weekly Stock return. Following the extant literature (Ding et al., 2021), *each firm's weekly stock return* is calculated using dividend-adjusted closing prices on the week's last trading day. In essay 3, The key dependent variable for the research is *Breach*. Following extant literature (Hsu & Wang, 2014), this research defines a breach as Equals 1 if the firm has cyber security breach announcement(s) at time t; 0 otherwise.

1.5.2.3. Key independent variables for essay 1

The key independent variables in this study are firstly *BOARD_MON*. *BOARD_MON* is the first principal component of board monitoring mechanisms comprising the

proportion of independent directors, CEO duality, and board gender diversity. Prior studies use the percentage of female directors on the board to measure gender diversity (e.g. Adams & Ferreira, 2009; Ahern & Dittmar, 2012; Faccio *et al.*, 2016; Huang & Kisgen, 2013). Other studies (e.g. Gul *et al.*, 2011) use the number of women on the board or a dummy variable to measure the proportion or percentage of female directors on the board. Secondly *CEO_INCENTIVE*. *CEO_INCENTIVE* is the first principal component of TMT incentive alignment comprising *DIR_PAY* and *CEO_PAY*. *DIR_PAY* was measured by the sum of shares and other compensation awarded to a firm's executive listed on Bloomberg. *CEO_PAY* is the total CEO pay (e.g. salary, annual bonus, long-term incentive plans, option and stock grants). Prior studies use the proportion of CEO long-term variable pay (e.g. stock-based compensation) scaled by total compensation as a measure of incentive alignment (e.g. Messersmith *et al.*, 2011; Ntim *et al.*, 2019; Oh *et al.*, 2018). Lastly, *NGQ* is the first principal component of the six NGQ dimensions (Kaufman *et al.*, 2011): voice and accountability, political stability, government effectiveness, regulations, the rule of law, and corruption.

1.5.2.4. *Key independent variable for essay 2*

The primary explanatory variable in this research is *ID_DIVERSITY*. Ideological diversity in the boardroom is measured using political campaign contributions recorded by the US FEC. Our study focused on donations to the two major parties, Democrats and Republicans, and support for the two parties is strongly related to ideological liberalism and conservatism, respectively (Jost, 2006). We constructed this measure from individual directors' donations, as corporate contributions tend to be motivated by non-ideological aims (i.e., lobbying), whereas directors will use their contributions to express ideological preferences (Ansolabehere *et al.*, 2003; Fremeth *et al.*, 2013).

We coded individual directors' yearly campaign contributions as either Democrat or Republican and calculated a measure of ideology for each director year in our sample, using the inverse Herfindahl index.

1.5.2.5. Key independent variable for essay 3

The primary explanatory variable in this research is *CEO_DUALITY*. *CEO_duality* is coded as one (1) if the CEO is the same person as the chairman/chairperson of the board; otherwise, zero.

1.5.2.6. Endogeneity

This research first employs ordinary least squares (OLS), considering the time series and cross-sectional differences to study the relationship between CG mechanisms and firm outcomes. In order to individually consider time-series and cross-sectional differences, the research then employs fixed effect (FE) in essay one in order to help avoid misspecification of the model due to omitted variable bias and controls for year fluctuations. The research also employs alternative variables and econometric specifications to investigate the robustness of the results. Additionally, to address the concern of endogeneity, this research uses several strategies, including the two-stage least squares (2SLS) and propensity score matching (PSM) estimators. The 2SLS is a statistical technique that is used to estimate the causal relationship between two variables when there is an endogeneity problem.

Endogeneity occurs when the explanatory variable in a regression is correlated with the error term, resulting in biased estimates. Instrumental variables (IV) is a method used in econometrics to address endogeneity by using a variable that is correlated with the explanatory variable but not correlated with the error term. The instrument should meet two criteria: relevance and exogeneity. The instrument is considered relevant if it is correlated with the endogenous explanatory variable, and it is considered exogenous if it is not correlated with the error term. The two stages in 2SLS involve creating a set of instrumental variables in the first stage and then estimating the regression using those instrumental variables in the second stage. The first stage estimates the relationship between the endogenous variable and the IVs. The second stage estimates the relationship between the instrumental variables and the dependent variable. In essay one, the IVs

employed are a predicted board monitoring and CEO incentive variable using all relevant control variables in the analysis., following Ferreira & Laux (2007). In essay two, the IVs employed are the ESG score of the firms, the proportion of female directors and the average age of directors following the works of (Chin et al., (2013) and Hutton et al., 2014). Last but not least, in essay three, the IV employed is CEO age, following Gontarek & Belghitar (2020), Cornett et al. (2009), and Brick et al. (2006).

Further, propensity score matching is a statistical technique used to reduce selection bias in observational studies. Selection bias occurs when the treatment and control groups differ systematically in characteristics that affect the outcome variable. Propensity score matching seeks to address this problem by creating two groups that are similar in terms of their propensity to receive the treatment. The propensity score is the probability of receiving the treatment, given the covariates or observed characteristics of the individual. It is estimated using a logistic regression model that includes all relevant covariates. The propensity score represents the likelihood that an individual would receive the treatment based on their observed characteristics.

Once the propensity score has been estimated, individuals in the treatment group are matched with individuals in the control group based on their propensity score. The matching can be done using various algorithms, including nearest neighbour (1:1) matching, stratification matching, and kernel matching. In this study we use the nearest neighbour matching which involves identifying the control individual with the closest propensity score to each treated individual. After the matching is complete, the two groups are compared in terms of their outcome variable, and the treatment effect is estimated using the regression analysis. These strategies are suggested in the literature and considered to be state-of-the-art approaches for addressing endogeneity concerns (e.g. Chen et al., 2017; Gippel et al., 2015; Liu et al., 2014). Nevertheless, this research recognises that it is challenging to remove endogeneity bias altogether. However, the research employs numerous strategies to provide a certain extent of comfort that the association between corporate governance mechanisms and numerous firm outcomes is consistent.

1.6. Overview of Research Findings

The findings of this study show that, in the US, corporate outcomes are influenced by the composition of the board of directors and the participation of female directors.

The empirical findings show that the effects of board structure and female representation as a bundle influence comovement of stock returns in the US S&P 500 firms. In the first empirical chapter⁷, the study relies on the agency theory assumptions as the main theoretical background, whereas, in the second empirical chapter, investigating the effect of board gender diversity relies on different theoretical perspectives, such as agency theory, social psychology theory and the last empirical chapter again relies on multi-theoretical perspectives such as agency theory, stewardship theory, and resource dependence theory, due to the interdisciplinary nature of the subject.

Governance bundles and stock price comovement: This research thoroughly examines the influence of CG monitoring and incentive alignment provisions as a bundle on stock price comovement of firms in the S&P 500 and, as a result, determines whether the relationship is moderated by the US national governance quality (*NGQ*). Judging by the current emergence of reforms to improve the effectiveness of board functions, this investigation is timely. Positive agency theory's formative arguments have primarily motivated CG studies and practical applications (see, for example, Fama & Jensen, 1983; Jensen, 1983; Jensen & Meckling, 1976), and it has thus been "most concerned with describing the governance mechanisms that solve the agency problem" (Eisenhardt, 1989, p.59). Consequently, many governance frameworks have been proposed to effectively mitigate the agency problem and examine how they influence organisational objectives or performance. Admittedly, there needs to be more experimental proof of how the effectiveness of each governance mechanism as a bundle affects the informativeness or non-informativeness of equity prices. Compelling evidence would thus allow us to make a more objective and informed decision about this issue.

⁷ We used empirical chapter and essay interchangeably throughout in this thesis.

In this chapter, the study aims to contribute to narrowing the evidence gap on the board of directors monitoring mechanisms and incentive alignment provisions as a bundle and the capacity of stock prices to inform by investigating the previously unexplored questions. Firstly, CG monitoring mechanisms as a bundle can affect the level of information flow into firms' share prices (*COMOVEMENT*). The second question is if incentive alignment provision can explain the level of information flow into firms' share prices (*COMOVEMENT*). The third question examines whether national governance quality (NGQ) can affect information flow into firms' share prices (*COMOVEMENT*). The main aim of this empirical chapter is to test three hypotheses about the relationship between firm-level and national governance mechanisms and stock comovement. Using Data spanning 2659 firm-year observations from 321 S&P 500 firms from 2009 to 2017, in addition to employing 2SLS and PSM regression analysis.

According to the findings of this study, CG monitoring mechanisms and incentive alignment as a bundle are negatively associated with return comovement as measured by the log transformation of R^2 . Corporate Governance monitoring mechanisms and incentive alignment as "bundles" improve the dependability of firm-specific information, avoiding agents' self-serving practices and validating the rewards of unbiased stock market transactions. Furthermore, the results indicate that NGQ modifies the relationship between board monitoring power and comovement. In particular, the influence of incentive alignment provision is most visible in firms with more significant growth opportunities than in firms with lesser significant growth prospects. This study did not find evidence of an association between incentive alignment and NGQ. This chapter's findings agree with the CG bundles view (e.g. Aguilera et al., 2008; Dalton et al., 2003; Misangyi & Acharya, 2014; Rediker & Seth, 1995); the governance bundles' multiple internal mechanisms work in tandem. This chapter also highlights the need to monitor and reform the institutional incentives surrounding CEO and TMT incentive alignment provision. They make decisions in the interest of the shareholders, reducing information asymmetry problems, which reduces the comovement of equity prices. It also highlights the necessity of better conceptualising the link between firm size and incentive alignment provision.

This thesis seeks to contribute to theory and practice in CG and stock price informativeness literature. However, what sets this essay apart is its divergence from the study of how governance bundles are formed (see, e.g. Aguilera et al., 2008; Dalton et al., 2003; Rediker and Seth, 1995; Yoshikawa et al., 2014). It broadens the theoretical boundary to include how multiple governance mechanisms interact to produce corporate outcomes such as equity price comovement. However, the practical implication shows how CG mechanisms should be designed to reduce information asymmetry and agency problems, reducing comovement, especially by displaying the joint effects of multiple governance mechanisms. To the author, this empirical study is the first to investigate CG bundles' impact on a firm's equity price performance. The results, therefore, indicate that governance monitoring mechanisms have a complementary relationship with NGQ for return comovement. Firms have strategic flexibility in configuring governance practices based on their circumstances, consistent with equifinality.

Board of directors' ideologies and stock returns: This research responds to calls for a more behaviourally oriented examination of the board by investigating the board of directors' gender and ideology in facilitating or hindering board effectiveness. Specifically, this chapter uses the SARS-CoV-2 exposure and investor attitudes to examine if the ideology of the board of directors (*ID_DIVERSITY*) explains the share prices of corporations' resilience to the pandemic. Research has explored the impact of CEO political leaning or homophily on Corporate Social Responsibility (CSR) (Chin et al., 2013; Di Giuli & Kostovetsky, 2014), Risk strategy (Christensen et al., 2015) and CEO compensation contracts (Gupta & Wowak, 2017). The limited empirical research on CEO homophily or homogeneity indicates one perspective on this phenomenon: conservative CEOs differ from all other CEOs. This research is necessary given the rise in political polarisation in the United States. The ideological differences (heterogeneity) between male and female democrat and male and female republican directors remain largely unexplored in the literature. This chapter, therefore, seeks to fill this academic lacuna on how board homophily influences firm-level outcomes (Bayat, 2017; Gupta et al., 2020; Kim et al., 2013) by answering the following research questions.

Firstly, Do the board of directors' ideological diversity influences the share price of firms in the S&P 500 amidst SARS-CoV-2 exposure and sentiment thereof? the second research question is to what extent the board of directors' ideological diversity may have a moderating power on the share price-exposure/sentiment nexus.

This study uses information on political donations from the Federal Election Commission (FEC), which gives data on both the donation (sum, schedule, recipient's name, and beneficiary) and the giver (name, address, occupation, employer, and job title) to analyse the effect of *ID_DIVERSITY* on equity return in the presence of the pandemic.

Following Gupta & Wowak (2017), this research uses the data to estimate *ID_DIVERSITY* in this empirical chapter. The study demonstrates that SARS-CoV-2 induced a plunge in equity returns in the S&P 500 from Q1 2020 to Q1 2021, which was milder among firms with more heterogeneous boards. The practical implication shows that since *ID_DIVERSITY* improves firm resilience to pandemic-induced uncertainty, higher levels of *ID_DIVERSITY* in the boardroom should be encouraged. In summary, empirical findings help offer recommendations to boards for determining the needs of firms concerning board diversity levels and evaluating the suitability of the existing board structure. This study also found that as board heterogeneity increases, firm resilience improves. As a result, the board must be aware of diversity shortfalls, the reasons for those shortcomings, and the risk of resolving their diversity issues. This is critical if S&P 500 firms want to maximise boards' potential.

Board structure on the likelihood of cybersecurity threats: Motivated by the open research questions: firstly whether firms are targeted due to lack of board oversight and policies related to governance for example leadership configuration, in the boardroom: secondly, whether gender diversity, IT expertise and market competition helps firms respond to a data breach. In other words, this study examined developed hypotheses to determine whether board structure, on the basis of CEO duality reduce the risk of data breaches. and whether the presence of women, IT expertise in the boardroom and market competition moderates the relationship.

Following *extant* literature (e.g., Higgs et al., 2016; Lankton, 2021; Lending et al., 2018; Li, No, & Wang, 2018), this research adopts a dependent variable, using the privacy rights database to obtain cyber security breach data. If a firm reported a breach during the fiscal year, the occurrence of the breach is measured as an indicator variable. From 2009 to 2018, a sample of 377 US firms was used. This study finds a negative association between the risk of cyber security breaches in firms where the CEO is the same person as the chairman. The results are robust using alternative measures of CEO power.

In addition, the study shows that product market competition, the presence of women and IT expertise in the boardroom moderates the negative association between CEO duality and the possibility of security breaches. In contrast, and interestingly, the proportion and power of influence of women in the boardroom exacerbates the risk of security breaches. Further, we did not find support of the relevance of IT expertise in the boardroom outside of IT firms and its effect on the probability of information security breaches. This result implies that board-level IT governance is less critical than board oversight. As a result, non-expert board members who are sufficiently involved in oversight may be adequately qualified to address the possibility of cybersecurity breaches. Also, as a robustness test, different estimation methods, specifically the Prais–Winsten regression and Newey–West robust standard errors to correct for heteroscedasticity and first-order autocorrelation, were applied.

The research findings based on these estimation methods were unaffected. This study adds to the literature in some ways. Previous research has found that the event of cyber security has a negative market response. (Gordon et al., 2011; Kamiya et al., 2020; Johnson et al., 2017; Telang & Wattal, 2007), resulting in increased risk (Romanosky et al., 2014), higher audit fees (Li et al., 2020) and an increase in bid-ask spread (Rosati et al., 2017). To the best of the author's knowledge, this empirical essay is the first study to combine existing literature on three academic research areas: governance structure, the role of female directors, board of directors' attributes, product market competition, and cyber security breaches. This empirical evidence also contributes to the body of knowledge on IT governance.

Previous research has shown that having board-level IT governance reduces cyber security risk (e.g., Haislip, Masli, et al., 2016; Haislip, Peters, et al., 2016; Higgs et al., 2016; Smith et al., 2019). This study needed to demonstrate the importance of IT expertise in the boardroom and its moderating effect on the chances of information security breaches. Given that the literature on the relationship between board structure is at an early stage, we provide the foundation for future research in this field.

1.7. Contributions of the Study

With their related implications, the findings reported in this thesis make several contributions to existing literature that will be helpful for regulators and policymakers. In the aftermath of the recent crisis, many observers and regulators claimed that the board of directors was being subject to some responsibility for firms' failures and losses. More importantly, the emphasis was on the role of the board with respect to stock price comovement. Answering the call to increase the representation of female directors on corporate boards, this study used the presence of female directors on boards as one of the proxies of effective board monitoring to examine the effect of board structure on the S&P 500 US firms' share price performance and cyber security threat over the period 2009 to 2021. This study provides several essential contributions concerning the board structure and share price performance nexus. First, the corporate governance literature has extensively studied the board of directors with firm value. However, only a few studies examine governance mechanisms as a bundle (Rediker & Seth, 1995) with respect to share price performance.

Therefore, this study contributes to the existing governance literature by assessing the interaction between internal and external governance mechanisms as a bundle and the informativeness of a firm's share prices using a panel dataset from the US market. This thesis has made a significant contribution to the existing body of knowledge by providing new insights into board monitoring proxies and their impact on stock return comovement. Here the thesis presents a novel approach to board monitoring, using a Principal Component Analysis (PCA) technique to develop a new alternative proxy that includes

one key component out of three widely used governance proxies. The results provide important empirical evidence that can be used to guide future research in this area.

Additionally, the study adds to the current literature by examining the impact of governance mechanisms on stock return comovement. The findings suggest that governance mechanisms, when viewed as a bundle, have a significant influence on the comovement of stock returns. This is an important contribution to the literature on corporate governance, as it highlights the need for a more holistic approach to understanding the relationship between governance mechanisms and stock market outcomes. In summary, the thesis has extended and added new insights to the existing literature on corporate governance and stock market comovement.

Furthermore, our empirical chapter 1 provides a novel approach to board monitoring proxies, and the study adds to our understanding of the impact of governance mechanisms on stock return comovement. The results of this research have important implications for both researchers and practitioners in the field of corporate governance. This research paper adds to the existing body of knowledge on corporate governance by exploring the connection between female directors and firm risk. While previous studies have mostly focused on the relationship between female directors and corporate performance, this study aims to shed light on how female directors interact with other governance mechanisms to impact corporate outcomes. The literature on risk-taking behaviour suggests that males and females differ in their approach to risk (as indicated by psychology and sociology studies). However, most of the previous research on gender differences in risk-taking has been based on “event studies” involving women from the general population. Therefore, it is crucial to understand whether in reality, women in senior leadership positions (such as female directors) play a role in shaping corporate risk. This study specifically examines how female directors in the S&P 500 collaborate with other governance mechanisms, such as independent directors and CEO duality, to influence firm risk. By doing so, the study fills a significant gap in the literature on the relationship between gender diversity and corporate governance as a bundle of practice.

The findings of this research can help inform policy and practice related to gender diversity in corporate leadership, as well as shed light on the factors that contribute to effective corporate risk management. This study builds on previous research by examining the impact of the connection between NGQ, monitoring and incentive alignment mechanisms on stock price performance.

The results reveal that NGQs have a moderating effect on the relationship between board monitoring power and the comovement of stock returns. The study highlights that this effect is more significant in smaller firms with lower market capitalisation. Furthermore, the provision of incentives for alignment has the most noticeable impact on the stock prices of firms with greater market conditions. The study's findings provide important insights into the role of NGQs in corporate governance and their impact on stock price performance. This research sheds light on the importance of board monitoring power and the need for incentives to align the interests of executives with those of shareholders. Moreover, this study demonstrates that the effect of NGQs varies depending on the firm's size and market conditions, emphasising the importance of considering these factors in corporate governance. Overall, this study contributes to our understanding of the complex relationship between board monitoring power, NGQ connection, incentives for alignment, and stock price performance. These findings can be useful for firms and investors alike in making informed decisions regarding corporate governance and investment strategies. By exploring the relationship between firm size and incentive alignment provision, researchers can gain a deeper understanding of how board of directors' structure and incentives impact firm performance. This can lead to the development of more effective incentive alignment strategies tailored to companies of different sizes and industries. Second, given the importance of the recent pandemic as an economic event that affects most firms on a global scale, this study contributes to the literature on infectious disease (see, e.g. Donadelli et al., 2017) by providing empirical evidence on the relationship between the board of directors' ideology and share price performance during the pandemic. For instance, Gormsen & Kojen (2020) find that investors' expectations regarding firms' future growth have reduced substantially, partially explaining the sharp global decrease in stock markets.

Ramelli & Wagner (2020) find that the SARS-CoV-2 effect is positive for some industries (e.g., healthcare) but negative for others (e.g., transportation) and that US firms with strong links to China have suffered significant economic harm. The SARS-CoV-2 also plays a significant role in earnings calls, although its impact is moderated by past experiences with an epidemic (Hassan et al., 2020). Ashraf (2020) shows the effects of government interventions during the SARS-CoV-2 on stock market returns. Unlike the studies mentioned above, we examine how the board of directors' ideological diversity influence the initially observed adverse effect of SARS-CoV-2 across US firms.

The study's exploration of the impact of boardroom diversity on firms' ability to navigate pandemic-induced uncertainties enhances our understanding of the benefits of diverse perspectives and approaches in decision-making. This new knowledge can inform future research on board diversity and guide organisations in implementing more effective crisis management strategies. This study presents novel evidence on the moderating impact of board ideology diversity on the connection between disease exposure (specifically, SARS-CoV-2 exposure) and stock price return, adding to the existing literature on the subject. Our study makes a valuable contribution to the corporate governance literature by exploring the impact of board ideological composition on a firm's strategic outcomes. Specifically, the study investigates whether the ideological alignment of directors in high leadership positions has important implications for the firm.

The findings of this study have several potential implications for policymakers, including the need to include more ideologically diverse directors on corporate boards as a means of enhancing board competence. Moreover, the study highlights the economic value of increasing ideological diversity on corporate boards. In addition to promoting social justice and equity, diverse perspectives and approaches can lead to better decision-making and ultimately drive positive firm outcomes. By bringing a wider range of ideas and experiences to the table, ideologically diverse directors can help firms navigate complex challenges and seize new opportunities. Overall, this study underscores the importance of considering ideological diversity in corporate governance and suggests that increasing

diversity may be a key factor in driving long-term firm success. As such, it offers valuable insights for both policymakers and business leaders seeking to enhance board effectiveness and drive better strategic outcomes and improved resilience.

Lastly, our work here might add a fresh perspective to the theorisation of board structure for modern organisations. We contribute to the debate on *CEO_DUALITY*. Traditionally, the elements of information security governance and control have been implicitly discussed within the board concept of corporate governance. Nonetheless, with the increasing demand for regulatory compliance and the role of technology in internal control, the board is assigned an additional responsibility to ensure that managers act responsibly to safeguard the critical information assets in the organisations. This study provides empirical evidence on the impact of board leadership configuration on the likelihood of cybersecurity threats, particularly in light of the SARS-CoV-2 pandemic and the increased use of remote work. By addressing this timely and important issue, the study adds to the existing literature and highlights the significance of effective board leadership in managing cybersecurity risks in a rapidly changing business landscape. Past research has established the crucial role of board size and independence in effective information security management, as demonstrated by studies such as Hsu & Wang (2014). However, this study builds on this research by examining a relatively underexplored aspect of the board's impact on information security: the potential influence of leadership configuration, specifically CEO duality. By shedding new light on this important but often overlooked dimension of board governance, the study contributes to a more comprehensive understanding of how boards can best protect against cybersecurity threats and promote robust information security management. This can have significant implications for organisations of all sizes, particularly in light of the increasing frequency and severity of cyber-attacks and the growing importance of digital infrastructure in today's business landscape.

Numerous studies have demonstrated the important supervisory role that firms play in ensuring effective governance and risk management. For example, existing research has shown that the quality of a company's governance, as indicated by factors such as

ownership and control rights divergence (Lin et al., 2013), the presence of institutional ownership (Boubaker et al., 2017), and the effectiveness of external governance practices, can significantly impact firm performance and risk management.

By highlighting the crucial link between effective governance and risk management, this research emphasises the need for organisations to prioritise these factors in their strategic decision-making and operations. Such efforts can help ensure that firms are well-equipped to navigate the increasingly complex and rapidly evolving business landscape, and ultimately achieve long-term success and sustainability. This study provides a deeper empirical understanding of the relationship between CEO duality and the likelihood of cybersecurity threats in several ways. Drawing on agency theory and stewardship theory, the study highlights the crucial role that CEOs who also serve as chairpersons can play in effectively managing IT risks through unique managerial skills and experience of their board of directors. This finding underscores the importance of identifying and leveraging the strengths and capabilities of key firm actors in cybersecurity management and risk mitigation efforts.

Furthermore, the study also contributes to our understanding of the moderating effect of other governance mechanisms on the relationship between CEO duality and cybersecurity threats. Specifically, the study identifies the presence of women, IT expertise, and market competition as critical factors that can moderate this relationship. These findings suggest that a more holistic approach to governance that leverages multiple mechanisms and factors can be especially effective in managing cybersecurity risks. For instance, the presence of women on corporate boards can bring a valuable perspective and diversity of thought to the governance process, which can enhance decision-making and help identify potential cybersecurity threats. Similarly, having IT expertise within the boardroom can provide valuable insights and technical knowledge that can help firms stay ahead of emerging threats and vulnerabilities. Finally, market competition can create incentives for firms to prioritise cybersecurity and invest in robust risk management practices, which can help mitigate the potential impact of cyber-attacks. Overall, the study provides an important step toward understanding the benefits of an integrated and multifaceted

approach to governance that leverages the strengths and capabilities of board of directors and external governance mechanisms. By highlighting the moderating effects of these factors on the relationship between CEO duality and cybersecurity threats, the study offers valuable insights and recommendations for firms seeking to enhance their cybersecurity posture and mitigate potential risks.

Moreover, these findings have significant practical implications for firms of all sizes and types. As cyber threats continue to grow in complexity and frequency, the need for effective cybersecurity management and risk mitigation strategies has become increasingly urgent. By leveraging the insights provided by this study, firms can develop more robust and effective governance structures and practices that can help them stay ahead of emerging threats and protect against potential vulnerabilities. In doing so, they can enhance their overall performance, resilience, and sustainability, and position themselves for long-term success in an increasingly challenging business environment.

1.8. Structure of the Thesis

This chapter has presented a brief overview of the background and rationale of this study. The study motivation, objectives and contributions are also highlighted in this chapter. Furthermore, this chapter presents the methodological frameworks that are employed in the current work, highlights the data collection process and the sample construction criteria. The chapter also explains the definition and measurement procedures of the main study variables, i.e., dependent, independent and control variables. Further, the empirical models and the common econometric problems that may arise in the data analysis are discussed. Moreover, it describes the primary estimation method, *IV 2SLS*, in detail and justifies the selection of this technique. Chapter 2 reviews the theoretical and empirical work on corporate governance and its effect on firm performance outcomes. The chapter begins with a detailed review of agency theory since it is the most popular and dominant theory in corporate governance studies. In addition, the review highlights the empirical papers on the board structure-performance nexus.

Further, the chapter reviews the theoretical work on the importance of gender diversity and board expertise under the resource dependence theory. Chapter 3 presents the empirical evidence on the relationship between the board structure as a bundle of practice and price comovement. In this chapter, first, the hypotheses to be tested are developed. Several empirical tests are conducted. These empirical tests confirm that the board structure variables and the firm financial characteristics are endogenously determined. Using three estimation methods, namely *OLS*, *IV2SLS* and *PSM*, this chapter reports the results of the relationship between board structure as a bundle of practice and price comovement.

Chapter 4 provides the empirical findings on the relationship between the board of directors' ideological diversity and share price performance amidst the pandemic. The chapter begins with the hypothesis's development. Further, the chapter moves to the empirical analysis, where the estimation methods are *OLS*, *IV2SLS* and *PSM*. The empirical findings indicate that ideological diversity influences share price resilience.

Chapter 5 examines the impact of board structure, specifically *CEO_DUALITY*, and female directors' presence on corporate risk. Using logistic regression and *IV2SLS*, our result argues that in matters relating to information governance, there is a case to ignore the benefit associated with the impartiality of *CEO_DUALITY*, who has the all-knowing firm-specific information about cybersecurity threats faced by the firms.

Chapter 6 summarises the study's empirical findings and concludes the whole work. In addition, it provides the possible implications of the study findings, contributions, limitations, and suggested recommendations for future research.

Chapter 2

Theoretical Framework

2.1. Introduction

In this chapter, various definitions of corporate governance suggested by researchers and academics are delineated. The agency theory is utilised as the main theoretical framework in this study to examine the impact of corporate governance on diverse firm performance outcomes.

Corporate governance is a multifaceted concept that relates to the resolution of conflicts that arise due to differing interests in agency relationships (Shleifer & Vishny, 1997). These conflicts can be traced back to various factors, including the separation of ownership and control, diffuse ownership, and the inability to write complete contracts (Berle & Means, 1932; Hart, 1995). Nonetheless, such conflicts provide a basis for developing effective corporate governance mechanisms. To address these conflicts, Keasey & Wright (1993) proposed two essential dimensions that corporate governance must consider. Firstly, monitoring managerial actions and ensuring their accountability towards shareholders is crucial, emphasising the stewardship and accountability aspect of corporate governance. This dimension involves designing appropriate mechanisms for monitoring the actions of managers and ensuring they act in the best interest of shareholders. Secondly, providing management with appropriate incentives to align their interests with those of the firm's shareholders is equally essential.

This dimension highlights the need to align the interests of managers with those of shareholders, ensuring that managers are incentivised to take actions that maximise shareholder value. Keasey & Wright (1993) stated that corporate governance comprises various mechanisms intending to reduce conflicts and enhance the wealth of the firm.

The opening section of this chapter delves into agency theory, which is a widely studied concept in the field and serves as the theoretical foundation for comprehending the complexities of conflicts within the agency relationship (Jensen & Meckling 1976; Ross 1973).

By familiarising oneself with agency theory, one can gain insight into how various corporate governance mechanisms, including the board of directors, influence the overall performance and outcomes of a firm. The subsequent sections of this chapter will specifically centre around the board of directors and its role as the primary internal governance tool. Through an in-depth examination of the board's composition, structure, and responsibilities, we will explore how this governing body can impact a firm's operations and strategic decision-making. After providing the theoretical explanations for the role of the board, the role of female directors on the board structure is also reviewed and discussed. The last part of this chapter focuses on diversity on the board of directors. The literature indicates that diversity in the boardroom enhances the board's effectiveness (Kang et al., 2007) and increases board independence (Carter et al., 2010). Further, the theoretical background on board diversity and firm outcomes are also presented and reviewed. The focus of this study is to indicate how the structure of the board of directors and the presence of diversity in the boardroom influence firm outcome.

2.2. Agency Theory

Agency theory is a concept that was first introduced by Ross (1973) and later refined by Jensen & Meckling (1976). The main focus of agency theory is to explain the conflicts that can arise between the owners of a company (the principals) and the management (the agents) who run the day-to-day operations of the business. In particular, agency theory highlights the potential for self-serving managerial behaviour, where managers act in their own best interests rather than in the best interests of shareholders (Eisenhardt 1989). One of the key underlying assumptions of agency theory is that the separation of ownership and control in modern corporations creates a potential conflict of interest

between shareholders and management. This separation was first identified by Berle and Means (1932) and refers to the fact that in large corporations, ownership is typically dispersed among a large number of shareholders, while control of the company is vested in the hands of a small group of managers. This separation can create a situation where managers act in their own interests rather than in the interests of shareholders.

A close alignment between ownership and management typically characterises the early stages of a firm's development. In these early stages, the entrepreneur who founded the firm is typically also the owner and manager, which creates a strong incentive to work in the firm's best interests. As a company grows and ownership is dispersed among a more significant number of shareholders, this alignment can begin to break down. Managers may begin to prioritise their interests over those of shareholders, leading to conflicts and potential losses for investors. Similarly, when the firm becomes larger and larger since more capital is needed to finance the operations. Berle & Means (1932) indicated that the entrepreneur will seek external capital from the stock market. This means the firm's ownership is no longer related to the entrepreneur alone. Other parties who provide the funds share the ownership and look for a return from its operation. The entrepreneur's incentives to work hard are different now as part of the outcomes will go to the other owners. Berle & Means (1932) explained that, when the entrepreneur sells his/her total shares in the firm, the firm is directed by professional actors who usually own nothing or very few shares.

In their seminal work published in 1932, Berle and Means presented a clear perspective on the division of labour within firms. They argued that while managers possess the necessary skills and expertise to operate a firm successfully, they typically need more capital to finance it. On the other hand, the owners have the capital but often need more experience and knowledge to manage the firm effectively. This leads to a separation of ownership and control, where the managers run the firm while the owners provide the necessary funding. As the firm grows and attracts a more significant number of shareholders, the control of the firm becomes increasingly concentrated in the hands of the managers, as the dispersed owners are unlikely to be motivated to monitor their

actions. Within the context of agency theory, Jensen & Meckling (1976, p.5) define the agency relationship as “a contract under which one or more persons the principal engage another person the agent to perform some service on their behalf which involves delegating some decision-making authority to the agent”. The basic assumption of agency theory is the divergence of interest between shareholders and managers (Eisenhardt, 1989).

Put differently, the agents may take decisions that serve their interests. Shleifer & Vishny (1997, p.741) provide another definition for the agency problem: “the difficulties faced by financiers in assuring that their funds are not expropriated or wasted on unattractive projects”. The conflict of interest in the principal–agent relationship may be controlled without a complete contract (Fama & Jensen, 1983).

The concept of a complete contract, which accurately specifies how managers should behave under all circumstances, is a theoretical ideal, according to Fama and Jensen (1983). However, due to the inherent difficulty of predicting future events that can affect managerial decisions, as Hart (1988) and Williamson (1984) noted, it is practically impossible to write such contracts. Additionally, even if such contracts could be written, they would be complex and challenging to formalise (Williamson, 1984). Therefore, both parties must agree on residual control rights, which determine who has decision-making authority in situations not explicitly covered by the contract (Grossman & Hart, 1986). Since shareholders are not typically qualified to make these decisions, managers have these control rights (Shleifer & Vishny, 1997). Within a corporate setting where managers possess control rights, managerial opportunism often manifests as expropriating shareholders’ wealth (Grossman & Hart, 1986).

Consequently, such actions by managers can adversely affect the resources invested in the firm due to a misalignment of interests between managers and shareholders. Denis (2001) explains that shareholders’ interests are primarily financial, while managers’ interests revolve around employment-related considerations, as outlined by researchers (see Amihud & Lev, 1981).

Thus, agency theory assumes that managers deviate from shareholder wealth maximisation and serve their interests (Jensen & Meckling, 1976). One of the basic assumptions of agency theory is the shareholders' diffuse ownership (Fama & Jensen, 1983). Therefore, those shareholders are less motivated to monitor managers, who have the control right and engage in self-interested decisions (Jensen & Meckling, 1976).

However, ownership concentration may be considered a tool that may control the principal-agent relationship; according to agency theory, those investors with concentrated ownership are highly motivated to properly monitor the management (Shleifer & Vishny, 1997). Nevertheless, the concentration of ownership may create another conflict known as the principal-principal agency problem (see, e.g. Globerman et al., 2011; Wu et al., 2011; Young et al., 2008). According to Young et al. (2008), the principal-principal conflict mainly occurs between the controlling and minority shareholders of the firm. Young et al. (2008) argue that two conditions lead to this type of conflict, the existence of shareholders with concentrated ownership and weak corporate governance mechanisms, as well as the legal system that cannot effectively protect minority shareholders' rights.

In those two conditions, agency problems typically exist between the majority and minority shareholders. In general, majority shareholders, or so-called large block holders, own substantial equity ownership in the firm (Shleifer & Vishny, 1997). Holderness (2003) explains that two reasons may encourage shareholders to concentrate their ownership in the firm: the shared and private benefits of control (Holderness, 2003, p.54). Large block holders, particularly, seek to maximise their wealth and at the same time, they can control the management to some extent (Shleifer & Vishny, 1997). The literature indicates the benefits of large block holders since they are considered a power source in the corporate governance literature. They effectively monitor managerial actions and decisions (Hoskisson et al., 2002; Kim & Buchanan, 2008).

The benefits in the previous paragraph are shared with the minority shareholders; this effect is known as the shared benefits of control.

Despite the clear advantages of large block holders, their existence in the firm also carries a cost. Large block holders may be motivated to expropriate the firm resources or have some unique benefits unavailable to the minority shareholders (Holderness, 2003).

The main problem is that, while large investors use their voting power to serve their benefit, this is not necessarily matched with other investors' interests in the firm, employees, or even managers (Shleifer & Vishny, 1997). Further, Shleifer & Vishny (1997, p.758) state, "In the process of using his control rights to maximise his own welfare, the large investor can redistribute wealth in both efficient and inefficient ways from others". This statement can summarise the central conflict between large block holders and minority shareholders. A conflict of interest may also emerge between a company's shareholders, who supply the equity financing, and its trade payables, who supply the debt financing. In certain situations, the choices made by management could decrease the value of the claims held by the debtholders, thus initiating the conflict.

The primary reasons that give rise to conflicts between bondholders and shareholders are succinctly summarised by Smith and Warner (1979). The first reason is the dividend payout policy, where the conflict emerges from increased dividends paid to shareholders. Such a move will decrease the value of debt. The second reason is that issuing additional debt at the same or higher priority level will reduce the debt's value. Lastly, investing in high-risk projects, also referred to as "Asset substitution" (Smith & Jensen, 2000), will also lower the value of the debt. Goergen (2012) provides a complete picture of such conflicts between the two parties. Shareholders tend to gamble with the debtholders' fund by seeking high-risk investments. This is because in the case of failure; the debtholders will bear most of the losses (Demsetz et al., 1997). On the other hand, the profit generated from the investment mainly goes to the firm's shareholders (Jensen & Meckling, 1976). This is a common problem in the relationship between shareholders and debtholders of a firm. The debtholders have a limited upside from investing in the firm, while the shareholders have the opposite case, with unlimited upside with limited liability (Demsetz et al., 1997). Galai & Masulis (1976) and Jensen & Meckling (1976) argue that shareholders prefer excessive risk-taking behaviour.

This tendency results from the moral hazard problem, the limited liability and the unlimited upside potential of their investments. In the context of our research, the literature on corporate governance sheds light on the various factors that give rise to conflicts in the agency relationship, namely, moral hazard and information asymmetry.

The agency problem arises due to the divergence of interests between shareholders and managers, stemming from the separation of ownership and control. Shareholders seek to maximise their returns on investment, while managers strive to achieve their personal goals and objectives, which may not always align with those of the shareholders. This misalignment of interests can lead to conflicts and a breakdown in the agency relationship. Moral hazard arises when managers have incentives to take actions that benefit themselves but may not be in the best interest of the shareholders.

Information asymmetry occurs when one party, usually the manager, has superior information to the other party, i.e., the shareholders. This information gap can lead to adverse selection and moral hazard problems, causing conflicts and inefficiencies in the agency relationship. To gain a comprehensive understanding of why conflicts arise in the agency relationship, it is essential to take into account the interests and incentives of both shareholders and managers. Addressing these conflicts is crucial for ensuring effective corporate governance and maximising shareholder value. Finance theory suggests that when shareholders invest their capital, they expect to receive a return on their investment (Sharpe, 1963). As a result, shareholders are inclined towards maximising their wealth, and this can be indicated by the firm's share price (Jin, 2002). However, managers do their best to retain their jobs and not be replaced by shareholders. In addition, those managers have other interests related to their positions, such as personal benefits that are not available to the firm's shareholders (Denis, 2001). These personal benefits that the managers gain may be in the form of office expenses, meals and personal issues, etc. These benefits may be considered under the term of managerial consumption of perquisites (Denis, 2001, p.193). The literature highlights two sources that may create conflicts between managers and shareholders. These sources are related to moral hazards and information asymmetry.

Moral hazards: Another source of conflict known as moral hazard, which refers to the possibility of the agent being less responsible and not exerting the maximum effort (Alchian & Demsetz, 1972). Eisenhardt (1989, p.61) defines moral hazards as a “lack of effort on the part of the agent”. In other words, moral hazards exist because the principal cannot observe the managerial action all the time and, consequently, cannot judge the quality of the management team (Eisenhardt, 1989). In light of incomplete contracts and moral hazards, it is difficult for shareholders to control such conflicts in the principal-agent relationship.

According to Denis (2001), the shareholders fail to conduct effective monitoring because they need the proper experiences, which means that they may need to understand the managerial actions. In addition, they lack incentives to perform this monitoring, especially when they own only a small equity in the firm, and the monitoring cost may outweigh the benefit. Agency theory assumes that the firm’s managers, who run the daily affairs of the business, have more information than the shareholders (Fama & Jensen, 1983). This leads to information asymmetry, which is considered a source of conflict in the agency relationship. The existence of information asymmetry limits the shareholders’ ability to properly monitor managerial actions and make sure that those managers are working in the shareholders’ interest. Further, the inability of shareholders to access all the information and therefore judge the managerial decisions creates a so-called adverse selection. According to Eisenhardt (1989, p.61), “Adverse selection refers to the misrepresentation of ability by the agent. The argument here is that the agent may claim to have certain skills or abilities when he or she is hired. Adverse selection arises because the principal cannot completely verify these skills or abilities either at the time of hiring or while the agent is working”.

The literature suggests several actions to mitigate the information asymmetry effect; for instance, the disclosure and financial reporting of private information, enforcing regulations which may obligate managers to disclose certain information to shareholders, the existence of information intermediaries such as financial analysts who may reduce information asymmetry through facilitating disclosure between firm’s managers and

shareholders (Healy & Palepu, 2001; Leftwich et al., 1981; Watts & Zimmerman 1983, 1986).

Corporate governance literature suggests several mechanisms that aim to minimise the effect of these conflicts in the agency relationship. However, Jensen & Meckling (1976) indicate that these mechanisms are not free and result in what is called agency cost. The agency cost results from the agency relationship naturally in order to control managerial opportunism. Further, the shareholders bear these costs to make sure their wealth maximisation is the managers' priority. According to Jensen & Meckling (1976), the agency cost is the sum of monitoring, bonding and residual loss cost. Monitoring cost refers to the actions and efforts that the principal takes in order to monitor management behaviour. It is clear that this type of cost is paid by the principal to make sure that managers act in their interest.

Monitoring action may include several activities, such as incentives' policies and constraints on a budget (Jensen & Meckling, 1976). In addition, shareholders may also bear the additional cost of using external auditing to check on the firm's financial statement and ensure that the moral hazard risk is minimised. The second part of the agency cost is related to the bonding cost, which is incurred by the agent. The firm managers may want to exhibit to the principal that they are working as required (Jensen & Meckling, 1976). These actions from the agent's side could serve as proof of their accountability.

The cost associated with these actions is not necessarily financial. For example, the managers may provide shareholders with additional information on the firm policy and structure (Jensen & Meckling, 1976). Watts (1988) indicates that managerial expenses on audit committees, non-executive directors and internal auditors are common examples of bonding costs.

The last component of agency cost is related to residual loss. Monitoring and bonding are incurred to align the interests of shareholders with those of managers.

However, it is difficult to reach full alignment, and still, there will be a loss resulting from the divergence of interests between the two parties. Jensen & Meckling (1976, p.5) define residual loss as “The dollar equivalent of the reduction in welfare experienced by the principal as a result of this divergence”. Fama & Jensen (1983) add that, in the existence of incomplete contracts, managerial decisions may not be in the best interest of the principals.

Residual loss is incurred by the principal and occurs when the full cost of contract execution exceeds the benefits (Fama & Jensen, 1983, p.327). Agency theory, according to Shankman (1999), stresses the importance of corporate governance mechanisms that ensure the best alignment between managers and shareholders. Proper selection of such mechanisms will lead the managers to satisfy the shareholders’ interests, and therefore the agency cost will be minimised. An extended version of agency theory is the multiple agency theory, which deals with more complex relationships where there are multiple principals, agents or both (Arthurs et al., 2008). A common example of multiple agency conflicts appears when firms have partnerships with other firms through what is known as strategic alliances. These alliances are usually shaped for specific purposes, such as supporting foreign market entry or accessing certain technology or other resources (Dussauge & Garrette, 1999). Equity-based joint ventures are a common type of strategic alliance in which there is a pooling of ownership assets, and this leads to a degree of joint management between two or more partner firms (Child & Rodrigues, 2003).

In this regard, multiple principals where each has their motivation for allying, and each is sufficiently salient to require its interests to be respected. In addition, since the owner-partners usually provide complementary assets to the joint venture (Geringer, 1991), they also, in effect, become agents for each other in ensuring its viability. In the meantime, joint venture managers are regarded as agents for their owners (Child & Rodrigues 2003). It is obvious, therefore, that multiple agency theory allows for many-to-many relationships with potential conflicts among multiple principals and agents (Arthurs et al., 2008; Hoskisson et al., 2002). The potential conflicts in these complex relationships arise from conflicting interests among contractual parties within multiple

agency theory. Arthurs et al. (2008) explain how the risk-taking behaviour of executive directors on the board is influenced by the investment time horizon and employment concerns.

Using the multiple agency theory, the study investigates how the decision-making process during an initial public offering (IPO) is influenced by the different board of directors' agents who have varying interests. According to Arthurs et al. (2008), executive directors on the board of an IPO firm tend to have a more long-term perspective than venture capitalists and underwriters, who usually face the pressure of generating quick returns. The executive directors' dual role as principals and agents allows them to be more effective monitors during the IPO process and more prudent in their investment decisions (Pratt & Foreman, 2000).

Even though agency theory is crucial in elucidating conflicts in contractual relationships, other theories in the literature approach agency conflict from diverse viewpoints. The subsequent section briefly overviews the primary theories that support agency theory.

2.2.1. Auxiliary Theories of Agency Theory

Agency theory is a prominent concept in the realm of corporate governance, which aims to address the potential conflicts of interest that arise between the principal and the agent in a given relationship. The primary objective of agency theory is to identify and implement effective governance mechanisms that can minimise or eliminate any divergence of interest between the two parties. In essence, agency theory serves as a framework for evaluating and optimising the performance of firms by aligning the interests of managers and shareholders. The significance of agency theory in corporate governance research cannot be overstated. Many scholars and researchers in this field (see e.g. Daily et al. 2003; Eisenhardt 1989; Hill & Jones 1992; Zajac & Westphal 2004) have employed agency theory as a foundational framework for exploring various aspects of corporate governance, such as executive compensation, board structure, and shareholder activism.

The dominance of agency theory in corporate governance research reflects its widespread applicability and relevance in understanding the complex dynamics of principal-agent relationships. Although, different theories arise in the literature which provide a complementary view to the agency problem.

The most popular theories that support the notion of agency theory are stewardship theory, and resource dependence theory. Daily et al. (2003, p.372) state that “A multi-theoretic approach to corporate governance is essential for recognising the many mechanisms and structures that might reasonably enhance organisational functioning”. The presence of multiple supporting theories enriches the theoretical framework and provides a multi-faceted approach to addressing the issue at hand. Each theory brings its unique perspective, which allows for a more comprehensive analysis of the problem, revealing nuances that may have been overlooked by a single theory. This multi-theoretical approach also allows for a more robust examination of the issue as it enables the identification of patterns and connections between the different theories.

By drawing from a variety of theoretical perspectives, researchers can gain a deeper understanding of the underlying mechanisms at play and develop more effective solutions.

2.2.1.1. Stewardship Theory

Stewardship theory operates on the premise that managers of firms act as stewards and are committed to managing the resources entrusted to them by the owners (Davis et al., 1997; Donaldson 1990; Donaldson & Davis 1991, 1994) in the most effective manner.

In essence, this theory asserts that managers are responsible for safeguarding and growing the assets of the firm and are motivated to act in the best interests of the owners, who have entrusted them with their capital. The theory assumes that managers possess a sense of loyalty, honesty, and integrity, and are committed to fulfilling their fiduciary responsibilities towards the shareholders. Therefore, stewardship theory postulates that managers will always act in a manner that maximises the long-term value of the firm and benefits the shareholders. Therefore, managers primarily strive to increase the wealth of the owners, and even though various stakeholders may have divergent goals, the managers will make decisions that align with the overall objectives of the firm (Davis et al., 1997). The origin of stewardship theory lies in the fields of organisational psychology and sociology, where the driving force for managers is the desire to accomplish tasks (Donaldson & Davis, 1991).

Agency theory concentrates on monitoring the agent and the need for control to safeguard the interests of the principal (Jensen & Meckling, 1976). In contrast, stewardship theory endows managers with the autonomy and authority to act in the best interests of the principal (Donaldson & Davis, 1994). According to agency theory, minimising conflicts in the principal-agent relationship and consequently reducing agency costs can be achieved by aligning the interests of managers and principals (Jensen & Meckling, 1976). To foster such alignment, agency theory proposes that managers should be offered suitable financial compensation structures to incentivise them to act in the best interests of shareholders (Eisenhardt, 1989).

Moreover, agency theory suggests that an alternate governance structure, such as the board of directors, should be employed to monitor management effectively (Fama & Jensen, 1983). In contrast, stewardship theory assumes that managerial behaviour is driven by intrinsic incentives, rendering the mechanisms proposed by agency theory unnecessary to motivate managers (Davis et al., 1997; Donaldson & Davis, 1991).

Agency theory assumes that self-interested managers may make decisions that serve their personal interests and emphasises the need for disciplining mechanisms. Consequently, the board of directors is considered a vital tool to control such behaviour. Agency theory suggests that independent directors should dominate the board (Hermalin & Weisbach, 1991; Johnson et al., 1996) since they are more effective monitors and care about their reputation in the market (Fama, 1980). In other words, independent directors are disciplined by the external market and are expected to act in the shareholders' interest (John & Senbet, 1998). Therefore, based on agency theory's assumptions, a board with a higher proportion of independent directors would enhance the firm's performance and safeguard shareholders' rights (Rosenstein & Wyatt, 1990).

Various supportive evidence in the literature indicates a relationship between independent directors and firm value. Specifically, Dahya & McConnell (2007) explored this relationship within the UK context by examining the changes in board composition and corporate performance of 1124 UK industrial firms from 1989 to 1996. Their findings suggest a positive correlation between the two variables, indicating that firms in the UK that follow the Cadbury committee's recommendation of having three outside directors experience improvements in their operating performance, both absolutely and relative to peer group benchmarks. Daily & Dalton (1992) and El Mehdi (2007) report a similar positive relationship. Agency theory also suggests that the role of the CEO and the chairperson should be separated. When the two positions are combined, much more power will be concentrated in the CEO's hands (Donaldson & Davis 1991). In this case, the CEO will dominate the board and possibly this will increase his/her opportunistic behaviour. In the UK, the Cadbury Report (1992) recommends that these two positions should be separated.

The board leadership importantly affects the board's control function. Vafeas & Theodorou (1998) indicate that when the two positions are held by different persons the board effectively exercises its control function and therefore this will improve firm performance. The structure of the board of directors can be viewed differently through Stewardship theory. According to this theory, managers are assumed to be reliable and their decisions will always align with the interests of their principals (Donaldson & Davis, 1994). Stewardship theory places greater emphasis on the significance of inside directors and the CEO's dual role. It suggests that the shareholders' interests can be better served if the board of directors is dominated by insider managers. This assumption is based on the belief that inside directors possess more knowledge and expertise than outside directors (Donaldson & Davis, 1994).

According to Baysinger and Hoskisson (1990) and Kesner (1987), inside directors are better equipped to make important decisions because they are more involved in the firm's day-to-day operations. In addition, stewardship theory proposes that the CEO and chairperson roles should be merged (Donaldson & Davis, 1994). Combining these roles gives the CEO, who also holds the chair position, greater authority to improve the company's performance. Donaldson and Davis (1991, p.52) assert that: "the expectations about corporate leadership will be clearer and more consistent both for subordinate managers and for other members of the corporate board. The organisation will enjoy the classic benefits of unity of direction and of strong command and control".

The literature provides evidence that supports the stewardship theory, as demonstrated by empirical studies. For instance, Boyd (1995) investigated the connection between CEO duality and firm performance among 192 US companies across 12 industries. The study found that companies that combined the roles of CEO and chairman had better performance. Additionally, Haniffa and Hudaib (2006) found a positive and significant relationship between CEO duality and a company's accounting-based performance. However, the agency theory has a stronger theoretical foundation and receives more empirical support in the corporate governance literature.

2.2.1.2. Resource Dependence Theory

Resource dependence theory (RDT) perceives a firm as a system that interacts with its external environment (Preffer & Salancik 1978). According to this theory, to comprehend the behaviour of an organisation, it is essential to comprehend the context in which that behaviour occurs, which is the firm's ecological environment. The theory emphasises how external factors, such as resource availability, technological advancements, legal and political policies, market competition, and social norms, shape and influence the behaviour of firms (Pfeffer 1972). This theory indicates that the firm should be able to adapt to external interdependencies in order to survive (Hillman et al. 2009). Particularly, mitigating risks, uncertainties and dependence may primarily fall under the purview of the board of directors (ibid, p.1404).

RDT offers an explanation for the role of the board of directors, which is widely regarded as a crucial component of corporate governance, in accessing external resources (Pfeffer, 1972). One such resource is the independent directors, who are not part of the executive team, but serve on the board and are perceived as valuable assets (Haniffa & Hudaib, 2006). Specifically, non-executive directors possess the capability to furnish the firm with pertinent information via their network of contacts, and to align it with the firm's requirements and/or needs (Nicholson & Kiel, 2007). According to Preffer & Salancik (1978), the board of directors can serve as a crucial conduit to external resources that can boost the firm's value. The authors identified four advantages that the directors may offer, which include providing valuable information through advice and counsel, connecting the firm with vital information in its environment, facilitating access to external resources via their networks and interlocks, and contributing to the firm's legitimacy. The arguments of the resource dependence theory are backed by empirical evidence demonstrating the impact of directors. Provan et al. (1980) illustrate that firms with influential directors are better able to secure critical resources from the external environment. Similarly, Preffer & Salancik (1978) reveal that regulated industries have a higher demand for non-executive directors with specific skills and experience.

Recent research by Peng (2004) suggests that boards with outside directors who can acquire resources demonstrate better firm performance. Correspondingly, Nicholson & Kiel (2007) found that directors with ample resources have a positive impact on firm performance.

In summary, the function of the board is approached from distinct angles by resource dependence theory and agency theory. While agency theory highlights the board's responsibility for oversight and regulation, resource dependence theory considers the board as a conduit to external resources. According to Daily et al. (2003, p.275), the emphasis of future research should shift from scrutinising the board's ability or willingness to control executives towards exploring how directors aid in accessing valuable resources for the firms and acting as a source of guidance and consultation for CEOs.

The agency theory is widely recognised as the predominant theoretical framework that elucidates the intricacies of conflicts that arise in the agency relationship. The fundamental concept of agency theory is the separation of ownership and control, which refers to the delegation of decision-making authority from the principal (owner) to the agent (manager). The theory highlights the divergent interests and objectives of the principal and the agent and the resultant agency costs, including monitoring and incentive costs, that occur due to information asymmetry and moral hazard. The seminal works of Jensen & Meckling (1976) and Ross (1973) have provided a solid foundation for the development of agency theory and its application to various contexts, such as corporate governance, executive compensation, and financial reporting. Despite criticisms of its assumptions and limitations, agency theory remains a vital lens through which to examine the complex dynamics of the principal-agent relationship. Moreover, agency theory receives much attention from researchers in the corporate governance area, and in turn, dominates most of the corporate governance research (Daily et al. 2003; Eisenhardt 1989; Hill and Jones 1992; Zajac and Westphal 2004).

Further, agency theory offers a powerful tool for providing an insight into suggested solutions to the conflicts arising in the principal-agent relationship.

Accordingly, this theory is taken as the main theoretical approach in studying the board structure–risk-taking relationship. The above discussion indicates that the board of directors is one of the main corporate governance tools that effectively monitor the management (Adams et al. 2010). The main duty of the board is to look out for the shareholders' interest and ensure that their goals are achieved (Pearce and Zahra 1992). Therefore, the structure of the board of directors plays an important role in influencing the firm's output (Hardwick et al. 2011). The next section emphasises the role of the board of directors as a governance tool and a solution to the agency conflicts.

2.2.1.3. The Board of Directors as a Governance Mechanism

The preceding dialogue implies that agency theory is primarily focused on addressing the discrepancies that arise from conflicting interests in agency relationships.

However, the objective of corporate governance mechanisms is to minimise these conflicts, as mentioned by Denis (2001). Jensen (1993) identifies four corporate governance mechanisms, including legal and regulatory mechanisms, internal control mechanisms, external control mechanisms, (including market competition), that work towards achieving this goal. Jensen (1993) suggests that certain mechanisms are necessary to ensure that the interests of shareholders are aligned with those of managers and to safeguard the firm's resources from misappropriation. The board of directors is identified as the primary internal control system within a corporation, according to Jensen (1993), and is responsible for ensuring the proper functioning of the firm.

The CEO's conduct is primarily governed by the board, which serves as the apex of the internal control system. Agency theory suggests that the board of directors is the primary means by which shareholders can exert control over the firm's management (Denis & McConnell 2003; Hermalin & Weisbach 1991; John & Senbet 1998; Johnson et al. 1996), due to the widespread dispersion of shareholder ownership. As a result, the board of directors is expected to monitor the management of the firm on behalf of the shareholders, according to Pearce and Zahra (1992).

According to Jensen (1993, p.40) the main role of the board is to “hire, fire, and compensate the CEO, and to provide high-level counsel”. In addition, extant literature (see e.g. Adams & Ferreira, 2007; Linck et al. , 2008; Raheja , 2005), posit that the board of directors plays two critical roles in the firm.

The initial role is to monitor, which involves regulating and observing managerial activities. Effective monitoring ensures that the concerns of shareholders, particularly those of minority shareholders who have less power and motivation to monitor the management, are safeguarded. The second role is to provide guidance, whereby the board offers the necessary support to execute sound managerial decisions and achieve a successful strategy.

The effectiveness of a board is largely determined by its composition and structure, as noted in several studies (Baysinger & Hoskisson 1990; Cochran et al. 1985; Kesner 1987; Mace 1971). For instance, Mace (1971) suggests that having the right combination of executives and non-executives is crucial for the board to fulfil its service role, while Baysinger & Hoskisson (1990) point out that the type of directors, whether they are executives or non-executives, affects the implementation of the firm's strategy. Moreover, other research demonstrates that the board's structure plays a role in its ability to effectively monitor and control management (Baysinger & Hoskisson 1990; Kesner 1987).

It should be noted that certain authors offer a specific definition of the term "board structure/composition". Pearce & Zahra (1992, p.412) define it as "the number of directors", in our study we refer to it as "board size", and the type of members based on the insider-outsider classification. On the other hand, Ellstrand et al. (2002, p.770) describe board composition as the proportion of inside directors (i.e., employees of the firm) and outside directors on the board. **Furthermore**, in our study, board structure refers to board size, board independence, i.e., number of independent director's relative to the board size, and CEO/Chairperson duality. In particular, these variables are the most debated in the corporate governance literature (Adams et al. 2010).

2.2.1.4. Female Directors on Corporate Boards

In the preceding section, we provided a broad summary of the theoretical literature concerning board structure. In this section, we will focus specifically on the issue of gender diversity within the board of directors and its effects on corporate outcomes. Gender diversity refers to the inclusion of women on the board, and we will explore how the presence of female directors can improve firm performance by bringing their distinct perspectives and experiences to the decision-making process.

According to agency theory, the separation between management and ownership leads to agency conflicts (Eisenhardt 1989; Jensen & Meckling 1976). The structure and makeup of a board play a crucial role in determining its effectiveness, as noted by Pearce and Zahra (1992). Several scholars (see e.g. Daily et al. in 2003; Farrell & Hersch , 2005; Kesner, 1988), have suggested that having female directors on a board can impact its performance, procedures, and ultimately, the outcomes of the firm. One of the primary reasons for advocating for the inclusion of women in leadership roles is the importance of diversity in the boardrooms. The next section highlights the importance of female representation on the board of directors. This topic's interdisciplinary nature allows for the incorporation of various theoretical perspectives, including agency theory, resource dependence theory, and social psychology, to support the arguments and discussion.

2.2.1.5. Importance of Diversity in the Boardroom

Extensive research has consistently shown that boards with greater gender diversity and higher female representation have a significant and positive impact on group decision-making and outcomes (Adler 2001; Campbell and Mínguez- Vera 2008; Carter et al. 2003; Martín-Ugedo & Mínguez-Vera 2014). These studies have indicated that diverse perspectives, experiences, and skills brought by women to the boardroom enhance the quality of discussions, promote creativity, and lead to more effective problem-solving. Furthermore, having more women on corporate boards has been linked to better financial performance and higher shareholder value.

This is because gender-diverse boards are more likely to consider a wide range of stakeholder interests, such as social and environmental concerns, which can contribute to long-term sustainability and resilience of the firms.

The inclusion of women in decision-making roles in the workplace has been shown to have a positive effect. Research conducted by Lucas-Pérez et al. (2014) suggests that this positive effect comes from the unique perspectives and skills that women bring to the table. By having a diverse group of decision-makers, firms can benefit from a wider range of viewpoints and experiences, leading to better problem-solving and decision-making. Additionally, studies by Carter et al. (2003) have found that boards with more female directors tend to perform better financially than those without. This may be due in part to the fact that women are able to contribute valuable insights and ideas, leading to more innovation and ultimately, greater success for the firm. Therefore, promoting gender diversity in the workplace can be highly beneficial, not only for the individuals involved, but for the success of the company as a whole.

Therefore, it is not only the moral and ethical issues or the social justice that are relevant; there are many economic reasons to predict this positive association. Theoretically, several arguments from several theories support the positive link between gender diversity and corporate value. According to the agency theory, diverse boards have a better ability to function effectively. Fama & Jensen (1983) consider the board of directors as the central point of decision-making control for a firm. All the important strategic decisions of the firm are validated by the board of directors (Lipton & Lorsch, 1992). Additionally, the board plays a crucial role in monitoring the firm's activities to safeguard the rights of the shareholders and prevent managerial opportunistic behaviour (Fama & Jensen, 1983). In an agency context, for an effective monitoring and decision-making process, the board must be independent. The agency theory proposes that independent directors will not conspire with management against the shareholders' interests. Fama (1980) argues that independent directors have a personal incentive to perform effectively and build a reputation as expert monitors. Consequently, Carter et al. (2003) contend that boards with more diversity increase the independence of the board.

This simply implies that the presence of more women directors on a board can improve the monitoring and control of management behaviour. According to Carter et al.,(2003) having board members with different genders, ethnicities, or cultural backgrounds can lead to a more diverse range of questions and concerns being raised compared to a homogenous board. This diversity can make boards more proactive, and thus improve their independence function. Adams & Ferreira (2009) support this view, arguing that female directors in particular can enhance board independence, as they are not part of the *old boys club* and more closely align with the independent director concept emphasised in theory.

According to the resource dependence theory, firms operate within an open system where they must acquire and exchange resources to ensure their survival (Pfeffer & Salancik, 1978). The board of directors serves as the connection between the firm and external entities, creating a dependence (Carter et al., 2010). In this context, greater diversity within the board results in improved access to external networks and connections with other firms. These networks facilitate access to capital and serve as a channel for communicating and exchanging information with other firms (Pfeffer & Salancik 1978). In addition, diverse boards improve the firm image in the market, because diversity is viewed as a positive signal that may attract talented and qualified members outside the traditional method of recruitment (Nina et al. 2006; Rose 2007). Greater equality in terms of more female representation on the board is also useful in reflecting the diverse demographic features of the firm's stakeholder group such as customer, employees, etc. (Mateos de Cabo et al. 2012). Greater diversity also leads to the ability to better understand and penetrate markets. Given that the markets are diverse, diverse boards will be more able to understand and meet the needs of the market (Robinson & Dechant 1997). Carter et al. (2010, p.398) state that "Resource dependence theory provides the basis for some of the most convincing theoretical arguments for a business case for board diversity".

The authors indicate that boards that include members with a unique set of information enhance the pool of information and positively improve the decision-making process.

Social Psychology Theory presents another theoretical viewpoint on group diversity. Theories within social groups, such as social categorisation (Tajfel, 1981) and social identification (Turner, 1982), predict a negative impact of diversity on firm value. These theories explain how individuals divide group members into in-groups (those similar to themselves) and out-groups (those dissimilar to themselves), with in-groups being viewed more favourably (Nielsen & Huse, 2010). Kanter (1977) argues that in-group members tend to seek trust, and thus, any individuals outside of these groups may be seen as a potential threat.

Based on these theories, it is suggested that members of a group who hold the majority may wield an outsized amount of power in decision-making processes (Westphal & Milton, 2000). Consequently, when women are in the minority in male-dominated boards, their influence may be limited. Typically, corporate boards only have a small number of female members, and this minority group may feel marginalised when participating in large group decisions (Kanter, 1977). This underrepresentation of female directors can be viewed as tokenism, and it may have a negative impact on the influence that women have on decisions. As a result, female directors may not have a significant impact on a firm's value creation (Adams & Ferreira, 2009). Additionally, tokenism can lead to feelings of isolation, self-doubt, and reduced influence (Lucas-Pérez et al., 2014). In the context of social psychology, some researchers propose that having gender diversity in a group can have a positive impact on the group's outcomes. Westphal and Milton (2000) contend that the presence of gender minorities within a group can enhance divergent thinking, resulting in better-quality decisions.

This heterogeneity positively brings different perspectives, innovation, and creative ways to problem solving and the decision-making process (Daily et al. 2003; Forbes & Milliken 1999; Hillman et al. 2002). Kim et al. (2009) argue that diversity on boards positively affects and improves the breadth and speed of top management team strategic action. The outcome of social psychology theory predicts that the effect of diversity in groups could impact either positively or negatively on firms' value. In summary, the previous discussion highlights the importance of gender diversity on board effectiveness.

Female directors have been shown to possess the necessary competencies, skills, creativity, external networks, and human capital required for high-level leadership positions. Empirical research has supported these theoretical predictions, with several papers offering evidence. One such study is Adler's (2001) investigation into the correlation between promoting females to executive positions and firm profitability. Adler's research, which examined 215 Fortune US 500 firms over a 19-year period from 1980 to 1998, found that firms with a higher proportion of female promotions had greater profitability, as measured by a percentage of revenue, assets, and equity. Adler attributed this positive association to the ability of firms with more women in leadership roles to attract highly qualified and talented candidates, who bring diverse perspectives and backgrounds that lead to better decision-making and, consequently, increased profitability. Erhardt et al. (2003) offer similar evidence supporting this positive relationship.

The study examines how demographic diversity on boards of directors affects corporate financial performance. The study was conducted in the US using 127 companies over the period 1993–1998. Their results show a positive influence of female directors on firm value measured by return on assets and return on investment. Consistent with these findings, Campbell and Minguez-Vera (2010) document positive evidence on the appointment of new females on Spanish boards. The authors find that between 1995 and 2000 there were 47 female board appointments. The study conducts an event study to examine the stock market reaction to these appointments. The results indicate that the market positively reacted to the appointment of female directors, which is expressed in higher stock prices. This implies that investors in the market believe that women are able to add value to the firm. This positive link between female directors and corporate value has also gained support in recent empirical papers by Anderson et al. (2011), Joecks et al. (2013) & Palvia et al. (2014). However, some empirical papers have found a negative or insignificant relationship between female on the boards and firm value (e.g., Adams & Ferreira 2009; Ahern & Dittmar 2012; Carter et al. 2010; Chapple & Humphrey 2014; Rose 2007). One interesting and important paper was provided by Adams & Ferreira (2009).

In this study, the sample includes an unbalanced panel of 1,939 US firms. Using the fixed effect method, the authors provide evidence that female behaviour in the boardroom is different from that of their male counterparts. The findings reveal that female directors have more attendance at meetings and are more likely to be assigned to monitoring roles such as participating in audit, nominating and governance committees. Moreover, the study reports that boards with more female directors positively affect corporate governance. For example, the study finds that the sensitivity of CEO turnover increases with more female presence on the board. However, Adams & Ferreira (2009) indicate that the effect of female directors on firm value is negative.

The authors explain the negative finding as female directors exert too much monitoring which in turn negatively affects firm value. Other papers explain the negative or insignificant effect as more diverse boards suffer from communication and coordination problems which in turn result in a lower and less effective decision-making process (Forbes & Milliken 1999). In this regard, Earley & Mosakowski (2000) suggest that homogeneity between members leads to better communication as most of them share similar views. Campbell & Mínguez-Vera (2008) agree that gender diversity provides more views and brainstorming, but the decision-making process may become less effective and require more time. Milliken & Martins (1996) point out that more dissatisfaction and higher turnover ratio is found in more diverse boards.

2.3. Summary

In the first section of this chapter, we delved into both theoretical and empirical research on the connection between board structure and firm performance. The agency theory served as the main theoretical foundation for our review. This theory focuses on the potential conflicts that can arise between the agent (e.g. executives) and the principal (e.g. shareholders) due to differing interests. As one of the most widely used theoretical frameworks in corporate governance, agency theory provides a useful tool for examining possible solutions to these conflicts. Given our objective of investigating the impact of corporate governance on various firm performance outcomes, as stated in the

introduction, the narrow definition of corporate governance is most pertinent as it establishes a direct link between corporate governance and performance. In addition to agency theory, we also explored resource dependence theory and stewardship theory. Moreover, we reviewed empirical studies on the relationship between board structure and firm performance. The literature suggests that certain factors such as board independence, diversity, and CEO duality are relevant to corporate performance outcomes.

However, the results of these studies are mixed and inconclusive. Nonetheless, the body of research we reviewed serves as a foundation for understanding the complex relationship between board structure and firm performance and can guide future studies aimed at further illuminating this critical area of corporate governance.

Chapter 3

Impact of Board of Directors on Stock Comovement

“One person can never accomplish great things in business. A group of individuals completes them..” – Steve Jobs, n.d.,

3.1. Introduction⁸

Academic research has demonstrated the effectiveness of publicly available information on equity prices (see, for example, Grossman & Stiglitz, 1980), in which market participants disclose information as a result of trading. This type of information is closely associated with equity returns mostly proxied by idiosyncratic volatility, illiquidity ratio, stock return synchronicity/non-synchronicity (Amihud, 2002; An & Zhang, 2013; Becker-Blease & Paul, 2006; Boubaker, et al., 2014; Chan & Chan, 2014; Chelley-Steeley, Lambertides, & Steeley, 2015; Easley et al., 1996; Gul et al., 2011; Kim et al., 2014), and stock return fluctuation range (Bloom, 2014; Huang, 2011). Using a sample of 2,659 firm-years from non-financial S&P 500 firms from 2009 to 2017, this paper explores the previously unexplored question: whether corporate governance monitoring and incentive alignment⁹ provisions as a bundle influence the ability of stock prices to integrate firm-specific information. Consequently, we test if the NGQs moderate this relationship. *Extant* literature (Schepker & Oh, 2013; Yoshikawa et al., 2014), opines that it is illogical to imply that governance factors could operate autonomously because performance of

⁸ The modified version of this empirical chapter is published as: “Stock comovement and governance bundles: Does the quality of national governance moderate this relationship?” *International Journal of Finance and Economics* <https://doi.org/10.1002/ijfe.2548>

⁹ Agency theory has recommended a number of different mechanisms, to effectively mitigate the agency problem including the internal monitoring by the board of directors (Fama & Jensen, 1983; Mizruchi, 1983) and the alignment of executives’ interests with those of shareholders, via either compensation contingent on firm performance (Holmstrom, 1979; Murphy, 1986) or executive stock ownership (Alchian & Demsetz, 1972; Demsetz, 1983; Jensen & Meckling, 1976).

a firm is more reliant on the “bundle” rather than any single type of governance factor (Aguilera et al., 2008).

Several governance practices operate simultaneously within firms, representing the context of governance environments (Yoshikawa et al., 2014) and influencing subsequent organisational decisions and outcomes (Oh et al., 2018). To make a case for the impact of governance practises as a bundle, this research contends that monitoring mechanisms and incentive alignment provisions operating as a bundle will improve stock prices' ability to integrate firm-specific information and thus increase functional efficiency. In other words, reduce comovements of stock prices. This study is the first to examine this relationship. This article connects to a range of studies investigating the association between the structure of the board and the capacity of stock prices to inform. Gul et al. (2011) demonstrate that gender heterogeneity of the board reveals more firm specific information through an enhanced public transparency in large firms. Kim, Pantzalis & Wang, (2018) find shareholder coordination enhances stock price comovement through a system of enhanced voluntary disclosure quality; Ferreira et al. (2011) show evidence of a negative association between board of directors' independence and return comovement implying that board independence and return comovement are substitutes Yu, (2011) documents that all mechanisms used in their analysis except for board-related governance are positively linked to return comovement.

This study differs from the extant literature. Previous CG research has either often mainly used single CG mechanisms, such as board independence, gender, institutional ownership (e.g., Gul et al., 2011; 2010; Ferreira et al., 2011) or some form of constructed composite indices (e.g., Gompers et al., 2003; Bebchuk et al., 2009; Karpoff et al., 2016) to explain firm or share price performance. It is needless to say that the findings of a vast majority of extant governance studies are mixed, and therefore raise major inquiry as to whether the indices that are often used are actually generally acceptable proxies (see e.g., Aguilera et al., 2008). In addition, Larcker et al., (2007) contend that the possible measurement error that may arise from the use of single governance factor (e.g., gender, CEO duality, board independence and so on), will undoubtedly cause the

coefficients of regression to be unpredictable. To solve this, researchers developed governance indices that include several provisions. Nonetheless, there appears to be no theoretical framework for the selection of governance provisions, as these indices are "naively constructed," according to Brown & Caylor (2006), and thus result in observational errors (Black et al., 2017).

Furthermore, not only is including all applicable governance provisions extremely difficult, but it is also likely that not all of the provisions will be relevant to the study, and thus observational errors, such as selection bias, are likely to be present in such governance indices (Larcker et al., 2007; Black et al., 2017; Karpoff et al., 2016). To counter this, this research builds a more robust governance indices using statistical methods following the works of Black et al. (2017); Karpoff et al. (2016); Chen, Lu, & Sougiannis (2012) and Larcker et al. (2007). This clearly indicates the combination of three board monitoring (board independence, CEO duality and board gender diversity) and two TMT/CEO compensation (Total executives' compensation and Total CEO compensation) to proxy for board monitoring and incentive alignment provision respectively, based on the first principal component of the variables. This study's main indicator for stock price returns comovement is the reciprocity of idiosyncratic volatility following extant literature (see e.g., Crawford et al., 2012; Piotroski and Roulstone, 2004; Morck et al., 2000; Ferreira & Laux, 2007; Ferreira et al., 2011).

The research added audit quality and good governance index variables to a set of control variables to account for transparency and/or voluntary disclosed information by firms as these factors have been found to be related to return comovement. (Durnev et al., 2003; Gul et al., 2010; Kim, Zhang, Li, & Tian, 2014; Cheong & Zurbuegg, 2016). In this regard there is a significant negative association between monitoring and incentive alignment provisions as a bundle of practice and return comovement, indicating that governance structures that function as a bundle improve the ability of stock prices to integrate firm-specific information which informs investors of firm performance, ultimately reducing return comovement.

This study also shows evidence of a complementary relationship between the NGQ and a firm's board monitoring. In addition, this study uses a range of procedure to address questions about possible endogeneity issues arising from omitted variables and reverse causality. First, the use of a two-stage least square (2SLS) instrumental variables, to estimate the effect of the independent variables of interest on comovement. As instruments this study implements Ferreira and Laux, (2007) by predicting the value of our endogenous explanatory variables in the first stage and in the second stage the use of predicted values derived in the first stage as instruments. Second, the research carries out the Rubin (1990) theory of unconfoundedness, which posits that altering variations in a fixed set of explanatory variables eliminates biases in both the treated and control units, therefore allowing a causal understanding of such variations.

The results show that CG monitoring and incentive alignment as a bundle reduces stock return comovement and lastly, the study carried out a propensity score matching (PSM) analysis. Specifically, matching up a group of firms with low board monitoring capability and lower incentive structure (below the median value) with a group of PSM-identical firms with high board monitoring capability and high incentive structure (in this case above the median value). The results indicate that the observations are robust to estimation using a matched PSM sample. In summary, the results indicate that governance mechanisms as a bundle of practice and NGQs play important role in promoting the flow of information to the market, thereby reducing stock return comovement.

This study contributes to the body of knowledge in the following ways. First, it adds to the corporate governance bundles literature by 1) employing a PCA technique to develop and introduce a new alternative board monitoring (incentive alignment) proxies containing one key component out of three (2) widely used governance proxies for board monitoring (incentive alignment provision). Secondly, it also adds to existing literature by exploring the influence of governance mechanisms as a bundle on stock return comovement. Thirdly, contributing to existing studies by providing insights into the avenues through which NGQ-Board monitoring connection can have an effect on stock

price performance. Specifically, the results highlight that NGQs moderates the association between board monitoring power and stock return comovement, especially, in smaller firms with lower market conditions as defined by market capitalisation, whilst the effects of incentive alignment provision are most noticeable in firms with greater market conditions. Lastly, the findings open a new line of enquiry on the association between firm size and incentive alignment provision. This research is of interest to decision makers. First, a number of CG strategies can be used to accomplish specific outcomes with firm effectiveness. Second, for firms to create an open financial system, policy makers should, inter alia find a balance between corporate governance oversight frameworks and incentive alignment provisions, specifying how each bundle best suits them.

The rest of the paper is explained as follows: Section 3.2. explores the related literature and describes the research hypotheses. Section 3.3. sets out the data and variables, Section 3.4. carries out the empirical analysis and Section 3.6. concludes the article.

3.2. Hypothesis Development

3.2.1. *Literature on Stock Return Comovement*

Stock market price efficiency is defined by the degree with which prices of traded securities are reported on the stock exchange (Durnev et al., 2003). Thus, stock return comovement¹⁰ indicates the sum of relevant data about future earnings that has been contained into the price. A common estimate to differentiate between the sum of firm-specific and market-wide information contents in stock prices is presented in the work of Roll (1988), which deploys the R-squared as a predictor of stock return comovement from a market model regression.

A lower R-squared suggests that the stock price is contained with more firm-specific details and that the stock price is more informative (Todea & Buglea, 2017). In comparison, the larger the R-squared, the stronger the stock is bidirectional with the movements of the stock market (Cheong & Zurbruegg, 2016). Stock returns represent new market conditions and provide firm-level specific information. Extending the work of Roll (1988), Morck et al. (2000) in their cross-country analysis find that stock prices co-move in poorer economies than in wealthier ones. They show that a relationship exists between stock price return comovement and the institutional environment within which firms are placed. They contend that higher investor's rights protection promotes trading on information that is yet to reflect in stock prices, which in turn ease adding specific firm information into stock prices (Boubaker, Mansali, & Rjiba, 2014), leading to lower

¹⁰ Stock return comovement is the extent firm stock moves in the same direction with the market and industry returns, reflecting the amount of systematic volatility relative to idiosyncratic volatility. In some studies (see e.g Morck, Yeung & Yu, 2000; Wurgler, 2000; Morck & Yeung, 2004; and Chan & Chan, 2014) Stock return comovement have been referred to as stock return synchronicity because stock return synchronicity measures the degree to which individual stock comove with the market (Chan & Chan, 2014). Different views exists on what stock return comovement reflects in terms of price informativeness. In this research we take the view of extant scholars (see Morck, Yeung & Yu, 2000; Wurgler, 2000; Durnev et al., 2003; Morck & Yeung, 2004) who posits that stock comovement is negatively related to price informativeness i.e., the lesser the amount of firm-specific information contained in the stock prices the larger the stock return comovement across firms.

comovement. Actuated by the work of Morck, Yeung & Yu, 2000 their paper, many studies have investigated the association between stock price comovement and CG (Ferreira, Ferreira & Raposo, 2011; Kim, Pantzalis & Wang, 2018; Gul, Srinidhi, & Ng, 2011; Yu, 2011) analyst action (Chan & Hameed, 2006), transparency (Jin & Myers, 2006), voluntarily disclosed information (Haggard et al., 2008), and quality of audit (Gul, Kim & Qiu, 2010), among others. Firm-specific information has been argued by Ferreira, Ferreira & Raposo, (2011) to be helpful for the supply of incentives in firms and in constructing the mechanism of CG.

3.2.2. Monitoring and Incentive Alignment

Agency theory explains that the separation of ownership and control usually leads to potential conflicts or certain malfeasance between shareholders and managers (see e.g. Demsetz, 1983; Fama, 1980; Fama & Jensen, 1983; Jensen, 1983; Jensen & Meckling, 1976; Shleifer & Vishny, 1997) just as much as between controlling shareholders and non-controlling shareholders (see e.g. Anderson et al., 2007; Martin, Wiseman & Gomez-Mejia, 2016), particularly when the shareholders become executives of the firm (Anderson et al., 2007; Hansmann & Kraakman, 2004; Jensen & Meckling, 1976; Shleifer & Vishny, 1997). Shleifer & Vishny (1997) contend that privately-owned gains from ownership privileges (opportunism) are frequent indications of the agency costs, and that addressing these types of agency conflicts usually results in enormous costs for firms due to opportunistic behaviour, which is counterproductive to firm performance.

Furthermore, agency theory suggests that an efficient CG structure is an acceptable strategy for mitigating agency costs in order to protect shareholders' interests and discourage non-stewardship behaviour on the part of the controlling party (Conheady et al., 2015). To put it another way, in order to improve performance, businesses must implement governance frameworks as a monitoring system and incentive instruments to reduce conflicts of interest among firm participants (Daily, Dalton, & Cannella, 2003).

Put differently, CG protects the interests of shareholders' by establishing mechanisms in order to effectively reduce the impact of the agency problems (Nam & Nam, 2004; Velnampy, 2013).

There are two approaches to resolving agency conflicts: supervision and governance. Supervisory approaches rely on regulations, guidelines, or legislation to resolve disputes between the firm's managers and shareholders, whereas governance approaches include 'monitoring' mechanisms and 'incentive' alignment provisions (Hansmann & Kraakman, 2004). Creating CG systems that serve as oversight instruments (monitoring) for shareholders to control executive actions can alleviate agency issues and protect shareholders' interests. Weisbach (1988), Shleifer & Vishny (1997), and Daily et al. (2003). Additionally, Incentive alignment or the compensation contract are also used as a tool for controlling executive or managerial actions to align their interests with the preferences of the shareholders (Anderson & Bizjak, 2003; Florackis, 2008). Furthermore, CG systems not only mitigate the abuse of power or corporate malfeasance between shareholders and managers, but also eliminates the issue of information asymmetry between them (Chen, 2007). Non-controlling shareholders can safeguard their interests by monitoring managerial behaviour and, at the same time provide opportunities to enable executives to align managerial decisions with shareholders preferences. Crucially, both the monitoring mechanisms of CG and executive incentive alignment contribute to firm performance (Ntim et al., 2015), which is perceived in extant literature as the core for designing managerial compensation contracts.

Efficient corporate governance not only contributes to stronger firm performance (Klapper & Love, 2004; Nelson, 2005), it also affects the firm's level of incentive alignment by enhancing firm efficiency and rewarding managers appropriately. In addition, as managers reap optimal compensation, they may fulfil their functions to optimize firm performance correspondingly (Sun, Cahan, & Emanuel, 2009), suggesting that an element of association exists between managerial compensation, firm performance and CG.

The narrative provides proof that the relations between governance, incentive alignment and stock price comovement require a re-examination of analysis to boost the understanding of the potential interaction between various governance factors and stock-price return comovement. To do this, the study applies the CG bundle mechanism.

3.2.3. Governance Mechanisms as a Bundle in Practice

Extant literature (see e.g. Schepker & Oh, 2013; Yoshikawa, Zhu, & Wang, 2014) recommends that it is not reasonable to assume that governance factors could function independently. Firm performance depends more on the bundle instead of any one type of governance factor (Aguilera et al., 2008). Multiple governance mechanisms function concurrently within firms and collectively represent the context of governance environments (Yoshikawa et al., 2014) and impact subsequent organisational choices and outcomes (Oh et al., 2018).

Therefore, to make a case for the impact of governance practices on firm outcomes, it is imperative to think about a collection of reticulated governance mechanisms (see e.g. Desender et al., 2013; García-Castro, Aguilera, & Ariño, 2013). Desender et al. (2013) reported that board's monitoring performance is dependent on ownership characteristics, for instance, the type of controlling shareholder. Also, Ward et al. (2009) documented that firm performance is explained by the conditions when there is an interaction between CG monitoring functions and incentive alignment provisions (see e.g. Daily & Dalton, 1994; Guo & Masulis, 2015; María-Victoria et al., 2018) that align managerial pay with shareholder value (Sanders & Hambrick, 2007). All these governance mechanisms offer accountability wherein agents or managers are compensated with higher pay packages based on their decision-making that raise shareholder value or disciplined for initiatives that weaken profitability. This study will specify each one of these mechanisms distinctly and present hypotheses.

3.2.4. Board of Directors' Monitoring

The board of directors performs two primary functions: monitoring and advising top management (Jensen, 1993). The monitoring role involves overseeing management with a view to minimising potential agency problems, while the advising role involves assisting management in strategy formulation and execution, as well as providing counsel in other areas of top-level decision making. Directors are either affiliated with the firm or independent, with the latter having no significant relationships with the company beyond being directors. Because of this perceived objectivity, independent directors are viewed as valuable monitors and their greater involvement in board oversight is usually suggested as a means of improving managerial accountability and protecting shareholders.

Prior studies have shown independent directors as effective monitors in various contexts: 1) Brickley & James (1987) show that managerial consumption of perquisites is lower when the board is dominated by independent directors, 2) Weisbach (1988) and Borokhovich, Parrino, & Trapani (1996) report that firms with more independent directors are more likely to remove poorly performing CEOs and to select replacements from outside the firm.

Additionally, Vafeas (2005) as seen in Faleye et al., (2011) shows that monitoring quality improves when directors increase the time devoted to oversight duties. In addition, concurrent service on multiple oversight committees can broaden independent directors' understanding of the firm and its operating environment, thereby enhancing their ability to make better-informed decisions. Therefore, assigning more monitoring duties to individual independent directors can lead to improvements in oversight quality. The board of directors endorses and monitor strategic targets such as spending on high-risk programmes planned and implemented by managers. Fama & Jensen (1983) offer evidence of a significant corporate governance structure established by the board structure.

Independent boards ensure oversight by recommending and supervising Chief Executives Officers (CEO) and agreeing or overturning takeover defences (Walsh & Seward, 1990). This implies that, independent directors are therefore a significant corporate governance mechanism for monitoring and motivating managers to align them with shareholders so that the incentives and job opportunities for managers are only increased if their decisions also improve firm profitability.

Furthermore, different dynamics of the board define to what degree boards are independent. Boards with higher concentration of outsider representations, and boards that separate CEO and chairperson positions appear to be more independent from managers and are more plausible to align managers with shareholders' interests (Daily & Dalton, 1994). Also, board gender diversity increases the consistency of decisions by adding new insights and enhancing knowledge to the team at board meetings, which in practise will enhance the monitoring of boards (Dalton, Daily, Johnson, & Ellstrand, 1999). Therefore, a richer information environment is generated with more board diversity, wherein the expense of gathering firm-specific information is lower. These narratives indicate that board monitoring, encourages managers to take decisions that are in the best interests of shareholders by aligning managers with shareholders. Ultimately, this would alleviate agency problems and in turn reduce the comovement of stock prices. Motivated by this, we propose the hypothesis on board monitoring and stock price comovement relationship in the following terms:

Hypothesis 1: Ceteris paribus, the effect of monitoring mechanisms as a bundle can scale back the comovement of stock prices.

3.2.5. *TMT/CEO Incentive Alignment*

A crucial aspect of board monitoring involves establishing effective managerial incentives via well-crafted compensation agreements. In an ideal principal-agent scenario, executive pay is the outcome of fair negotiations between self-interested executives and a board of directors dedicated to maximising shareholder value.

Therefore, executive compensation levels and modifications should be solely determined by economic factors such as managerial job market conditions and company performance. However, according to Bebchuk and Fried (2004), reality deviates from efficient contracting, and management often manipulates the pay-setting process for its benefit, which harms shareholders. Extensive previous research has investigated these issues, concluding that compensation incentives improve as board monitoring becomes more robust. Specifically, Core, Holthausen, & Larcker (1999) show that CEO compensation is positively related with CEO duality and board size. They also show that CEOs enjoy excess pay when a majority of independent directors are busy (i.e., serve on multiple boards). Extant literature using agency theory (see Palmer & Wiseman, 1999; Sanders & Hambrick, 2007) document that incentive compensation aligns managers' interests with that of shareholders. A selection of compensation structures e.g., managerial shareholding, stock options, and earnings-linked incentives (total compensation and cash compensation) can help to better align managers' pay with shareholder interests.

At a fundamental level, a primary reason boards use pay-for-performance schemes is because of an inherent belief that executives (and, by extension, firms) will perform better when performance is rewarded. Theoretically, both methods of incentive alignment could result in higher levels of performance. If boards are vigilant in rewarding increases in shareholder wealth by adjusting CEOs' salaries and bonuses, executives should find that motivational. Likewise, the theory behind stock options and other long-term contingent compensation plans is that executives will do all in their power to increase shareholder returns so that they can cash in their options for significant gains.

Although the benefits of pay-for-performance plans are widely believed, there is scant empirical evidence that such arrangements for CEOs have material effects on subsequent firm performance. It is also possible that options do not have the incentive alignment effect that many assume. Therefore, managers are also more apt to be aligned with shareholders when the motivation for managers is better matched with the shareholders' value. This in effect would alleviate agency problems and weaken stock return comovement. Motivated by this, this research proposes the hypothesis on incentive alignment and stock price comovement relationship in the following terms:

Hypothesis 2: Ceteris paribus, the effect of TMT and CEO incentive alignment as a bundle can scale back the comovement of stock prices.

3.2.6. Comovement, Monitoring and Incentive Alignment: The Effect of NGQ

Some researchers (Aguilera, 2005; La Porta et al, 2000) posit that national governance structures or institutional environments are used to handle agency issues. Others (Kaufman, Kraay & Mastruzzi, 2011; Schiehl et al., 2014; Yoshikawa, Zhu, & Wang, 2014) argue that there are formal restraints (e.g., rules, laws and procedure) and informal rules containing ethical codes, social norms and values that are unwritten but comparatively essential. NGQs could therefore, serve as a determining factor ensuring that economic actors comply with the laid down rules.

They also suggest that NGQs will defend shareholders from being taken by the agents, and safeguard minority investors' rights. Therefore, stringent NGQs tend to demand necessary information disclosure and regulate the intermediaries within the market, thereby assuaging information asymmetries. Also, they pressure the board to implement their regulatory duty (Yoshikawa et al., 2014). In this research context, NGQs can even function as an important external corporate governance mechanism to guard shareholders and impact comovement. Empirically, Morck Yeung & Yu (2000) show that a relationship exists between stock return comovement and the institutional environment within which firms are located. They argue that better investors' rights protection on the premise of legal origin promotes information exchange, which adds firm-related information into the price of stock, resulting in lower comovement.

Additionally, Ernstberger & Grüning (2013) propose that NGQ could be substitutive or complementary on the relationship between corporate governance and disclosure practices and further called for the examination of the role of national and firm-level corporate governance structures in the Anglo-Saxon countries. Furthermore, researchers (see e.g. La Porta et al., 1997; 2000; Aguilera et al., 2008; Alon & Dwyer, 2014; Cahan et al., 2015) documented that NGQ would potentially enhance corporate governance structure on the basis of legal rules and regulations and the level of mechanisms available to enforce those rules meaning that NGQ could play a moderating role in the extant

agency problems. These arguments lead us to propose the hypothesis on the NGQ bundle stock price comovement relationship:

Hypothesis 3: The presence of NGQs moderate agency problems, thereby increases the negative relationship between monitoring and incentive alignment bundle and comovement ceteris paribus.

3.3. Sample and Data

The selection includes companies listed in S&P 500 during the periods between 2009 and 2017. S&P tests the efficiency of the portfolio of 500 major US firms and makes adjustments to the set of companies every now and then. The S&P 500 identifies the most influential listed companies from different business sectors and their market performance shows the actual position of the US economy and capital market.

In addition, the total market cap of all 505 constituents in the S&P 500 index is approximately equivalent to ninety percent (90%) of the total value of the NYSE-listed companies compared to the DOW Jones Industrial Average (DJIA) which only comprises 30 large firms. Therefore, the research uses the listed companies in the S&P 500 for any of the years in our sample period. Monthly¹¹ Data on market and firm-level returns were collected from the Datastream Global Equity Index (DGEI) database from 2009 to 2018. Financial data were collected from the World scope database. Country-level economic statistics and NGQ bundles data were taken from the World Bank. This study will limit the analysis to non-financial firms. This is because, financial firms (SIC) codes 6000–6999 are governed differently making it more difficult to equate their financial details with that of firms in other industries (Boubaker et al., 2014). The study also omitted firms with insufficient information on corporate governance and incentive alignment (compensation) or missing data for estimating our control variables. The research removed 2018 from the study due to lack of data for that year for the NGQ. Furthermore, we removed six firms that their headquarters is not in the US – after these requirements were applied, the (unbalanced) sample consists of approximately 325 companies, with a total of 2669 firm–year observations. There is no evidence of significant differentiation across the sample years within the range of observations. This study employs Fama-French 12 industry classification for statistical distribution. The majority of results came

¹¹ In this analysis, monthly data is used rather than daily or weekly data to avoid the mix of high-frequency data issues e.g. zero returns, significant and non-synchronicity. Puthanthong and Roll (2009) posit there are explanations “thin trading and other microstructure effects” to imply that extended returns intervals could be better even if the number of observations is reduced.

from four main industries: industry 12 others (25.85%), industry 10 healthcare (15.25%), industry 6 business equipment, computers and software (14.91%) and industry 1 consumer non-durables (12.06%). These sectors make up 68% of the full sample used in the analysis. There was permission for firms to be included and excluded in the research sample during the time under review to mitigate the survivorship bias.

3.3.1. Measure of Comovement

This study will use stock return comovement as the dependent variable. Following Crawford et al. (2012), the research demonstrates the construction of stock return comovement. First, there is need to measure the market regression model for every firm-year using monthly stock return data to extract the R^2 . The regression model following is:

$$\mathbf{r}_{i,k,t} = \alpha_I + \beta_1 * \mathbf{r}_{mt} + \beta_2 * \mathbf{r}_{kt} + \epsilon_{it...} \quad (1)$$

Here, $r_{i,k,t}$ represents the monthly return of firm i in industry k in month t , r_{mt} represents the value-weighted market return in month m , r_{kt} is the value-weighted industry return k in month m , the value weighted industry return in month t , is for all firms that belong to, however not including the monthly return of firm i . The industries are classified by Fama-French 12 industries classification and ϵ_{it} is unspecified random factors. Secondly as the R^2 from the first stage is bounded within the intervals of $[0, 1]$, this study use the log transformation of R^2 from Model (1) following Boubaker et al., (2014) to generate the variable comovement for each of the firm-year as follows:

$$CO_MOVE = \log [R^2 / (1-R^2)]. \quad (2)$$

A higher CO_MOVE value indicates signs of correlations between the stock returns of a firm and the industry and market returns indicating that comparably very little firm-specific information is contained in the stock price and vice versa.

3.3.2. *CG Measures*

3.3.2.1. *Board Monitoring (BOARD_MON)*

Boards with a greater proportion of outsiders (Board Independence) are seen as useful monitors, worthy of strengthening management decision-making and improving firm performance (Daily and Dalton, 1994).

Comparably, board governance structure (from separating the functions of the CEO and Chair of the board of directors) strengthens the capacity of a board to efficiently track the CEO's decision, allowing very little incentives for CEOs to engage in activities that will hinder performance (Daily and Dalton, 1994). In addition, since boards practise monitoring through their discussions, Gul et al. (2011) argue that gender diversity facilitates informed and comprehensive discussions of issues at board meetings during the year which is likely to increase the reach of board monitoring (Dalton et al., 1999). Consequently, the research assesses the efficacy of board monitoring by drawing on these board features that specifically explain analogous elements of board monitoring. The study tested the impact of board monitoring on the basis of a composite measure of board governance consisting of Board Independence (proportion of outside directors), CEO duality (where the CEO is also the Chair of the Board), and Gender Diversity (the proportion of females on board). Considering that these different board attributes could work simultaneously to provide monitoring, our study used a tool for factor extraction—principal component analysis (PCA). Following the extant literature (Black et al., 2017; Karpoff et al., 2017), we obtained a common factor that summarises the common knowledge in the aforementioned corporate governance measures. Explicitly, as our measure of board monitoring, we extracted the first principal component of the three variables.

A higher score on our measure suggests greater efficacy of monitoring. Although as a result of measurement error, it assumes it is not possible that any single board feature can perfectly capture a firm's unobservable level of board monitoring. Nonetheless, by summing the common information among these measurable factors, PCA decreases the estimation error and provides a common link that underlies the maximum likelihood between these variables.

3.3.2.2. TMT and CEO Incentive Alignment (CEO_INCENTIVE)

An essential governance tool has been noted for aligning the CEO's interests with those of the shareholders through equity-based incentives (see e.g., Armstrong et al., 2015; Coles, Daniel, and Naveen, 2006; Core and Guay, 2002). In this study we calculate CEO incentive alignment following (Jensen, Murphy & Wruck, 2004 and Frydman & Saks, 2010) as the total amount of cash pay, equity-based and non-equity-based incentive payments. Specifically, using data from Bloomberg, our CEO incentive alignment proxy is measured as the total salaries awarded including restricted stock pay-outs from long-term pay and stock options granted to a CEO in any year under review. Although it is known that CEOs who perform well earn dramatically higher compensation (Wade et al., 2006, 2008), there is hardly any proof of how those higher compensation are applied to the rest of the TMT. Graffin et al. (2008) suggest that certain CEOs, would aim for a more equitable distribution of pay among their TMT. Studies, based on theories of equity and social comparison (Adams, 1965; O'Reilly et al., 1988), posit that it is highly likely that the CEO would want to extend the compensation earned from an increase to their performance to the rest of the TMT by pursuing a pay raise for its members to preserve good relationship, teamwork and cooperation (Ensley et al., 2007; Carpenter & Sanders, 2002). TMT incentive is calculated by using the logarithm value of the remuneration of all the executives divided by the number of executives for each given period listed in Bloomberg. This offers an estimation of the average TMT pay consistent with previous research (see Conyon & He, 2011; Oh et al., 2018; Ntim et al., 2019).

On this basis, incorporating the work of Chen, Lu, & Sougiannis, (2012), the PCA was used to obtain a common factor summarising the common information contained in these two measures.

3.3.3. *National Governance Quality (NGQ)*

Extant literature suggests that NGQ influences the information environment of firms (Kaufmann et al., 2011; Zatzoni & Van Ees, 2012). In this research, we use Kaufman, Kraay and Mastruzzi (2011) six dimensions¹² as a proxy for our NGQ bundles (NGQ): first, quality of voice and accountability; second, the quality of the political stability; third, quality of government effectiveness; fourth regulatory-related quality fifth, rule of law; and sixth, corruption control. Correlation results of six dimensions in Table 1 suggests that a high correlation is present. This finding is not novel to this study. It is, however, consistent with previous studies (see e.g., Alon and Dwyer, 2014). Table 2 also shows the PCA (eigenvectors) and diagnostics of NGQ dimensions. The Kaiser-Meyer-Olkin (KMO) estimate, which is our sampling adequacy test, is 0.8939. The test result is greater than the suggested least possible PCA score of 0.50 (Hutcheson and Sofroniou, 1999). The study then conducts a PCA to generate an NGQ bundle for our NGQ dimensions.

¹² We choose to use the indices constructed by Kaufmann, Kraay, and Mastruzzi (2011) because, it updated yearly or every two years and has time series variations. This data have been used in corporate governance research (see e.g., Elamer et al., n.d; Eun et al., 2015).

Table 1. Correlation matrix of the NGQs

Variable	VAQ	PSQ	GQ	RQ	ROLQ	COCQ
VAQ	1					
PSQ	0.8145	1				
GQ	0.9200	0.8025	1			
RQ	0.8696	0.6723	0.9091	1		
ROLQ	0.9195	0.7504	0.9414	0.9320	1	
COCQ	0.9493	0.7545	0.9443	0.9222	0.9392	1

Note. NGQ variables are voice and accountability quality (VAQ), political stability quality (PSQ), government quality (GQ), regulatory quality (RQ), rule of law quality (ROLQ), and control of corruption quality (COCQ).

Table 2. Principal Component Analysis (Eigenvectors) for the NGQs

Variable	Com1	Com2	Com3	Com4	Com5	Com6	KMO
VAQ	0.4174	0.0669	-0.6862	0.2599	-0.1344	-0.5145	0.8731
PSQ	0.3629	0.8952	0.2734	0.1708	0.0158	0.1245	0.8819
GQ	0.421	0.0352	0.1576	-0.7508	0.341	-0.3417	0.9096
RQ	0.4055	0.4179	0.5196	0.5486	0.2238	-0.1998	0.9088
ROLQ	0.4187	0.2029	0.1553	-0.1961	-0.8197	0.2214	0.9181
COCQ	0.4208	0.1728	-0.3679	0.01247	0.3787	0.717	0.8719
Eigenvalue	5.360	0.379	0.1066	0.6492	0.0546	0.0328	-
Proportion	0.8933	0.0632	0.0178	0.0108	0.0094	0.0055	-
KMO	-	-	-	-	-	-	0.8939

Note. This table reports the dimensions of NGQ, PCA (eigenvectors); Com refers to component. The six dimensions of NGQ indicators are voice and accountability quality (VAQ), political stability quality (PSQ), government quality (GQ), regulatory quality (RQ), rule of law quality (ROLQ), control of corruption quality (COCQ). Also, Kaiser–Meyer–Olkin measure (KMO) is a measure of sampling adequacy.

3.3.4. *Control Variables*

The research did control for other factors that could influence firm level performance: in this study we controlled for variables that have been found to correlate with board structure.

The scope of operations hypothesis suggests that the size and complexity of a firm's operations affect its board structure (Fama & Jensen, 1983). We consider proxies to capture firms' operational complexity such as: firm size & leverage. Firm size (*SIZE*) is defined as the log of total assets at the end of the fiscal year and (*MV*) is as the share price multiplied by the number of ordinary shares in issue at the end of the fiscal year. Leverage (*LEV*) is defined as the ratio of total debt divided by total assets. The justification here is because Ferreira et al., (2011) argue that more leveraged firms are more dependent on external resources and thus leverage can be considered as a proxy for firm complexity.

Under the monitoring hypothesis¹³ we control for the cost of monitoring by using firm accounting performance (*PERF*) defined as the ratio of operating income before depreciation to total assets. Performance volatility (*SdROA*) is defined as the volatility of profitability or return on company's assets standard deviation over 7 years, Board Size (*BOARDSIZE*) is defined as the number of board of directors these variables are possibly related to agency conflicts. National governance variables like annual inflation (*INFLATION*) is defined as the annual inflation rate in percentages per year. Based on the findings of previous studies (see e.g., Morck et al., 2000), we control for the good government index, such as audit quality (*AUDITQ*) and good governance index using a parsimonious G-index (*PINDEX*). As these factors may affect stock return comovement. Furthermore, this study used industry and year dummies as control variables for the years from 2009 to 2017.

¹³ The monitoring hypothesis is the set of formal and informal theories emphasising the importance of a firm's business environment for the optimal design of its board structure (e.g., Demsetz & Lehn, 1985; Raheja, 2005; and Adams & Ferreira, 2007; Ferreira et al., 2011)

3.3.5. *Model Specification*

This research aims to expand extant literature on corporate governance bundles (Rediker and Seth, 1995; García-Castro, Aguilera, and Ariño, 2013), which posit that the performance outcomes of firms rely on the efficiency of a bundle of governance practices interacting at the same time instead of the effect of one individual governance factor. To test the hypotheses using the following firm-level panel data regressions:

$$\begin{aligned}
 Comove_{it} = & \alpha_0 + \beta_1(NGQ) + \beta_2(Lev) + \beta_3(PERF) + \beta_4(SdROA) + \beta_5(MV) \\
 & + \beta_6(SIZE) + \beta_7(AUDITQ) + \beta_8(PINDEX) + \beta_9(INFLATION) \\
 & + \beta_{10}(BOARDSIZE) + \beta_{11}(BOARDMON) + \beta_{12}(CEOINCENTIVE) \\
 & + \beta_{13}(BOARDMON \times CEOINCENTIVE) + \beta_{14}(BOARDMON \times NGQ) \\
 & + \beta_{15}(CEOINCENTIVE \times NGQ) \\
 & + \beta_{16}(BOARDMON \times CEOINCENTIVE \times NGQ) + \sum_{I=1}^{11} INDUSTRY \\
 & + \sum_{I=1}^9 YEARS + \epsilon_{it}
 \end{aligned} \tag{3}$$

For the hypotheses to hold, there should be a negative association between governance bundles, NGQ and COMOVE. A significant and negative β_{11} and β_{12} would support Hypothesis 1 and 2 since it would indicate that stronger board monitoring mechanisms and managerial incentive alignment will reduce agency problems, therefore, weaken COMOVE. Similarly, a significant and negative interaction term β_{14} , β_{15} and β_{16} will support Hypotheses 3 since this would indicate that NGQ moderates the negative relationship between monitoring and incentive alignment provisions and comovement. Ordinary Least Square (OLS) is an efficient and reliable statistical tool under these conditions and therefore the primary basis of analysis results is not reported. We also use a fixed effects method for our analyses, a Hausman test, compares fixed effects and random effects estimations. It suggests that the fixed effect is the correct estimate to use in the analysis.

In addition, we tested the primary independent variables (the measurement of board monitoring, and incentive alignment) for endogeneity using the augmented regression test Hausman Taylor (1981). The results show that the board monitoring and incentive alignment are not endogenous.

The augmented regression tests, however, show that although the measure of monitoring and incentive alignment is not endogenous, the study cannot rule out endogeneity in the regression analysis. Therefore, the study implemented the following: first, the use of Rubin (1990) methodology, which involves turning the independent variables of interest i.e., *BOARD_MON* and *CEO_INCENTIVE* into a Boolean dummy; secondly, the use of instrumental variable (2SLS) regressions with predicted instruments to account for the potential endogeneity issues; thirdly, the study carried out a propensity score matching, and lastly, as an additional test, the study undertook and documented a cross-sample analysis to see whether the findings hold.

3.4. Empirical Results

3.4.1. Descriptive Statistics

Table 3. Summary Statistics 1

Table 3 presents the descriptive statistics of the variables. The sample consists of 2,678 firm-year observations over the period 2009 to 2017. The list of variables, definitions are provided below.

	N	Min	Max	Mean	St.Dev	Median
COMOVE	2669	-4.948	2.961	0.049	1.321	0.215
Board size	2669	5	18	10.747	2.092	11
Independent_dir	2669	0	1	0.831	0.103	0.875
CEO duality	2669	0	1	0.555	0.497	1
P index	2687	0	6	3.746	1.063	4
Diversity	2669	0	0.625	0.172	0.099	0.167
Dir pay	2669	0.837	2.796	1.417	0.278	1.356
CEO pay	2669	0	15.342	13.826	1.315	13.955
LEV	2669	0	0.828	0.272	0.169	0.259
PERF	2669	-.167	0.407	0.118	0.076	0.108
SdROA	2669	0.074	0.08	0.077	0.002	0.076
NGQ	2669	-1.092	-0.787	-0.957	0.097	-0.954
MV	2669	5.443	13.591	9.676	1.151	9.525
SIZE	2669	11.775	20.475	16.42	1.277	16.455
INFLATION	2669	-0.356	3.157	1.433	0.992	1.622
Board_mon	2669	-4.4	3.038	0.006	1.233	0.03
CEO_incentive	2669	-9.895	2.075	-.005	1.087	.207
AuditQ	2678	-1.217	.499	.07	.077	.068

Note: The table presents the descriptive statistics of the variables. The sample consists of 2,678 firm-year observations over the period 2009 to 2017. COMOVE, stock comovement, is defined as the log- transformation of the adjusted R² of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; Board Size is the total number of directors on board; Independent_dir is the proportion of outside directors to insiders; Ceo_duality is a Boolean dummy variable of 1 wherever CEO is also the same person as the chairman, and zero otherwise; P_index is the sum of 6 parsimonious index from GIM namely limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; Diversity is the proportion of females on the board; Dir_pay is the log of the remuneration of all directors scaled by the number of directors; CEO pay is the log of the total CEO remuneration; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the SD of the ratio between operating income and total assets over 7 years; NGQ is the first principal component of the six NGQ dimensions Kaufmann et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; MV is the log of the share price multiplied by the number of ordinary shares in issue at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; INFLATION is the annual inflation rate in percentages per year; Board_Mon is the first principal component of board governance comprising of independent director, CEO_duality, & Diversity; Board_incentive is the first principal component of TMT incentive alignment comprising of dir_pay & CEO_pay, AuditQ proxied by the likelihood of loss avoidance is earnings scaled by total assets.

Table 3 summarises the statistics for all variables used in the study. Except for CEO duality, all firm-level and governance variables are winorised at 1% upper and lower tails of the distribution. The *COMOVE* measure has a mean (median) value of 0.049 (0.215) and a range of -0.689 (25th percentile) to 1.992 (95th percentile). *BOARD SIZE* has a mean (median) value of 10. (11). inferring that the sample contains considerably bigger boards on average the mean (median) number of *INDEPENDENT_DIR* is 0.831 (0.875), indicating that firms in the sample have more independent directors on average.

The mean (median) of *P_INDEX*, which is the measure of good corporate governance, is 3.745 (4.0) and varies from 3 (25th percentile) to 5 (95th percentile) and mean (median) of firm size; *SIZE* measured by the log of total assets is 16.420 (16.454). *MV* the natural log of the share price multiplied by the number of ordinary shares in issue 9.676 (9.524): this shows the sample pool is cluttered with the major firms. *PERF*, the measure of firm profitability, has a mean (median) of 0.117 (0.108), and standard deviation of 0.076. Finally, the mean (median) of the computed variables of interest *BOARD_MON* and *CEO_INCENTIVE* is 0.006 (0.03) and -0.005 (0.207). All the variables used in this analysis have substantial variation.

3.4.2. Correlation

Table 4. Correlation table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Comove	1.000																	
Board_size	0.111***	1.000																
Ind_dir	0.112***	0.135***	1.000															
Ceo_duality	0.114***	0.069***	0.245***	1.000														
P_index	-0.014	-0.063***	-0.057***	0.009	1.000													
Diversity	-0.045**	0.241***	0.244***	0.133***	-0.096***	1.000												
Dir_pay	-0.121***	-0.951***	-0.134***	-0.064***	0.054***	-0.240***	1.000											
CEO pay	0.046**	0.171***	0.118***	0.066***	-0.016	0.057***	-0.178***	1.000										
Lev	-0.023	0.169***	0.078***	0.040**	-0.031	0.090***	-0.179***	0.150***	1.000									
Perf	-0.114***	-0.121***	-0.095***	-0.027	0.013	0.007	0.103***	-0.039**	-0.144***	1.000								
Sd_roa	0.048**	0.033*	0.035*	-0.022	-0.044**	0.093***	-0.024	-0.006	0.080***	-0.067***	1.000							
NGQ	-0.022	-0.012	-0.022	0.016	0.009	-0.047**	0.008	0.026	-0.023	0.049**	-0.131***	1.000						
MV	0.025	0.389***	0.181***	0.138***	-0.200***	0.307***	-0.307***	0.042**	0.003	0.139***	0.061***	-0.035*	1.000					
SIZE	0.138***	0.521***	0.204***	0.151***	-0.196***	0.298***	-0.459***	0.132***	0.169***	-0.241***	0.035*	-0.009	0.803***	1.000				
Inflation	-0.049**	-0.021	-0.020	0.012	-0.007	-0.039**	0.025	0.027	-0.027	0.084***	-0.542***	0.582***	0.034*	0.011	1.000			
Board_mon	0.109***	0.553***	0.680***	0.548***	-0.087***	0.689***	-0.533***	0.163***	0.150***	-0.092***	0.061***	-0.029	0.407***	0.465***	-0.029	1.000		
CEO_incentiv	0.109***	0.731***	0.164***	0.085***	-0.046**	0.194***	-0.768***	0.767***	0.215***	-0.092***	0.012	0.012	0.227***	0.385***	0.001	0.453***	1.000	
e																		
AuditQ	-0.086***	-0.068***	-0.053***	-0.001	0.000	0.011	0.066***	-0.056***	-0.218***	0.777***	-0.085***	0.039**	0.174***	-0.129***	0.103***	-0.043**	-0.079***	1.000

Note: The table presents the Pearson correlation matrix of the variables. The sample consists of 2,678 firm-year observations over the period 2009 to 2017. *COMOVE*, stock comovement, is defined as the log-transformation of the adjusted R^2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; Board Size is the total number of directors on board; Independent director is the proportion of outside directors to insiders; *CEO_DUALITY* is a dummy variable of 1 wherever CEO is also the same person as the chairman, and zero otherwise; P_index is the sum of 6 parsimonious index from GIM namely limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; Diversity is the proportion of females on the board; Dir_pay is the log of the remuneration of all directors scaled by the number of directors; CEO pay is the log of the total CEO remuneration; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the SD of the ratio between operating income and total assets over 7 years; NGQ is the first principal component of the six *NGQ* dimensions Kaufmann et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; *MV* is the log of the share price multiplied by the number of ordinary shares in issue at the end of the last fiscal year; *SIZE* is the log of total assets at the end of the last fiscal year; *INFLATION* is the annual inflation rate in percentages per year; BOARD_MON is the first principal component of board governance comprising of independent director, ceo_duality, & Diversity; *CEO_INCENTIVE* is the first principal component of TMT incentive alignment comprising of Dir_pay & CEO_pay; AuditQ proxied by the likelihood of loss avoidance is earnings scaled by total assets *, ** and *** evidence significance at the 10%, 5% and 1% levels, respectively.

In Table 4, the study presents the pairwise correlation matrix which highlights the correlations among dependent, independent and control variables. The mean VIF (Variance Inflation Factor) of all variables is 2.42, below the rule threshold of 10 (Chatterjee & Hadi, 2006; Hair et al., 1995).

Therefore, there is no multicollinearity problem in the study. However, with regards to the pairwise correlation matrix, the subsequent results are notable. Comovement is positively and significantly correlated with CEO power (*CEO_DUALITY* $r = .11$, $p < 0.001$): however, *DIVERSITY* & *DIRECTOR'S PAY* was negatively and significantly correlated to *COMOVE* ($r = -0.05$, $p < 0.05$; $r = -.12$, $p < 0.001$, respectively). This suggests that *COMOVE* is lower in the presence of *DIVERSITY* and *DIRECTOR'S PAY*, the former being consistent with Gul et al., (2011) who show evidence that more firm-related information resonates with gender diverse boards. These variables, however, were used in the construction of the independent variables of interest *BOARD_MON* and *CEO_INCENTIVE*. Both variables are positively correlated with *COMOVE* ($r = .10$, $p < .01$; $r = .10$, $p < .01$), respectively.

3.4.3. Multivariate Results

Table 5. Baseline Model

Table 5 presents the fixed effect results on the effect of corporate governance monitoring mechanisms as a bundle and Incentive alignment on stock return comovement. The sample consists of 2,659 firm-year observations over the period 2009 to 2017. The list of variables, definitions are provided below

VARIABLES	Dependent variable	
	COMOVE	
	(1)	(2)
NGQ		-3.577*** (0.536)
Lev	-0.849** (0.338)	-0.785** (0.337)
Perf	0.769 (0.763)	0.725 (0.760)
Sd_roa	70.61** (28.50)	47.99* (28.27)
MV	-0.0946 (0.100)	-0.0964 (0.100)
SIZE	0.160 (0.118)	0.178 (0.118)
AuditQ	-0.636 (0.520)	-0.674 (0.519)
Pindex	-0.00273 (0.0382)	-0.00573 (0.0381)
Inflation	-0.218*** (0.0831)	-0.183** (0.0821)
Boardsize	0.0315 (0.0228)	0.0314 (0.0289)
Board_mon		-0.453** (0.206)
CEO_incentive		-0.494* (0.294)
Board_mon x CEO_incentive		-0.136 (0.195)
Board_mon x NGQ		-0.556*** (0.211)
CEO_incentive x NGQ		-0.474 (0.291)

Board_mon x CEO_incentive x NGQ		-0.183
		(0.200)
Constant	-7.354***	-9.353***
	(2.805)	(2.862)
<hr/>		
Observations	2,659	2,659
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R-squared	0.102	0.112
Number of firms	321	321

Note: The table presents the pooled OLS regression results. The sample consists of 2,659 firm-year observations over the period 2009 to 2017. COMOVE, stock comovement, is defined as the log-transformation of the adjusted R^2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; NGQ is the first principal component of Kaufmann et al. (2011) six NGQ dimensions Kaufmann et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the SD of the ratio between operating income and total assets over 7 years; MV is the log of the share price multiplied by the number of ordinary shares in issue at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; AuditQ proxied by the likelihood of loss avoidance is earnings scaled by total assets; Pindex is the sum of 6 parsimonious index from Gompers et al. (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; INFLATION is the annual inflation rate in percentages per year; Board Size is the total number of directors on board; BOARD_MON is the first principal component of board governance comprising of independent director, CEO_duality, & Diversity; BOARD_INCENTIVE is the first principal component of TMT incentive alignment. Additionally, Industry and year dummies are included but not reported for brevity. Robust SEs are in parentheses. *, ** and *** represents significance at the 10%, 5% and 1% levels, respectively.

3.4.4. *Effects of BOARD_MON and CEO_INCENTIVE as a Bundle on Stock Return Comovement*

Table 5 reports results related to the prediction that monitoring mechanisms and incentive alignment is related with lower return comovement. We use the first PCA of the three corporate governance variables (Board independence, CEO_duality and Gender Diversity) representing board monitoring *BOARD_MON* and two corporate governance compensation variables (Executive remuneration and CEO total pay) representing incentive alignment *CEO_INCENTIVE* as the proxies for board monitoring and board incentive in (Column (2)).

All observed t-statistics are corrected for heteroskedasticity and in-firm correlation using clustered standard errors. Further, the study included year and industry dummies to account for some cross-sectional reliance. In model 1, the study regresses *COMOVE* on the complete set of control variables in the study, and also control for firm-fixed effects. The fixed effects tend to be significant towards rejecting explanations of omitted variables as endogenous sources. The coefficients of *LEV* and *INFLATION* are strongly negative. For all other control variables, first, *INFLATION* controls for global financial and growth factors therefore, the results are adjusted for country-specific developmental factor. In addition, *LEV* controls for the dynamics of large firms thus, the findings are calibrated for the complexities of large firm's capital structure. In Table 5 Column 2, the study presents the results for the main independent variables of interest *BOARD_MON* and *CEO_INCENTIVE* which show evidence of a negative and significant (-0.453, t= -2.20; -0.494, t=-1.68) relationship respectively giving credibility to our H1 and H2. This result further contributes to the idea that board of directors monitoring, and incentive alignment provisions as stipulated by agency theorists (Dalton et al., 2007; Fama & Jensen 1983; Shleifer & Vishny, 199; Holmstrom, 1979; Murphy 1986) effectively mitigate agency problems which in turn allows the incorporation of firm specific information into stock prices to a large extent reducing comovement.

3.4.5. *Effects of NGQ on the Relationship Between CG Mechanisms as a Bundle on Stock Return Comovement*

Table 5 Column 2 presents evidence on the moderating effect of the institutional quality on the relationship between corporate governance monitoring mechanisms and incentive alignment provisions. Here the study measures institutional quality, as *NGQs* “the coefficient for the interaction between *NGQ* and *BOARD_MON*” is negative and significant, indicating that the *NGQs* heighten the negative association between *BOARD_MON* and stock price comovement, supporting Hypothesis 3. However, this did not find support for H4 on the interaction between *NGQ* and *CEO_INCENTIVE*.

In addition, this study further estimates the economic significance of the results, which is best illustrated by computing elasticities using the “DYEY” command in STATA relating the percentage change in *NGQ* for a given percentage change in *BOARD_MON*. For example, the relative impact of *BOARD_MON* comparing its high with low levels (as measured by one standard deviation above and below the mean of *BOARD_MON* i.e., $(0.006 + 1.23)$ for the high level, and $(0.006 - 1.23)$ for the low level), respectively indicates that an increase of *NGQ* by 1% reduces stock price comovement (*COMOVE*) by $-0.556 \times 0.01 \times 2.46 (= -0.0136)$, wherein -0.556 is the coefficient on the interaction between *BOARD_MON*NGQ* as seen in Table 5 and 2.46 is the difference between high $(0.006 + 1.23)$ and low $(0.006 - 1.23)$ levels of *BOARD_MON* respectively. This reduction is about 2.7% of the mean value of *COMOVE*. Therefore, we conclude that the negative relationship between *BOARD_MON*NGQ*, and *COMOVE* is both statistically and economically significant.

3.5. Robustness Test

3.5.1. 2SLS Regression Estimates

Following Wooldridge, 2013, Instrumental Variable (IV) regression analysis with a two-stage least square (2SLS) was performed. This analysis method provides the researcher with the robustness of the baseline analysis results. IV regression analysis is a widely used method that deals with the endogeneity issue that occurs when some of the independent variables correlate with the model's unobserved error term, as well as to mitigate the inconsistency in estimations of the parameters caused by endogeneity issues in CG research (Uyar et al., 2021). 2SLS regression estimates also eliminates the correlations between the error term and the independent variables. The endogeneity and the omitted variable bias were addressed by using the instrumental variable with 2SLS regression (Cui et al., 2018; Wooldridge, 2013). Identifying the right instruments in this situation is a genuine challenge.

Therefore, informed by Ferreira & Laux's (2007) argument, this study uses all control variables in the analysis to influence the instrument variables. In the stage one regression predicted values of board monitoring and incentive alignment proxies as a bundle (*BOARD_MON*, *CEO_INCENTIVE*) are obtained, by regressing *BOARD_MON*, *CEO_INCENTIVE* bundles on several other explanatory variables. The control variables used in the analysis are *PINDEX* (parsimonious good governance index), *LEV* (leverage), *AUDITQ* (Audit quality), *PERF* (return on equity), *SIZE* (log of total assets at the end of the last fiscal year) and *INFLATION* (the annual inflation rate in percentages per year) *MV* (the log of the firm's share price multiplied by the number of ordinary shares in issue at the end of the fiscal year). Year and Industry dummies are included in the model. In the second stage regression the predicted values of *BOARD_MON* and *CEO_INCENTIVE* are used as a substitute for the actual values. Following that, this study verifies that the instruments selected are both appropriate and relevant, specifically by testing for weak instruments and instrument relevance, over-identification, and joint significance, and have no ex-ante evidence to suggest that any of the instruments chosen

fails the instrument exogeneity criteria (as shown in Table 6 Panel B). All of the dimensions of heterogeneity previously identified as significant determinants of *BOARD_MON* and *CEO_INCENTIVE* bundles remain significant at similar levels, as shown in Table 5. These findings suggest that our analyses are resistant to the main types of endogeneity that could undermine the research results in this specific situation.

Table 6. 2SLS instrumental variables

Panel A. First-Stage
Regressions

Independent VARIABLES	Dependent variables	
	Board_mon	CEO_incentive
Pindex	0.0247 (0.0193)	0.0193 (0.0175)
Lev	0.125 (0.133)	0.449*** (0.121)
AuditQ	0.388 (0.424)	-0.218 (0.384)
Perf	-1.377*** (0.482)	0.738* (0.436)
Size	0.235*** (0.0401)	0.410*** (0.0363)
Inflation	-0.0431* (0.0244)	-0.00216 (0.0221)
MV	0.258*** (0.0442)	-0.129*** (0.0400)
Year – and Industry Effects	Yes	Yes
Observations	2,659	2,659
R-squared	0.317	0.282

Table 6 reports the two-stage least square (2SLS) estimates of the instrumental variable regressions. Panel A reports the first-stage estimates, where the dependent variables are Board monitoring bundle (*BOARD_MON*) and CEO incentive bundle (*CEO_INCENTIVE*) respectively. *BOARD_MON* is defined as the first principal component of board governance comprising of independent director, *CEO_duality*, & *Diversity*. *CEO_INCENTIVE* is defined as the first principal component of CEO and TMT incentive alignment. As instruments following extant literature, we include all control variables *LEV* is the total debt scaled by total assets at the end of the last fiscal year; *PERF* is operating income divided by total assets at the end of the last fiscal year; *MV* is the log of the share price multiplied by the number of ordinary shares in issue at the end of the fiscal year; *SIZE* is the log of total assets at the end of the last fiscal year; *AuditQ* proxied by the likelihood of loss avoidance is earnings scaled by total assets; *Pindex* is the sum of 6 parsimonious index from Gompers et al. (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; *INFLATION* is the annual inflation rate in percentages per year.

Panel B. Second-Stage
Regressions

Independent VARIABLES	Dependent variables	
	Comove	Comove
Board_mon (instrumented)	-0.536*** (0.718)	
CEO_incentive (instrumented)		-0.131* (0.0770)
ΣControls	Yes	Yes
Year – and Industry Effects	Yes	Yes
Cragg-Donald F	16.04***	331.06***
Sargan Stat	0.000	0.000
Observations	2,659	2,659
R ²	.	.

Panel B reports the second-stage estimates, where the dependent variable is comove, COMOVE, is defined as the log-transformation of the adjusted R2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns. The key independent variable are the predicted Board monitoring bundle (BOARD_MON) and CEO incentive bundle (CEO_INCENTIVE) from the first-stage regression, the control variables are identical to those used in regression 1 in Panel A of Table 4. All regressions are panel regressions with year- and industry-fixed effects, where industry is defined using 2-digit SIC codes. The sample period is from 2009 to 2017. Robust SEs are in parentheses. *, ** and *** represents significance at the 10%, 5% and 1% levels, respectively.

Since the research estimates the moderating effects of *NGQs*, the research also instruments the interaction of *NGQ* and the corporate governance variables. Firstly, the study predicts instruments following the Ferreira and Laux (2007) model by predicting a value of the interaction between *BOARD_MON* \times *NGQ* and *BOARD_INCENTIVE* \times *NGQ*. Secondly, the research uses the predicted values as instruments. The study also carries out tests to check the reliability of the instruments. Particularly, the tests indicate that neither of the models are “under-identified” nor have weak instruments. The results for this test (unreported) did not show support for (Hypotheses 3 and 4), therefore, are inconsistent with results of our main cross-sectional analyses in Table 3. This infers that the interaction term between country-level and firm-level governance does not indicate a strong interrelationship, suggesting that a substitutability effect between *NGQ* and our corporate governance proxies may exist.

3.5.2. Treatment effect on BOARD_MON and CEO_INCENTIVE provisions on return comovement

To further examine the hypotheses H1, H2, H3 and H4 discussed earlier, the research looks at the impact of *BOARD_MON*, *CEO_INCENTIVE* and their interactions with *NGQ* on stock return comovement (*COMOVE*) following Rubin (1990) unconfoundedness hypothesis, which implies that modifying variations in a fixed set of confounding factors eliminate biases in both the treated and control units, therefore enabling for causal understanding of those variations. Specifically, if the conditions under which the relaxation of the selection-on-observables¹⁴ assumption that makes our treatment insignificant are shown to be improbable then the effect of the treatment (*BOARD_MON* and *BOARD_INCENTIVE*) on stock return comovement (*COMOVE*) could be perceived as robust. Then there is the transformation of the independent variables of interest (*BOARD_MON* and *BOARD_INCENTIVE*) into Boolean dummy variable, which takes a value of 1 if *BOARD_MON* or *CEO_INCENTIVE* is above the median

¹⁴ The selection-on-observables assumption imply that the common variable that influence “treatment assignment” and “treatment-specific” result can be observed. Therefore, the reliance between treatment variable and treatment-specific results can be eliminated by moderating these observable variables. This is also known as conditional-independence assumption.

value and 0 otherwise. The study applies the baseline model including the individual governance factors (Table 7, Column 2). The study's Boolean dummy variables of interest *BM_DUMMY* yields a significant coefficient (- 1.431 and t-stat -1.96) and *BI_DUMMY* yields a significant coefficient (-1.564 and t-stat -2.16). The moderating effects between the modified variable *BM_DUMMY*NGQ* and *BI_DUMMY*NGQ* yields a significant coefficient (-1.280 and t-stat -1.70) and (-1.629 and t-stat -2.21) respectively. The significant negative results of these treatment effects in Table 6 panel B supports (Hypotheses 1, 2, 3 and 4), therefore, are consistent with results of the main cross-sectional analyses in Table 5.

Table 7. Treatment Effect of Governance

Table 7 presents Rubin (1990) treatment effects results on the effect of corporate governance monitoring mechanisms as a bundle and Incentive alignment on stock return comovement. The sample consists of 2,659 firm-year observations over the period 2009 to 2017. The list of variables, definitions are provided below

VARIABLES	Dependent variable	
	(1) COMOVE	(2) COMOVE
Independent_dir		0.0297 (0.454)
Ceo_duality		0.259*** (0.0917)
Diversity		-0.237 (0.469)
Dir_pay		-0.893** (0.452)
Ceo_pay		-0.0449* (0.0256)
Board_size	0.0459** (0.0232)	-0.0552 (0.0608)
Pindex	0.0523 (0.0384)	0.0571 (0.0384)
Lev	-1.817*** (0.320)	-1.725*** (0.322)
Perf	1.297* (0.768)	1.413* (0.774)
Sd_roa	54.97*** (13.24)	67.06*** (14.03)
MV	-0.419*** (0.0793)	-0.434*** (0.0838)
SIZE	-0.00188 (0.119)	0.0589 (0.120)
Inflation	0.0127 (0.0272)	0.0695** (0.0354)
AuditQ	-0.603 (0.533)	-0.742 (0.531)
BM_Dummy		-1.432* (0.731)
IA_Dummy		-1.565** (0.724)
BM_Dummy x IA_Dummy		0.699 (1.032)
NGQ		0.474 (0.431)
BM_Dummy x NGQ		-1.280* (0.752)
IA_Dummy x NGQ		-1.629** (0.738)

BM_dummy*IA_Dummy*NGQ		0.614 (1.065)
Constant	-0.391 (1.776)	1.064 (2.244)
Observations	2,659	2,659
R-squared	0.054	0.070
Number of firms	321	321

Table 7 reports the two-stage least square (2SLS) estimates of the instrumental variable regressions. Panel A reports the first-stage estimates, where the dependent variables are Board monitoring bundle (BOARD_MON) and CEO incentive bundle (CEO_incentive) respectively. BOARD_MON is defined as the first principal component of board governance comprising of independent director, CEO_duality, & Diversity. CEO_incentive is defined as the first principal component of CEO and TMT incentive alignment. As instruments following extant literature, we include all control variables LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; MV is the log of the firm's share price multiplied by the number of ordinary shares in issue at the end of the fiscal year; SIZE is the log of total assets at the end of the last fiscal year; AuditQ proxied by the likelihood of loss avoidance is earnings scaled by total assets; Pindex is the sum of 6 parsimonious index from Gompers et al. (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; INFLATION is the annual inflation rate in percentages per year; Board Size is the total number of directors on board. In the second-stage regressions. All regressions are panel regressions with year- and industry-fixed effects, where industry is defined using 2-digit SIC codes. The sample period is from 2009 to 2017. Robust SEs are in parentheses. *, ** and *** represents significance at the 10%, 5% and 1% levels, respectively.

3.5.3. *Matched Sample Analysis (Propensity score matching)*

The research conducted a propensity score matching (PSM) analysis to check whether the results are based on endogeneity following the work of Rosenbaum and Rubin (1984). To measure the PSM the research estimates a subsample by linking firms with low *BOARD_MON* power.

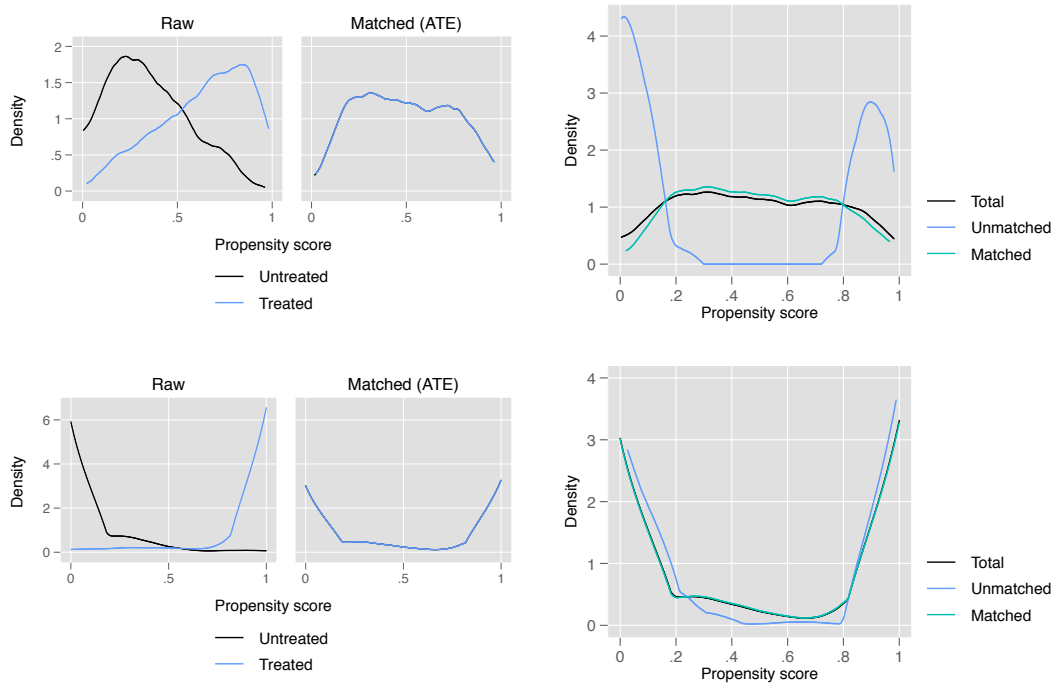
Next is to classify firms, as those with low *BOARD_MON* coded 1 (treatment firms) if they are less than the median value (0.03) in the same way as classify firms as those with high *BOARD_MON* coded 0 (control group) if they are larger than the median value. Secondly, the research employs a probit model in which the reasonableness of a firm having low board monitoring power is linked to firm-level control variables used in the baseline model. Furthermore, the research then runs the probit model in order to estimate the propensity of having a low board monitoring power. Thirdly, the research uses the nearest neighbour matching approach with common support to fit each treatment firm with a control firm.

To verify that there is no significant variation between the treatment and the control group, the ‘pbalchk’ programme in Stata (a statistical software) is employed and the results of the standardised differences, that is, the differences in terms of SDs and the balance test of covariates shown in Table 9 and 10 respectively, indicate that our matching is effective. The sensitivity test results of the PSM sample, reported in Table 11 and 12 respectively shows that the findings are descriptively unaffected, because the coefficient of the modified *BOARD_MON* is negative (-0.120, z-stat - 1.64) in regressions when *COMOVE* is the dependent variable.

The research followed the same steps to match firm with low *CEO_INCENTIVE* coded 1 (treatment firms) if they are less than the median value (0.207) in the same way it classifies firms as those with high *CEO_INCENTIVE* coded 0 (control group) if they are greater than the median value.

Here there are 2,669 observations we further repeat the analysis using the PSM sample, and the outcomes in Table 6 Column 3 show clear evidence that the results remain descriptively unchanged, because the coefficient of the modified *CEO_INCENTIVE* variable is significant negative (-0.170, z-stat -1.82) when *COMOVE* is the dependent variable. These results show evidence that the analysis is inconceivably induced by endogeneity.

Figure 1 Raw and Matched Average Treatment Effect (ATE)



Note the figure shows the matched sample (Matched (ATE)) as only one line, for both BOARD_MON and CEO_incentive modified variables which is good as there are no large deviations after matching was applied, the common support is very good, so we know both groups are similar on average. Common support ensures that persons with the same X-values have a positive probability of being both treatment and non-treatment. In the second graph we see that the total sample and the matched sample are very close, so we can assume that the final sample that is used in the matching is very similar on average to the original sample.

Table 8. Propensity score matching

Table 8 presents the first stage for Propensity score matching sample. The sample consists of 2,669 firm-year observations over the period 2009 to 2017. Robust standard error is reported in brackets. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	Propensity Score Matching – First Stage	
	Board_Mon	CEO_incentive
Pindex	0.122*** (0.0447)	0.190** (0.0832)
Lev	0.841*** (0.273)	2.371*** (0.532)
Perf		7.339*** (1.547)
Size	0.383*** (0.0440)	1.136*** (0.176)
MV		0.669*** (0.167)
Board_size	0.467*** (0.0288)	3.177*** (0.159)
Constant	11.02*** (0.733)	48.66*** (2.797)
Observations	2,669	2,669

Note: the dependent variable is the BOARD_MON and CEO_incentive modified variables Pindex is the sum of 6 parsimonious index from Gompers et al. (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; MV is the log of the firm's share price multiplied by the number of ordinary shares in issue at the end of the fiscal year; Board Size is the total number of directors on board.

Table 9. Balance test of covariates Board_MON

	Raw		Matched	
Number of obs =	2,669		5,338	
Treated obs =	1,302		2,669	
Control obs =	1,367		2,669	

	Standardized differences		Variance ratio	
	Raw	Matched	Raw	Matched
Lev	-.2833786	-.031775	1.67067	1.018367
Size	-.8485014	-.0925513	1.150961	1.037877
Pindex	.216228	.0056849	1.379569	1.008781
Board_size	-1.059979	-.1119427	1.074039	1.011412

Note: the matched sample results indicate that matching on the estimated propensity score balanced the covariates. The standardised differences are close to zero and the variance ratios are all close to 1. First step covariates used in the analysis are: PINDEX LEV, SIZE, and BOARD_SIZE.

Table 10. Balance test of covariates CEO_Inventive

	Raw		Matched	
Number of obs =	2,669		5,338	
Treated obs =	1,334		2,669	
Control obs =	1,335		2,669	

	Standardized differences		Variance ratio	
	Raw	Matched	Raw	Matched
Lev	-.3544653	-.1781819	1.196171	1.041093
Perf	.1632562	.0638829	1.534826	1.065109
MV	-.7257032	-.299635	.9337245	1.197129
Size	-1.047968	-.4569383	1.180229	1.243334
Pindex	.0702514	.0327649	1.611303	1.084772
Board_size	-2.404286	-1.128774	.8682571	1.180222

Note: the matched sample results indicate that matching on the estimated propensity score balanced the covariates. The standardised differences are close to zero and the variance ratios are all close to 1. First step covariates used in the analysis are: LEV, PERF, MV, SIZE, P_INDEX, and BOARD_SIZE.

3.5.4. Sensitivity test results (PSM)

Table 11. Treatment-effects estimation BOARD_MON

Comove	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ATT	-.120	.0733	-1.64	.102	-.2639094	.0236559

Note: The outcome variable here is COMOVE. ATT is defined as the average treatment effect on the treated. Std. Err. Is the standard error. First step covariates used in the analysis are: PINDEX LEV, SIZE, and BOARDSIZE.

Table 12. Treatment-effects estimation CEO_INCENTIVE

Comove	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ATT	-.156	.0843	-1.85	.064	-.321458	.009155

Note: The outcome variable here is COMOVE. ATT is defined as the average treatment effect on the treated. t-stat(b) is the bootstrapped t- statistic. Std. Err. Is the standard error. First step covariates used in the analysis are: PINDEX, LEV, PERF, SIZE, MV and BOARDSIZE.

3.5.5. *Subsample Split*

Another issue that must be addressed in this analysis is sample selection bias. As shown in Table 1, the selected companies are relatively large, and they are likely to be the main driver behind the study results. To address this possible selection bias, our study divides the sample into superior and inferior size sub-samples based on the median *SIZE* values (natural logarithm of total assets) and *MV* (natural logarithm of firm's share price multiplied by the number of ordinary shares in issue) and compares the baseline regression coefficients of *NGQ*, *BOARD_MON*, and *BOARD_INCENTIVE*.

The research uses the same number of the control variables as in the previous sections. The findings are shown in Table 13. The coefficients for *NGQs* are negatively and statistically significant across all subsample groups. Furthermore, *BOARD_MON* is negative and statistically significant among larger groups on the basis of total assets (-0.862, t-stat -2.28) and smaller firms on the basis of market value (-0.642, t-stat -2.09) consistent with Fama & Jensen (1983) "scope of operations hypothesis"; this suggests that intensive board monitoring by outsiders is beneficial to firms with intricate operating or financial structures.

Therefore, greater growth prospects and higher equity market conditions represented by *MV* requires less monitoring. *CEO_INCENTIVE* in opposition, interestingly show a negative significant coefficient (-1.166, t-stat -2.73) amongst large groups on the basis of market capitalisation; the implication here according to Ferreira et al. (2011) is that TMT/CEO shareholding in larger firms would provide incentives to boost growth opportunities that address the moral hazard issues which in turn reduces comovement of stock prices. On the moderating effect of *NGQs*, the interaction between *BOARD_MON*NGQ* are both statistically significant for both larger and smaller groups (*TOTAL_ASSETS* -0.999, t-stat -2.55; -0.533, t-stat -1.733)) and smaller group *MV* (-0.775 t-stat -2.49). at the same time, the interactions between *BOARD_INCENTIVE*NGQ* did not show any results of interest.

The findings have not shown support for the fact that the baseline results are not ascribable to large-sized firms. However, it opens a new line of enquiry on the relationship between firm size and incentive alignment provision.

Table 13. Baseline results across size groups

Table 13 presents the effects of corporate governance monitoring mechanisms as a bundle and Incentive alignment as a bundle on stock return comovement among small vs large company subsample.

VARIABLES	(SIZE_l)	(SIZE_s)	(MVS)	(MVL)
	COMOVE	COMOVE	COMOVE	COMOVE
Board_mon	-0.862** (0.378)	-0.455 (0.305)	-0.642** (0.306)	-0.178 (0.352)
CEO_incentive	-0.642 (0.429)	-0.457 (0.465)	-0.207 (0.463)	-1.166*** (0.427)
Board_mon x CEO_incentive	0.496 (0.396)	-0.328 (0.295)	-0.162 (0.294)	0.120 (0.359)
NGQ	-1.846** (0.770)	-5.348*** (0.778)	-5.239*** (0.866)	-2.600*** (0.747)
Board_mon x NGQ	-1.000** (0.392)	-0.533* (0.309)	-0.775** (0.311)	-0.240 (0.363)
CEO_incentive x NGQ	-0.467 (0.410)	-0.547 (0.475)	-0.223 (0.473)	-1.036** (0.410)
Board_mon x CEO_incentive x NGQ	0.460 (0.407)	-0.329 (0.302)	-0.145 (0.301)	0.0317 (0.371)
Constant	-10.86** (4.584)	-9.068** (4.108)	-13.24*** (4.607)	-9.347** (4.261)
Observations	1,280	1,379	1,323	1,336
Σcontrol variables	Yes	Yes	Yes	Yes
R-squared	0.113	0.129	0.122	0.115
Number of firms	189	194	221	233

Note: The sample is split into large and small sub-sample using the median value of *SIZE* (16.45) (*SIZE_L*: Large, *SIZE_S*: Small) & *MV* (9.525) (*MVL*: Large, *MVS*: Small). *COMOVE*, stock comovement, is defined as the log-transformation of the adjusted R2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; *BOARD_MON* is the first principal component of board governance comprising of independent director, *CEO duality*, & Diversity; *CEO_INCENTIVE* is the first principal component of TMT incentive. *NGQ* is the first principal component of Kaufmann et al. (2011) six NGQ dimensions Kaufmann et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; *LEV* is the total debt scaled by total assets at the end of the last fiscal year; *PERF* is operating income divided by total assets at the end of the last fiscal year; *SDROA*

is the SD of the ratio between operating income and total assets over 7 years; *MV* is the log of the firm's share price multiplied by the number of ordinary shares in issue at the end of the fiscal year; *SIZE* is the log of total assets at the end of the last fiscal year; *AuditQ* proxied by the likelihood of loss avoidance is earnings scaled by total assets; *Pindex* is the sum of 6 parsimonious index from Gompers et al. (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board and supermajority; *INFLATION* is the annual inflation rate in percentages per year; *Board Size* is the total number of directors on board; Additionally, *Industry* and *year dummies* were included but not reported for brevity. Robust SEs are in parentheses. *, ** and *** represents significance at the 10%, 5% and 1% levels, respectively.

3.6. Summary

Although the effects of related corporate governance frameworks on stock return comovement have been researched, this study also highlights the role of CG monitoring mechanisms and incentive alignment provision as a bundle in reducing return comovement. Previous studies (see e.g. Rediker & Seth, 1995; García-Castro, Aguilera, & Ariño, 2013; Misangyi & Acharya, 2014; Madanoglu, Kizildag & Ozdemir, 2018; Oh, et al, 2018) indicate that multiple mechanisms act together either as substitutes or complements. Misangyi & Acharya (2014) demonstrated, using a fuzzy set QCA, that governance mechanisms interact in a manner that is somewhat substitutive and or complementary therefore performance is best when governance monitoring mechanisms and incentive alignment provisions function as complements.

However, in this paper we extend the extant literature by analysing comovement on the basis of agency theory monitoring and incentive alignment CG practices using a dataset containing comprehensive governance characteristics from firms listed within the S&P 500 from 2009 to 2017. The study finds that using a common factor that is present when CG monitoring mechanisms and incentive alignment provisions (never been used in CG bundles literature) combined is negatively associated with return comovement, calculated by the log transformation of R^2 . The conclusion that can be drawn is that CG “bundles” increases the reliability of firm-specific information, which in turn evades agents self-serving practices, and validates the rewards of unbiased stock market transactions. In addition, the findings suggest that NGQs moderates the association between effect of board monitoring power and comovement; specifically, for smaller and or firms with lesser growth opportunities and or market conditions as represented by market capitalisation. the influence of incentive alignment provision is most apparent in firms with greater market conditions. This evidence opens a new line of inquiry to better understand the association between firm size and incentive alignment provision.

Furthermore, the study did not find any support where monitoring mechanisms and incentive alignment provision proxies interact concurrently to reduce comovement.

The implication here is that monitoring mechanisms and incentive alignments provisions are not required at the same time to reduce comovement, this study empirically extends the validity. In order to bolster the findings, the study conducted additional tests such as 2SLS, treatment effects test using unconfoundedness hypothesis and propensity score matching, the results are consistent and robust with these additional tests. Also examined was whether NGQs moderate the relationship between firm-level governance and stock price comovement. Using first principal component of Kaufman, Kraay & Mastruzzi (2011) six dimensions as a proxy for the NGQ bundles, the study finds evidence of a complementary relationship between NGQ and firm board monitoring. This study is susceptible to certain limitations, for example, the selection comprises the largest 500 US firms; therefore, the recommendation is that readers moderately extrapolate the conclusions of the current analysis to a broader context. Additionally, this study is of interest to decision-makers: a number of corporate governance strategies are used to accomplish specific outcomes with firm effectiveness. for firms to build an accessible financial framework, policymakers should, inter alia find a balance between corporate governance monitoring mechanisms and incentive alignment provisions, specifying how each bundle best suits them.

Chapter 4

Board of Directors' Ideological Diversity and Stock Return Performance During the Pandemic

... directors have scrambled to respond to coronavirus and its consequences. The crisis is testing the resilience of the “G” in the ESG triad of environmental, social and governance responsibilities.

[Andrew Hill, 2020](#)

4.1. Introduction

Until now, research has primarily concentrated on examining the consequences of cataclysmic and financial incidents on firm overall performance. For instance, studies have examined the impact of natural disasters such as hurricanes (Schuwer et al., 2019), (Dessaint & Matray, 2017); bushfires (Siddiquee & Rahman, 2017); and financial crises (Huang et al., 2020; D’Aurizio et al., 2015; Lins et al., 2017; Clarke et al., 2012; Mitton, 2002; Rajan & Zingales, 1998), on firms, and it is crucial to investigate how these types of events impact a firm’s operations and resilience. On March 12th, 2020, the World Health Organisation (WHO) confirmed the coronavirus disease (SARS-CoV-2) outbreak as a pandemic owing to its global impact on various sectors, including health and the real economy. The coronavirus pandemic 2019 (SARS-CoV-2) has killed 618,363 people in the US. as of August 10th, 2021, with corresponding SARS-CoV-2 cases of 36,152,620¹⁵Events in the above narrative created significant turmoil not only in global economic activity (e.g. see Baldwin & di Mauro, 2020) but also in financial markets around the world (e.g. see Cao, Li, Liu, & Woo, 2020).

¹⁵ The data is published by the New York Times at <https://github.com/nytimes/covid-19-data>

In light of the SARS-CoV-2 pandemic, the S&P 500 Index, the US benchmark financial and economic indicator, decreased from approximately 3,386.15 on February 19th, 2020, to about 2,237.40 on March 23rd, 2020, indicating a decrease of around 41%.

However, it significantly recovered with record braking values such as 4, 436.75 on August 10th, 2021. The implementation of social restriction policies, commonly referred to as lockdown rules, aimed at mitigating the spread of contagious diseases has resulted in a significant and abrupt decline in economic production across numerous nations, transcending beyond the boundaries of the US. These restrictions, which include the closure of businesses, travel restrictions, and mandatory social distancing guidelines, have had a devastating impact on the global economy, triggering widespread unemployment, market disruptions, and financial losses. Despite the perceived effectiveness of these measures in slowing down the spread of infectious diseases, the economic consequences of lockdown rules have been severe, causing immeasurable social and economic distress for individuals and businesses alike.

The resulting economic crisis differs from previous crises regarding urgent financial performance challenges, value chain disruptions, and difficulties conducting business activities during restrictions (Amore et al., 2022; Ding et al., 2021). Many studies have attempted to determine the key variables that affect firms' share price performance during the SARS-CoV-2 pandemic, specifically, family ownership (Amore et al., 2022), corporate governance (El-Chaarani et al., 2022), employee satisfaction (Shan & Tang, 2022), and corporate characteristics (Ding et al., 2021; Golubeva, 2021; Wu & Xu, 2021; Albuquerque et al., 2020; Cheng, 2020; Fahlenbrach et al., 2020; Gormsen & Kojien, 2020; Hassan et al., 2020). The aforementioned investigated the key factors influencing company operations and the initial strategies for dealing with adversity during a pandemic. Ding et al., 2021 find that substantial heterogeneity depends on a country's firm, industry, and macroeconomic factors. Firms with higher cash reserves and lower debt are more robust to the effects of SARS-CoV-2 (Fahlenbrach et al., 2020).

The SARS-CoV-2 pandemic has presented both challenges and opportunities for businesses across various industries. While many companies have suffered losses, some have managed to innovate and introduce new products or services to meet the evolving needs of consumers (Li et al., 2021).

In response to the pandemic, companies have been closely monitoring market trends and adapting their operations accordingly. Those with strong corporate governance have been able to respond quickly and effectively to the changing economic landscape (Huang et al., 2020). Despite the advantages of good governance, recent research has shown mixed results when it comes to the relationship between corporate performance and governance mechanisms (Chijoke-Mgbame et al., 2020). While some studies have highlighted the positive impact of governance on company outcomes, others have suggested that the relationship may not be straightforward. In any case, it is clear that the SARS-CoV-2 pandemic has provided a unique opportunity for firms to evaluate and improve their governance structures, as they navigate the ongoing challenges of the current environment. The shareholder-centred governance model suggests that separating a company's ownership from its control is responsible for agent–principal conflict. This is because managers prioritise their profits by maximising shareholder value (Dey, 2008; Jensen & Meckling, 1976). The corporate governance literature extensively debates the effectiveness of these potential solutions. In particular, agency theory has recommended several mechanisms, including monitoring by the board of directors. The board of directors is the “apex of decision control” (Fama & Jensen, 1983, p.311), setting the corporate competitive strategy and objectives (Bailey & Peck, 2013). The effect of board composition on firm possible outcomes, according to Withers et al. (2012), is a result of the social embeddedness of corporate boards which significantly affects their decisions and is influenced by individual and social factors that go beyond the economic interests of the firm and its shareholders (Van Ees et al., 2009; Westphal & Zajac, 1995).

Therefore, factors influencing board composition include situational factors, such as the working environment of firms or the social context of interpersonal interactions, and dispositional factors, which relate to people's cognitive and affective biases.

However, despite longstanding recognition that directors' values, beliefs, and attitudes influence firm performance (Chin, Hambrick, & Trevio, 2013), While many studies have examined inferential factors that shape our understanding of board composition, they have overlooked the importance of directors' cognitive and affective frames, as noted by Gupta and Wowak (2017) and Shropshire (2010).

However, some research on top management teams (TMTs) has recognised the influence of dispositional factors, such as the political ideology of the board of directors (see e.g. Boivie & Graffin, 2015; Chin & Semadeni, 2017; Chin et al., 2013; Christensen et al., 2020; Hutton, Jiang & Kumar, 2014; Kashmiri & Mahajan, 2017). Additionally, the focus of board research is typically on situational factors, but some studies such as (Boeker & Gomulya, 2020; Di Giuli & Kostovetsky, 2014; Gupta & Wowak, 2017) stand out as exceptions by highlighting the importance of dispositional factors like political ideology.

Ideology can be described as a system of beliefs and values that are internally consistent and comprehensive, and which shape an individual's behaviour and thinking (Jost, 2006). These beliefs and values are often grounded in an individual's social, cultural, and political experiences and can have a profound impact on their worldview. The nature of an individual's ideology can be discerned through various indicators, including their political orientations, which have been the subject of extensive research. Scholars such as Bonica (2016) and Jost (2006) have highlighted the importance of ideology as a guiding force in individuals' lives. It can serve as a framework for understanding complex issues and making decisions about how to act in various situations.

Moreover, ideology is not simply a passive set of beliefs but rather an active force that can influence an individual's behaviour and interactions with others. The political orientations of individuals are one of the most visible and measurable aspects of their ideology. Studies by (Bonica, 2016; Chin et al., 2013; and Jost et al., 2009) have explored the relationship between political orientations and other aspects of ideology, such as social and economic attitudes.

These studies have shown that political orientations can provide valuable insights into the underlying beliefs and values that shape an individual's worldview.

The reason why the liberal-conservative continuum is commonly employed is due to its enduring consistency (Jost, 2006), as well as its ability to consistently correspond with personality traits (Gerber et al., 2011), preconceptions (Fatke, 2017), and values (Carney et al., 2008). It offers a framework for action across various disciplines (Jost et al., 2009). As a result, there is evidence that decision-makers' ideology impacts various corporate objectives. For instance, democratic CEOs are more likely to be involved in Corporate Social Responsibility (CSR) and hire CSR executives (Gupta et al., 2020). In contrast, firms with right-leaning managers had lower debt levels, more robust profitability, less risky investments (Hutton et al., 2014) and more significant pay dispersion within the TMT (Chin & Semadeni, 2017). At the board level, right-leaning homogeneity is related to more substantial CEO compensation, a link between pay and performance on the board (Gupta & Wowak, 2017), and more CEO dismissals due to financial wrongdoing (Park et al., 2020). The above outcomes are consistent with the personality traits commonly associated with each ideological polarity, such as differences in risk tolerance (Anderson et al., 2011). Nonetheless, investigations have yet to be done on the relevance of the board of directors' ideology in market responses during a pandemic. As a result of the preceding literature and observations, these developments raise the research question:

Does ideological heterogeneity of the board of directors protect corporate share price performance amid uncertainties?

The objective of our research is to examine the impact of board of directors' ideology on share price performance during the presence of SARS-CoV-2 exposure. As the global pandemic continues to impact businesses and the economy, it is essential to understand how the ideology of the board of directors affects share prices during these unprecedented times. Therefore, our primary aim is to investigate this relationship in-depth and shed light on how the board's ideology can influence the company's financial performance during a crisis.

By conducting this research, we hope to provide valuable insights that can help companies make informed decisions when selecting board members and developing strategies to navigate the current economic climate.

In particular, this study hopes to contribute to existing knowledge by evaluating 1) whether board ideology diversity largely determines the equity prices of S&P 500 firms during a pandemic and 2) if board ideology diversity moderates the relationship between SARS-CoV-2 exposure and equity price performance during the pandemic. Further, we believe investigating the role of politics in corporate governance can contribute to extant

literature to better understand corporate governance. Using data on 316 S&P 500 firms from January 2020 Q1 through January 2021 Q1, the analysis takes a multi-theoretical framework that integrates ideas from the agency and social psychology theories in evaluating how the number of infectious disease cases affects equity price reaction to SARS-CoV-2. Here, the outcome variable is a cumulative winsorised weekly return of firm i in quarter t , computed from January 2020 to January 2021. The main explanatory variable of interest is board ideology diversity. We find that SARS-CoV-2 exposure and investor sentiment affected most of the firms and industries in the S&P 500 by increasing the level of uncertainty resulting in their equity market decline throughout Q2 – Q4 of the SARS-CoV-2 outbreak. We also find that firms with high ideological diversity have a 2% improved return in the period under review than firms with lower board ideological diversity, i.e., firms with high directors' heterogeneity performed better than more homogenous firms. Put another way, the average equity return of a firm with high ideological heterogeneity is more resilient to investor sentiments and SARS-CoV-2 exposure. The study further demonstrates that the findings are robust to alternative methods and tests.

This article expands on the existing literature and introduces new insights. Firstly, it adds to the growing body of research examining the financial consequences of the SARS-CoV-2 pandemic and other infectious diseases on firm equity prices.

Several studies, (see, e.g. Albuquerque et al., 2020; Cheng, 2020; Donadelli et al., 2017; Ding et al., 2020; Gormsen & Kojen, 2020; Hassan et al., 2020 among others) have explored this topic. The general agreement is that the pandemic led to a decline in global equity prices, but that these prices have mostly recovered.

Unlike the studies mentioned above, our study examined how the board of directors' ideological diversity could impact the initial negative effect of SARS-CoV-2 across firms. This empirical investigation also contributes to the literature on the importance of board ideology diversity in financial decision-making, leading to higher firm performance (Kim et al., 2013). Existing research indicates that board diversity can demonstrate change in the firm and individual investor-level economic decision-making (e.g. Bernile et al., 2018). However, investigations have yet to be performed on board ideology diversity's role in equity price responses during an epidemic. The SARS-CoV-2 pandemic provides an ideal opportunity to investigate the reaction to such events.

The rest of this paper is organised as follows: Section 4.2. contains a brief background of ideology Section 4.3. presents the review of relevant literature and the development of hypotheses. Section 4.4. discusses the data used in this study; Section 4.5. highlights the empirical results and analyses, Section 4.6. discusses the robustness tests, and endogeneity; and Section 4.7. summarises the chapter.

4.2 Ideology in Corporate US

Firms and top corporate actors, such as managers and directors, are often viewed as rational and pragmatic individuals who prioritise profit over anything else. However, recent studies have shown that these actors may also hold a diverse range of political ideologies that shape their decision-making processes within firms (Francia et al., 2005).

The significance of political ideology in firms has been recognised for several decades. One of the earliest studies to explore this relationship was conducted by Seider (1974), who used a Marx-Mannheim approach to examine the ideological preferences of US managers concerning how businesses should operate. The study found that managers held a wide range of ideological positions, with some adhering to a neo-classical model of business and others embracing social responsibility viewpoints. Since then, scholars have employed two primary approaches to investigate the role of political ideology in firms. The first approach focuses on the relationship between the political ideology of individual actors and their behaviour within firms. This approach examines how personal beliefs may influence decision-making, leadership styles, and communication within the firm. The second approach, on the other hand, explores how the political ideology of firms as a whole influence their strategic decisions and actions. This approach examines how political ideologies may shape firm culture, values, and goals. One views political ideology as an important bonding mechanism, which either ties together people and organisations or is a result of bonding. By measuring political action committee (PAC) contributions to certain political candidates and parties, Mizruchi (1990) found that geographical proximity, concentration of industries, and interfirm market interdependence affected the ideological similarity of two particular firms.

He then suggested that indirect interlock ties through financial institutions could predict this ideological similarity. Similarly, Burris (2005) showed that interlocking directors may facilitate political cohesion among corporate elites, and that this cohesion can be seen several links down the chain of indirect ties.

Examining Hungarian firms, Stark & Vedres (2012) observed that political affiliations positively influenced director interlock and partnership with other firms. Some directors were shown to favour CEOs with similar political leanings. Another study suggests that directors retain CEOs with similar ideologies, even when they are performing poorly, and that they will craft compensation packages for ideologically aligned CEOs which are less sensitive to performance (Lee, Lee, & Nagarajan, 2014). Similarities in political ideology between directors and CEOs have been shown to lower monitoring effectiveness, affecting firm value and performance (Kim, Pantzalis, & Park, 2013; Lee et al., 2014). Some scholars have focused on the beliefs and preferences associated with the political ideology of decision makers in organisations. Tetlock (2000) investigated how conservative managers are different from liberal managers in their preference for accountability and organization structure.

Conservative managers are shown to hold people accountable and favour a more straightforward structure and governance style (the shareholder over stakeholder view). Conservative managers also prefer outcome accountability, whereas liberal managers prefer process accountability (Tetlock et al., 2013). Chin et al., (2013) looked at the ideology of CEOs in their preference for corporate social responsibility (CSR) activities. They found that liberal CEOs tend to emphasize CSR activities, an emphasis that was more pronounced when CEOs were powerful and firm performance was poor. Similarly, Gupta et al. (2017) discovered that the beliefs and values held by a firm were demonstrated through actions such as promoting CSR by appointing more female executives and providing equal benefits for employees who identify as Gay, Lesbian, Bisexual, Transgender, Queer, Intersexual, or Asexual (GLBTQIA). The study also revealed that CEOs and top management teams with more conservative attitudes tended to avoid risky corporate policies, such as managing the level of debt, capital, R&D expenditure, and investment, and engaging in tax avoidance (Christensen et al., 2015; Hutton, Jiang, & Kumar, 2014). In recent times, researchers have started to focus on the impact of political beliefs on the board. According to Gupta and Wowak (2017), the viewpoints of directors could potentially affect the way they assess, and reward managers based on their performance metrics.

The aforementioned studies have established a crucial basis for understanding firms and the ideology of the actors driving them. In sum, political ideology as a set of beliefs and preferences, may be an important variable to consider when examining corporate governance and its impact on corporate resilience in times of uncertainty.

4.3. Hypothesis Development

4.3.1. Literature and Hypothesis Development

According to social psychology research, board diversity plays a vital role in how various cultures view and react to stress (e.g., Rodriguez et al., 2007). Extant literature (see, e.g. Brochet et al., 2019; Nguyen et al., 2017) show that values and beliefs (ideology) influence how people receive information and respond to it.

To the best of the author's knowledge, studies in this regard still lack empirical investigations that connect disaster of any kind and ideological diversity in the boardroom. SARS-CoV-2 provides an ideal opportunity to investigate how ideological differences influence the initial response to a pandemic. Individuals have a tendency to interact with people who share their beliefs and attitudes to reinforce their convictions and attitudes (Harrison et al., 2002). Differences in ideologies can result in a close fit, which refers to how social categorisation results in one or more distinct homogeneous subgroups within the overall group (Harrison et al., 2002; Van Knippenberg et al., 2004). Furthermore, Knight (2006) contends that ideologies and theologies shape people's beliefs rather than specific evidence and information. Cognitive biases have an impact on board processes such as communications and relating competing viewpoints (Van Ees et al., 2009) as purported by Jiang et al. (2018), ideology is a more fundamental and solid individual predisposition than other types of diversity; it is difficult to change without major cognitive restructuring (Olthuis and van den Oever, 2020).

The broader team becomes ineffective when subsets are not receptive to out-group members' ideologies because loyalty and strong leadership weaken.

The ideological perspective mentioned earlier above translates to challenging inter-subgroup relationships and conflicts during decision-making (Carter et al., 2010; Delis et al., 2016; Salloum et al., 2017; Van Knippenberg et al., 2004; Westphal & Milton, 2000), leading to low subgroup coherence. Consequently, the process of reaching a consensus and committing to a decision within the boardroom is hindered. To put it another way, the ideological heterogeneity of the board of directors may cause decision-making delays. Therefore, fewer projects may be executed, diminishing firm performance.

Conversely, the presence of a wider variety of viewpoints, information, and intellectual capital inside the boardroom contributes to the positive effects of the information/decision-making perspective as an underlying process of diversity (Baranchuk and Dybvig, 2009; LuckerathRovers, 2013; Ntim, 2015). Subgroups within the board may have significant ideological differences due to intellectual value, knowledge, and expertise (Jiang et al., 2018). Seeing that opposing perspectives force subgroups within the board to reconcile task-relevant knowledge and experience are communicated more frequently and more effectively. Further, when there is a high level of ideological diversity, initiatives are more likely to be re-adapted, resulting in a higher chance of making the best strategic decisions possible. That is, decision-making processes in the boardroom that promote comprehensiveness among subgroups will improve implementation effectiveness and thus performance (Amason, 1996; Simons et al., 1999; Young, Greenbaum and Dormady, 2017). Intuitively, behavioural learning occurs when the board has similarities (within subgroups) and dissimilarities (between subgroups). Common characteristics within a subgroup provide perspectives, while differences between subgroups ensure that differing viewpoints are examined, resulting in increased team learning and, ultimately, higher performance (Gibson and Vermeulen, 2003).

The underlying process of information-led decision-making suggests that greater ideological diversity improves board reflective thinking and engagement, which increases

the probability of making better decisions. Besides that, it encourages the depth and breadth of the decision-making process among subgroups, leading to improved effectiveness and a more resilient firm. This evidence leads to the null hypothesis:

Hypothesis 5. Board ideological diversity may help (hinder) firms in dealing with pandemic-induced uncertainties, therefore a positive (negative) association between ideology diversity and equity market return relating to SARS-CoV-2.

However, there is proof in social psychology studies that support the view that ideological diversity leads to moderated decisions (Young, Greenbaum, & Dormady, 2017). However, the effects of these decisions are still unclear. Political ideology is an important moderator because it affects individuals' information processing (Chan & Palmeira, 2021; Jost et al., 2003). Jost et al. (2003) show how several psychological factors can predict political conservatism. For example, intolerance of ambiguity and needs of structure and closure are positively associated, while openness to experience and uncertainty tolerance are negatively associated with conservatism.

The core of conservative ideology indicates a strong resistance to “change and justification of inequality” (ibid, p.339). Federico & Goren (2009) suggested that ideology serves as an “epistemic motivation” (ibid, p.267), which can help individuals situate themselves in the ideological spectrum and further lead them to construct a reality based on this self-placement. This implies how political ideology affects information processing and subsequent reality construction and perception shaping (Federico & Goren, 2009). Amodio et al. (2007) also exhibited different approaches of information processing between ideologically democrats and conservatives. For instance, they found that conservative managers were more persistent to their judgments, while democrat managers had higher tolerance to complexity and were more open to new experiences (Amodio et al., 2007). Recent research has consistently shown that conservatives spread misinformation more often than liberals (e.g., Marwick & Lewis, 2017).

Trying to make sense of why that might be the case, Vosoughi et al. (2018) have posited that conservatives trust news sources that have the highest misinformation in their content (such as the Rush Limbaugh Show, Glenn Beck Program, Fox News, and the Sean Hannity Show).

On the other hand, a majority of liberals trusted the New York Times, which has been known for its accuracy. Past research has largely confirmed that individuals may perceive information that comes from in-group members and sources as more credible and accurate (Ardèvol-Abreu et al., 2017; Garrett et al., 2019). Indeed, a large body of literature has examined the role political orientation plays in varying media effects, suggesting that the influences of communicative behaviours and psychological factors can be determined by the pre-existing ideology an individual holds (e.g., Reedy et al., 2014). In the current study, we are particularly interested in whether a firm's ideological diversity allows it to learn and shape its expectations for the SARS-CoV-2 and its possible effect on stock market price, we formulate the null hypothesis as follows:

Hypothesis 5a. Board ideological diversity moderates the relationship between SARS-CoV-2 exposure and market return, i.e., as ideology diversity increases in the boardroom, the more robust (weaker) the market return.

Hypothesis 5b. Board ideological diversity moderates the relationship between SARS-CoV-2 net sentiment and market return, i.e., as ideology diversity increases in the boardroom, investors net sentiments about SARS-CoV-2 exposure is weakened and therefore improves equity market return.

4.4. Sample and Data

In this investigation, we started with the population of publicly traded U.S. firms in the DataStream Global Equity Index (DGEI) database, which comprises board of director data for S&P 500 companies from 2009 to 2021. We combined these data with Hassan et al. (2021)¹⁶ Hassan et al., (2021) SARS-CoV-2 exposure, SARS-CoV-2 net sentiment data, corporate financial, equity market, and environmental, social, and governance (ESG) data from Thomson Reuters Refinitiv (Refinitiv), formerly known as DataStream, Worldscope, and ASSET4 respectively.

The measurement of political ideology utilised in this study relies on political donation data collected from the FEC, as detailed below. After removing observations with missing values for SARS-CoV-2 exposure, SARS-CoV-2 net sentiments, and our control variables, the final sample contained 328 firms. By winsorising every continuous variable in the top and bottom 1%, all corporate financial data were revised to limit the potential influence of outliers.

4.4.1. Data

This section describes data on *COVID_EXPOSURE*, *COVID_NET_SENTIMENTS*, Board ideology diversity metrics (*ID_DIVERSITY*) and company-level controls. We collect data on *COVID_EXPOSURE* and *COVID_NET_SENTIMENTS* from Hassan et al. (2020). Hassan et al. (2020) specifically, use transcripts of quarterly earnings conference calls held by publicly listed firms to construct our measures of firm-level exposure to epidemic diseases *COVID_EXPOSURE*. These transcripts are available from the Refinitiv Eikon database and they collect the complete set of 326,247 English-language transcripts from January 2001 to March 2020 for 11,943 firms headquartered in 84 countries¹⁷ Earnings calls are important corporate events in the investor relationship agenda because they allow financial analysts and other market participants to hear senior

¹⁶ The data is available at https://www.policyuncertainty.com/firm_pr.html

¹⁷ This study paid particular attention to the US

management present their perspectives on the firm's state of affairs and to ask these company actors questions about the firm's financial performance over the previous quarter and, more broadly, discuss current developments. *COVID_EXPOSURE*¹⁸ is therefore constructed by parsing the available earnings call transcripts and counting the number of times the synonyms "sarscov", "coronavirus", "corona virus", "ncov", "covid", are used scaled by the total number of words in the transcript to account for differences in transcript length.

According to Hassan et al. (2020), disease sentiments closely follows the procedure for epidemic disease risk in that it counts the words associated with disease risk; however, instead of conditioning on the proximity to words associated with risk, it conditions on positive-or-negative-tone words to capture the first moment. These positive-and negative-tone words are identified by Hassan and co, using the Loughran & McDonald (2011) "good," "strong," "great," are examples of positive words while "loss," "decline," and "difficult" are examples of negative words.

Following that *COVID_NET_SENTIMENTS* is developed and defined as the resultant following the difference of disease negative sentiment and disease positive sentiment. To construct a measure of *COVID_NET_SENTIMENTS*.

Hassan et al. (2021) first developed epidemic disease risk variable, by conditioning on the proximity to synonyms for risk or uncertainty conditioning on a neighbourhood of 10 words before and after the mention of an epidemic disease obtain a list of synonyms for "risk" and "uncertainty".¹⁹ Authentication of data and explanations as to how *COVID_EXPOSURE* and *COVID_NET_SENTIMENTS* are determined can be seen in (Hassan et al., 2019, 2020).

¹⁸ See Hassan et al.,(2021) for details of variable construction.

¹⁹ See Hassan et al., (2021) Appendix Table 6 for a list of frequently used words for risk and uncertainty.

4.4.1.1. *Equity Market Data*

We retrieve weekly equity price information during quarters 1 – 4 of 2020 and Q1 of 2021 from Thomson Reuters Refinitiv, formerly known as DataStream. We obtain initial data on 328 S&P 500 firms, and we also obtain data on firm financial characteristics (Worldscope) and environmental, social, and governance (*ESG*) performance (*ASSET4*). Concerning the selection of firms, we follow existing research (Ding et al., 2021) and include stocks that were actively trading in 2020 and calculate Weekly Equity Return computed from *TRI* as follows:

$$\text{Ret}_{it} = [(\text{TRI}_{i,t} / \text{TRI}_{i,t-1} - 1) - 1]. \quad \dots(4)$$

Here, $\text{TRI}_{i,t}$ is the total return index, i.e., the dividend-adjusted closing prices on the last trading day of the week. We also evaluate the robustness of the findings to using weekly price index returns as the dependent variable. Figure 2 plots the equity market returns from Q1 January 2020 through Q1 January 2021 for each firm in the sample.

4.4.1.2. *Measuring Board Ideology*

This study's principal purpose is to examine how ideological diversity on corporate boards impacts company sensitivity to pandemic-induced risk. We needed reliable data on the political ideologies of the individual directors serving on the boards in our sample in order to measure board ideology. In line with previous research, we investigated director contributions to the two major political parties in the US (Chin, Hambrick, & Trevino, 2013; Hutton, Jiang, & Kumar, 2014; Christensen et al., 2015).

According to political science and sociology research, the differences seen between the Democratic and Republican Parties in the US are primarily due to differences in stable political ideologies (Poole & Rosenthal, 1984; Goren, Federico, & Kittilson, 2009), with

Democrats holding more liberal beliefs and Republicans holding more conservative beliefs. Furthermore, academics have observed a growing ideological divide between the two parties (McCarty, Poole, & Rosenthal, 2006; Hetherington, 2006). However, donating to one party versus the other suggests an individual's particular ideological orientation.

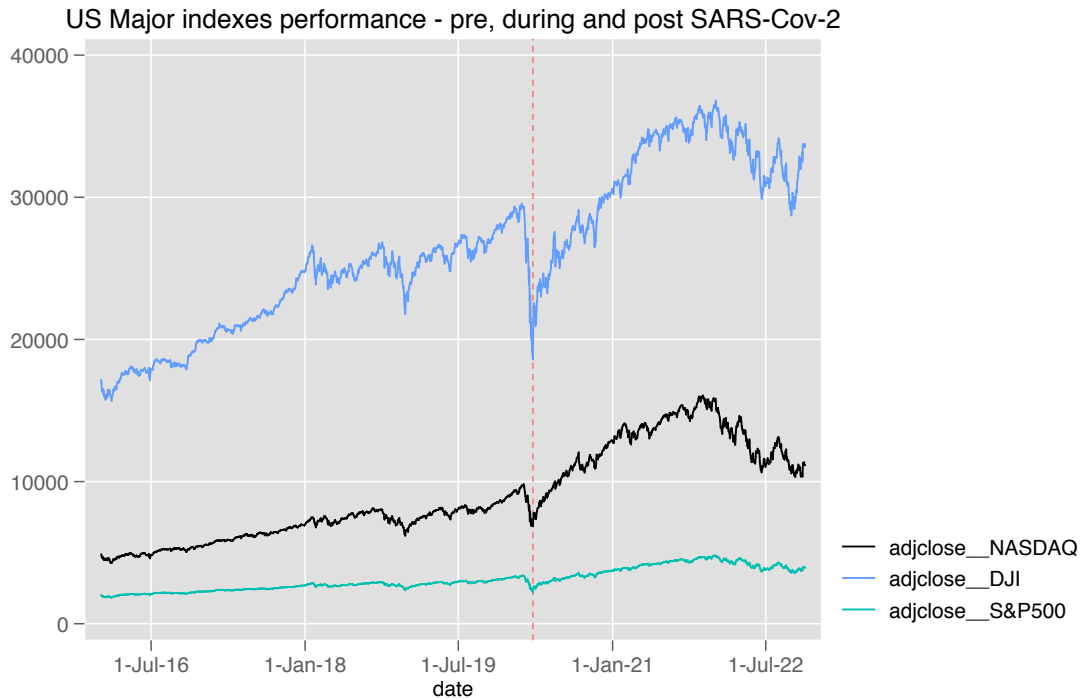
According to research evidence on political ideology, individual political donations are primarily motivated by people's support for a particular belief (Ansolabehere et al., 2003; Francia et al., 2003, 2005; Ensley, 2009). Multinational firms may make donations with the expectation of receiving benefits (Grier, Munger, & Roberts, 1994). According to Ansolabehere et al. (2003), private citizens make small contributions to political campaigns, indicating that the amount donated may not result in significant private benefits. However, individuals are still motivated to contribute due to their ideological beliefs and convictions.

These contributions may serve as a means to express their support for a particular candidate or party and to demonstrate their commitment to the values and principles that align with their ideology. Therefore, it can be argued that private citizens' donations have a greater impact on shaping the political landscape through the collective influence of their shared beliefs and values. The fact that these contributions are driven by ideology rather than the expectation of tangible benefits highlights the importance of understanding the role of values and beliefs in shaping political behaviour.

As a result, we set out to gather information on political contribution activity for the directors in our sample. The FEC catalogues and makes public all political donations upwards of \$200, providing information on both the donation (amount, date, recipient name, and recipient party) and the giver (name, address, occupation, employer, and job title). Following in the footsteps of previous studies (Gupta & Wowak, 2017), we used these data as the foundation for our estimate of director ideology. The study concentrated on the contributions of directors to candidates for federal or state seats. We performed an initial automated search to fit first and last names, as well as employer names, in the Bloomberg database and the FEC political contribution database, then manually

examined the search results, ignoring ambiguous cases (due to abbreviated names and unclear company identifiers) that could potentially represent false-positive matches.

Figure 2. The equity market, pre-SARS-CoV-2 exposure and post SARS-CoV-2 exposure



Source: Researcher's own work

This two-step method was employed to political contribution data from the 2008 to 2020 election cycles in the US, which effectively meant that the study accurately captured directors' stable political inclinations. The study ultimately identified our sample's political donations made by 11,741 (out of a possible 23,482) directors. Using political contribution indicators of personal ideology helps overcome a critical challenge in the research of boardroom homogeneity or heterogeneity: distinguishing the impacts of underlying ideological similarity from the effects of misconstrued similarity caused by preconceptions (Huckfeldt & Sprague, 1995; McPherson et al., 2001). Previous research on political ideology homogeneity has left it unclear whether individuals develop bonds

based on factual ideological similarities or on demographic traits that correspond with political ideas (McPherson et al., 2001). This confounding impact is addressed by using donation data, which removes the subjectivity inherent in self-reported measurements of one's and others' political opinions. Following that, we utilised these political donation numbers to derive indices of ideological diversity.

Our analysis took into account the potential for transient and specific factors to distort measurements of political ideology. To do so, we examined the donation patterns of directors to both political parties. To accomplish this, we followed established research practices (Hutton et al., 2011) by aggregating contributions made to both parties and constructing an index that considers the disparity in donations between the parties as a proportion of the total contribution for a given year. The variable of interest in this analysis is the ideology diversity of directors sitting on the board.

We measure diversity following existing literature (Alesina & La Ferrara (2005) and define ideological diversity (*ID_DIVERSITY*) as a measure of board diversity capturing the probability that any four randomly selected director has different ideologies, using a Herfindahl-based index as follows:

$$ID_DIVERSITY = 1 - \sum_{i=1}^n S^2 \dots (5)$$

Where *S* is the percentage of directors representing ideology *i* and *n* is the number of different categories, i.e., Male, Female Democrats and Male, Female Republicans respectively. The Herfindahl-based index is the most frequently used approach for measuring diversity in workgroup heterogeneity studies (Harrison & Klein, 2007). This approach is appropriate for measuring the diversity of a group where the variable of interest is categorical (i.e., male/female) and no group member belongs to multiple categories simultaneously. Given the distribution of ideological diversity measured by its skewness and kurtosis, we winsorised the variable at the 1st and 99th percentile.

4.4.2. *Control Variables*

The study considers four essential financial characteristics widely used in prior related literature (Balsam et al., 2021; Ding et al., 2021) that may affect a firm's market performance. Firm Size (*FSIZE*) equals the natural logarithm of the book value of total assets; Leverage (*LEVERAGE*) equals the ratio of total debt divided by total assets; Cash (*CASH_HOLDING*) equals the total amount of cash and short-term investments divided by total assets; Profitability (*PROFITABILITY*) is the ratio of earnings before interests, tax depreciation, and amortisation (*EBITDA*) to total assets (*ROA* (*EBITDA*)). We also controlled for other corporate governance diversity variables that may influence firm resilience to pandemic-induced uncertainties, such as *SARS-CoV-2*: Board size (*B_SIZE*) is the natural log of the total number of board members in any given board; Gender diversity (*PCNT_WOMAN*) is the proportion of female directors to male directors in any given board; Age (*AVE_AGE*) is the average age of directors. Lastly, to control for macro-environmental factors, the study added fixed effects based on industry (48 industry definition by Fama & French²⁰) and quarterly-year dummies (*QY_DUM*) for the period in review.

4.4.3 *Model Specifications*

4.4.3.1 *The Effects of ID_DIVERSITY in Determining Equity Market Decline (resilience) During the Pandemic*

This research produced preliminary evidence on this conundrum by estimating the following ordinary least square (OLS) regressions:

²⁰ Since the choice of industry classification, and sample period can significantly affect the performance of industry portfolio sorted by industry concentration levels from 1963 to 2017. Li, Liu and Refalo (2020) reviewed the consistency of performance before and after 1997 and find that 48 industry definition by Fama and French based on four-digit SIC code can produce consistent industry portfolio performance during industry consolidation (1998 -2017) a period that falls within our review.

$$\begin{aligned}
TRI_{it} = & \alpha + \beta(ID_DIVERSITY)_{it} + \beta(ID_DIVERSITY * COVID_EXPOSURE)_{it} \\
& + \delta(ID_DIVERSITY * COVID_NET_SENTIMENTS)_{it} + \sum_{i=1}^7 Controls_{it} \\
& + \sum_{i=1}^{47} Industry_{it} + \sum_{i=1}^2 Year_{it} + \varepsilon_{it}
\end{aligned}
\tag{6}$$

Where the dependent variable is (TRI) total return index defined as the cumulative weekly return of firm i in quarter t . The main explanatory variable is $ID_DIVERSITY$ defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. $COVID_EXPOSURE$ is the number of times the SARS-CoV-2 and its synonyms are used in the earnings conference call between the board of directors and investors scaled by the number of sentences in the transcript. $COVID_NET_SENTIMENTS$ is defined as the difference in the number of negative or positive tone words associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk used in the earnings conference call between the board of directors and investors.

The set of control variables employed in this study is $CASH_HOLDING$ defined as cash and short-term investments scaled by the value of total assets. Firm size (F_SIZE) is the natural logarithm of total assets. Board size ($Board_Size$) is the total number of directors in a given board. $LEVERAGE$ is defined as the debt in current liabilities plus long-term debt scaled by total assets. $PROFITABILITY$ is the ratio of net income (minus taxes) to total assets. $PCNT_WOMEN$ is defined as the proportion of the total number of women to the total number of board of directors and lastly, AVE_AGE defined as the average age of inside directors. All regressions are panel regressions with quarter year- and industry-fixed effects, where industry is defined using 48 industry definition by Fama and French.

4.5 Empirical Results

4.5.1. Descriptive Statistics

Table 14. Summary Statistics 2

This table reports the summary statistics of the key variables used in the analyses. Also reported is the value of the variable at the 25th, 50th and 75th percentile of the distribution of the variable.

	Mean	St.Dev	p25	Median	p75	min	max
Covid Exposure	1.231	1.296	0.294	0.914	1.709	0	8.866
Covid Net Sentiment	-0.104	0.475	-0.235	0	0.088	-5.57	2.374
TRi	0.085	0.433	-0.182	-0.036	0.197	-0.429	1.421
Cash Holding	0.124	0.125	0.03	0.076	0.171	0.005	0.447
Leverage	0.302	0.159	0.173	0.309	0.417	0.033	0.609
F_size	17.004	1.197	16.098	16.86	17.823	15.068	19.485
Board size	2.322	.204	2.197	2.398	2.485	1.099	2.833
ID_diversity	0.234	0.213	0	0.224	0.444	0	0.75
ESG	5.165	.333	5.021	5.271	5.398	3.695	5.615
Profitability	0.117	0.072	0.07	0.109	0.165	-0.078	0.26
Pcnt_women	0.248	0.102	0.18	0.25	0.3	0	0.67
Ave_age	62.202	3.422	60	62	64	50	78

Note Table 14 presents the summary statistics of the variables used in this study. The dependent variable is (TRI) Total return index is the cumulative weekly return of firm i in quarter t . the main explanatory variable are (ID_diversity) defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. (COVID_EXPOSURE) defined as the number of times the covid_19 and its synonyms are used in the earnings conference call between the board and investors scaled by the number of sentences in the transcript. (COVID_NET_SENTIMENTS) defined as the difference in the number of negative or positive tone words (associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk) used in the earnings conference call between the board and investors. The control variables employed in this study are (Cash_holding) is defined as Cash and short-term investments / total assets. (F_SIZE) is the natural logarithm of total assets. (Board_Size) is the total number of directors in a given board. (L_ESG)The overall firm score is calculated using disclosed data and the ESG pillar ratings.. (LEVERAGE) Debt in current liabilities plus long-term debt divided by assets. (Profitability) is the ratio of net income (minus taxes) to total assets. (PCNT_WOMEN) The percentage of the total number of women to the total number of board directors. (AVE_AGE) the average age of inside directors.

4.5.2. Correlation

Table 15. Correlation table

This table reports the correlation of variables used in the analyses. The list of variables, definitions are provided in the Appendix A *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Covid_exposure	1.000											
Covid_net_sentiment	-0.158***	1.000										
TRI	-0.082***	-0.102***	1.000									
Cash holding	0.082***	0.003	-0.055**	1.000								
Leverage	-0.038*	-0.026	0.063***	-0.163***	1.000							
Fsize	-0.033	0.027	0.028	-0.151***	-0.118***	1.000						
B_size	0.002	0.047**	0.063***	-0.005	-0.033	-0.014	1.000					
Id_diversity	0.055**	-0.011	0.083***	0.012	-0.004	-0.072***	0.208***	1.000				
ESG	0.009	0.007	-0.024	-0.069***	0.127***	0.308***	-0.001	-0.013	1.000			
Profitability	0.013	-0.016	-0.005	0.263***	0.169***	-0.404***	-0.002	0.039	-0.060**	1.000		
Pcnt_women	0.077***	0.059**	0.090***	0.011	0.006	0.078***	0.180***	0.111***	0.041*	-0.078***	1.000	
Ave_age	0.034	-0.026	0.069***	0.061**	0.015	0.034	-0.014	-0.025	0.081***	-0.011	-0.054**	1.000

Note Table 15 presents the correlation matrix of the variables used in this study. The dependent variable is (RI) Total return index is the cumulative weekly return of firm *i* in quarter *t*. the main explanatory variable are (ID_diversity) defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. (COVID_EXPOSURE) defined as Is the number of times the covid_19 and its synonyms are used in the earnings

conference call between the board and investors scaled by the number of sentences in the transcript. (COVID_NET_SENTIMENTS) defined as the difference in the number of negative or positive tone words (associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk) used in the earnings conference call between the board and investors. The control variables employed in this study are (Cash_holding) is defined as Cash and short-term investments / total assets. (F_SIZE) is the natural logarithm of total assets. (Board_Size) is the total number of directors in a given board. (ESG) The overall firm score is calculated using disclosed data and the ESG pillar ratings. (LEVERAGE) Debt in current liabilities plus long-term debt divided by assets. (Profitability) is the ratio of net income (minus taxes) to total assets. (PCNT_WOMEN) The percentage of the total number of women to the total number of board directors. (AVE_AGE) the average age of inside directors.

Table 14 reports the main statistics (means, standard deviations, median, p25, p75, min and max values), and Table 15 reveals the correlations among the variables. The aggregate figures in Table 14 demonstrate that the firms' market returns in our sample range from -0.429 to 1.421 and a mean of -0.036.

Closer inspection of *ID_DIVERSITY* shows a mean of 0.234 and a standard deviation of 0.213. Considering that *ID_DIVERSITY* conceivably ranges from 0 to 1, the observed large dispersion in the measure of diversity across the sample firms suggests that in the S&P 500 firms, the more significant majority of the directors belong to a specific ideology group (Male – REPUBLICANS), as shown in figure 2. In contrast, there are several directors (Male and Female) with different ideologies in other firms. Table 15 also includes the results of the correlational analysis and the associated significance. Multicollinearity is unlikely because the variance inflation factor (VIF) and tolerance scores for each predictor variable were well below the 10 threshold.

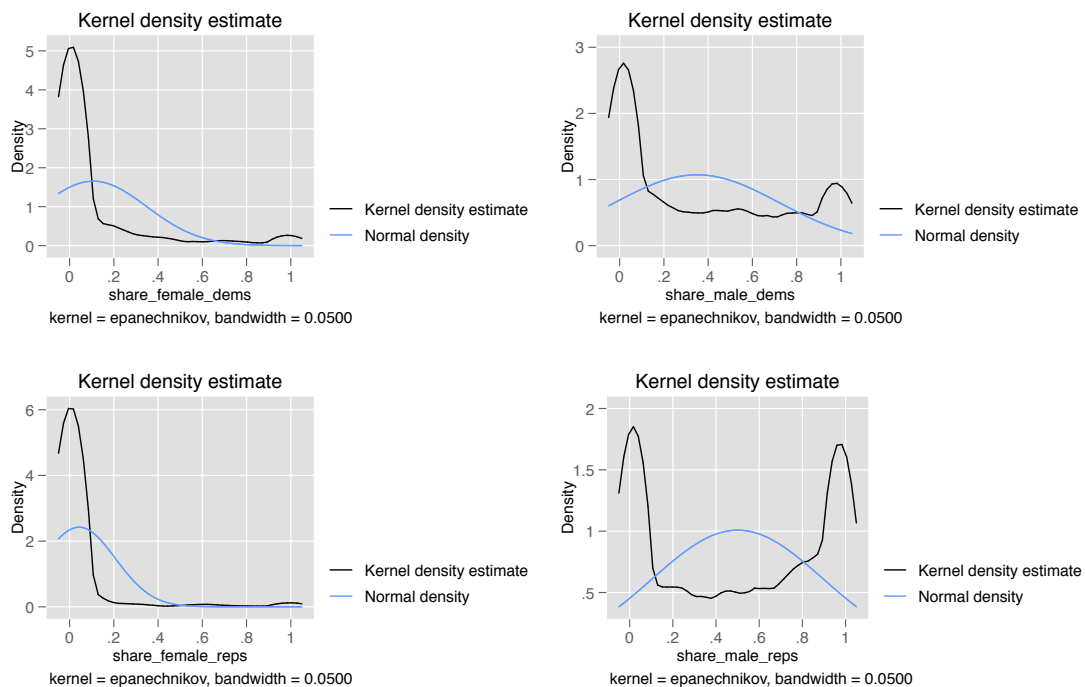
4.5.3. *Multivariate Results*

H5 propose that board *ID_DIVERSITY* determines the extent to which idiosyncrasies in directors' preferences, incentives, and information utilisation influence the board's decision-making process. Consequently, ideological differences among directors should have a first order impact on the risk linked with the outcome of board decision-making. Table 16 shows the preliminary results. The outcome variable of interest in the estimated quarterly-year regression models is a cumulative winsorised weekly return of firm *i* in quarter *t*, of the equity market returns of S&P 500 firms. All specifications include a host of control variables with Fama & French (1997) 48-industry, and quarterly-year effects. The evidence in Table 16 columns (3), (6) and (7) shows that higher board *ID_DIVERSITY* is linked with positive equity return ($\beta = 0.227$, $t = 3.20$; $\beta = 0.135$, $t = 1.68$; $\beta = 0.136$, $t = 1.68$). The data supports H5 that a more heterogenous group would make more informed decisions, which would be reflected in equity market return.

For example, the coefficient estimates on the *ID_DIVERSITY* in Column (7) implies that one standard deviation increase in *ID_DIVERSITY* (0.213) is linked with an increase in equity market return of 0.02 percentage points (2%) in the quarter of the period under review.

The results in Table 16 Column (7), however, may be skewed due to omitted variables as well as the endogenous nature of CG mechanisms. One can easily imagine the endogeneity bias going either way, contingent on how board *ID_DIVERSITY* influences the decision-making process. Conversely, if *ID_DIVERSITY* disrupts or delays the deliberation process and makes the ensuing results more unpredictable (Arrow, 1951), firms operating in a high SARS-CoV-2 *EXPOSURE* environment may find it beneficial to have less diversity on the board.

Figure 3. Ideology Diversity Densities



Source: Researcher's own work

Table 16. Main Regression Estimates

This table reports the estimation results from linear regressions of the following form:

$$y_{it} = \alpha_0 + \beta_{it} Covidexposure + \beta_{it} Covidnetsentiments + \beta_{it} IDdiversity + \phi \Sigma Controls + \delta t + \delta S + \varepsilon_{it},$$

it shows how stock market return in the S&P 500 returns respond to the rate of change in firm level covid exposure, covid_net_sentiments, and whether board of directors' ideology shape the response of market return to the pandemic. (Columns 1-3) regressions do not include control variables. (Columns 4 -6) regressions include control for cash holding firm size board size leverage and profitability of the firm, whereas (Column 7) includes all variables in the specification, FF48 industry and quarter effects are included. Standard errors are robust and are reported below the coefficients. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	S&P 500 Stock Market Return Q1 - Q4 2020 and Q1 2021						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Covid_exposure	-0.0372*** (0.0109)			-0.0339** (0.0147)			-0.0301* (0.0154)
Covid_net_sentiment		-0.108*** (0.0296)			-0.0816*** (0.0289)		-0.0825*** (0.0289)
ID_diversity			0.227*** (0.0710)			0.135* (0.0802)	0.136* (0.0807)
Cash_holding				-0.161* (0.0865)	-0.187** (0.0871)	-0.162* (0.0949)	-0.155 (0.0944)
Fsize				0.00825 (0.0126)	0.00887 (0.0127)	0.00734 (0.0136)	0.00936 (0.0136)
B_size				0.0572 (0.105)	0.0739 (0.107)	0.172* (0.0914)	0.186** (0.0909)
Leverage				0.109** (0.0461)	0.105** (0.0456)	0.139*** (0.0504)	0.137*** (0.0494)
Profitability				0.0207 (0.165)	0.0156 (0.166)	-0.0820 (0.174)	-0.0882 (0.173)
Pcnt_women				0.481***	0.480***	0.327**	0.350**

				(0.156)	(0.156)	(0.158)	(0.157)
Ave_age				0.00315	0.00292	0.00239	0.00261
				(0.00529)	(0.00530)	(0.00563)	(0.00560)
Constant	0.159***	0.102***	0.0719***	0.361	0.319	0.141	0.0529
	(0.0195)	(0.0144)	(0.0226)	(0.554)	(0.560)	(0.467)	(0.464)
Observations	1,850	1,850	1,607	1,621	1,621	1,431	1,431
R ²	0.006	0.007	0.006	0.295	0.295	0.288	0.292
FF48 & Quarter-year effects	Yes	yes	yes	Yes	Yes	yes	yes

Note Table 16 presents the main results of board ideology on the relationship between covid_19 exposure, covid_19 net_sentiment and stock market return the dependent variable is is (*TRI*) Total return index is the cumulative weekly return of firm i in quarter t. the main explanatory variable are (*ID_diversity*) defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. (*COVID_EXPOSURE*) defined as Is the number of times the covid_19 and its synonyms are used in the earnings conference call between the board and investors scaled by the number of sentences in the transcript. (*COVID_NET_SENTIMENTS*) defined as the difference in the number of negative or positive tone words (associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk) used in the earnings conference call between the board and investors. The control variables employed in this study are (*Cash_holding*) is defined as Cash and short-term investments / total assets. (*F_SIZE*) is the natural logarithm of total assets. (*Board_Size*) is the total number of directors in a given board. (*LEVERAGE*) Debt in current liabilities plus long-term debt divided by assets. (*Profitability*) is the ratio of net income (minus taxes) to total assets. (*PCNT_WOMEN*) The percentage of the total number of women to the total number of board directors. (*AVE_AGE*) the average age of inside directors.

4.5.4. On The Moderating Effect of *ID_DIVERSITY* On Stock Price Return In The Presence of *SARS-CoV-2 EXPOSURE* and *COVID_NET_SENTIMENT*

Table 17. Moderation Effect Tests

This table analyses the moderation effect of board ideology on the relationship between covid_19 exposure, covid_19 net_sentiment and stock market return. In this analysis the main explanatory variable of interest is covid_exposure*id_diversity and covid_net_sentiment*id_diversity. Models 1-2 controls include cash holding, firm size, board size, leverage and profitability of the firm, FF48 industry and quarter effects are included. Standard errors are robust and are reported below the coefficients. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	S&P 500 Stock Market Return Q1 - Q4 2020 and Q1 2021	
VARIABLES	(1)	(2)
Covid_exposure	-0.0478** (0.0209)	
Covid_net_sentiment		-0.1714*** (0.0407)
Covid_exposure x ID_diversity	0.0832* (0.0479)	
Covid_net_sentiment x ID_diversity		0.278** (0.119)
ID_diversity	0.0309 (0.1096)	0.1897** (0.0860)
Constant	0.372 (0.404)	-1.410*** (0.380)
Observations	1,431	1,431
R ²	0.290	0.125
Controls	yes	yes
FF48 & Quarter-year effects	yes	yes

Note Table 17 presents the moderation effect of board ideology on the relationship between covid_19 exposure, covid_19 net_sentiment and stock market return the dependent variable is *(TRI)* Toral return index is the cumulative weekly return of firm *i* in quarter *t*. the main explanatory variable are *(ID_diversity)* defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. *(COVID_EXPOSURE)* defined as Is the number of times the covid_19 and its synonyms are used in the earnings conference call between the board and investors scaled by the number of sentences in the transcript *(COVID_NET_SENTIMENTS)* defined as the difference in the number of negative or positive tone words (associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk) used in the earnings conference call between the board and

investors. (*Covid_exposure x ID_diversity*) the interaction terms between covid exposure and board ID_diversity. (*Covid_net_sentiment x ID_diversity*) is the interaction terms between covid_net_sentiment and board id_diversity. The control variables employed in this study are (*Cash_holding*) is defined as Cash and short-term investments / total assets. (*F_SIZE*) is the natural logarithm of total assets. (*Board_Size*) is the total number of directors in a given board. (*LEVERAGE*) Debt in current liabilities plus long-term debt divided by assets. (*Profitability*) is the ratio of net income (minus taxes) to total assets. (*PCNT_WOMEN*) The percentage of the total number of women to the total number of board directors. (*AVE_AGE*) the average age of inside directors. All the control variables introduced in section 4.4.2 are included in each model, but for brevity not reported and available upon request.

Table 17 provides the results obtained from the pooled OLS regression analysis.

The evidence in Table 17 columns (1) remain positive and significant when there are interactions between *ID_DIVERSITY* and *COVID_EXPOSURE* ($\beta = 0.0832$, $t = 1.74$) results illustrate that equity prices of firms with more *ID_DIVERSITY* are more resilient in response to SARS-CoV-2 than firms with lesser *ID_DIVERSITY*. Findings here support H5 which posits that as *ID_DIVERSITY* increases in the boardroom the stronger the equity market return of firms. Concerning the estimated economic magnitude, the coefficient estimates on *ID_DIVERSITY*COVID_EXPOSURE* suggests that an increase of one standard deviation in *ID_DIVERSITY* is associated with quarterly equity market returns increase by 0.02 percent more in response to an average quarterly SARS-CoV-2 value.

To further examine the relationship between *ID_DIVERSITY* and *COVID_NET_SENTIMENT*. The data presented in Table 17 provides support for H5a, which suggests that companies with higher levels of diversity are better equipped to handle the impact of the SARS-CoV-2 pandemic. Specifically, the results in column (2) of Table 17 demonstrate a positive and significant relationship between the interactions of *ID_DIVERSITY* and *COVID_NET_SENTIMENT* ($\beta = 0.278$, $t = 2.33$). These findings indicate that companies with more diverse teams are more resilient in response to SARS-CoV-2 than those with less diversity. This may be due to the fact that diverse groups are better equipped to make balanced and informed decisions, which can help to reduce fear and uncertainty associated with the pandemic's impact on the firm's financial health.

Ultimately, this improved decision-making can lead to better equity market returns for the firm. The findings here support H5b. Negative news about SARS-CoV-2 exposure can induce equity prices to fall. However, results in Table 17 columns (2) shows that equity prices of firms with high *ID_DIVERSITY* performed better than more homogenous firms (lower *ID_DIVERSITY*).

Reflecting the economic importance of the findings, the study shows that moving from the median to the 75th percentile of *COVID_NET_SENTIMENT* translates into a 0.52% increase in average equity return. In other words, the coefficient estimates from columns (2) suggests that the average equity return of a firm with high *ID_DIVERSITY* is more resilient to investors *COVID_NET_SENTIMENT* by 0.0052 percent points, per quarter in the period under review. *COVID_NET_SENTIMENT* is $>$ or $=$ 75th percentile = $0.278 * 0.213 * 0.88$. Given the retained statistical significance and sign on the interaction effect between variables for both OLS and GEE models (unreported), the study can conclude that our hypothesised effect remains robust.

4.6. Robustness Tests

4.6.1. *2SLS Regression Estimates*

As with any empirical analysis, it is essential to establish the empirical results' robustness and in order to accomplish this, we conducted several robustness checks. First, we checked the variables' variance inflation factors (VIFs) to ensure that multicollinearity did not affect the findings. For all models, the VIFs are between 1 and 3.7, below the thresholds of concern. Next, endogeneity may be contaminating our results (Semadeni, Withers, & Trevis, 2014). Several empirical (see e.g. Boone et al., 2007; Coles et al., 2008; Linck et al., 2008) and theoretical studies (Hermalin & Weisbach, 1998; Raheja, 2005; Adams & Ferreira, 2007, and Harris & Raviv, 2008) have demonstrated that CG mechanisms and corporate performance are endogenously determined. To overcome this limitation, the study required an instrument correlated with board ideology diversity but uncorrelated with our dependent variable (stock market return).

In corporate finance, it is not easy to find a perfect instrument. However, one can use a reasonable instrument not correlated with the dependent variable and test for the instrument's validity (Bartels, 1991).

We used as main instruments, Environmental Social & Governance Pillar (ESG) score of the firms in the sample. The choice of instrument relies on study findings that Corporate social responsibility (CSR)/ESG profiles (Chin et al., 2013; 2017) and demographic attributes of the directors (Hutton et al., 2014) is associated with ideology, thus making it a potentially suitable instrument. The critical test variables are the *ID_DIVERSITY* and *ID_DIVERSITY's* interaction(s) of *ID_DIVERSITY* with *COVID_EXPOSURE* and *COVID_NET_SENTIMENT*. Intuitively, if the *ID_DIVERSITY* is endogenous, its interaction(s) with *COVID_EXPOSURE* and *COVID_NET_SENTIMENT* is also expected to be endogenous. Hence, we use first-stage models, with *ID_DIVERSITY*, and its interaction(s) with *COVID_EXPOSURE* and *COVID_NET_SENTIMENT* as the respective outcome variables.

In the second stage, the estimated values of the *ID_DIVERSITY* and the interaction term from the first-stage models are used. Table 18 shows results for the 2SLS (IV) estimation. Panel A presents results from the first-stage models of the 2SLS (IV) estimation includes the interaction of the instrument, instrumented *ID_DIVERSITY* with *COVID_EXPOSURE* & *COVID_NET_SENTIMENT*, because if W_1 is the instrument for Y , therefore, the instrument for $X*Y$ (W_2) = W_1*X . The study also tested the power and instrument validity before accepting the specification's 2SLS (IV) treatment of endogeneity.

Table 18 analyses the 2SLS estimates of the instrumental variable regressions. Panel A reports the first stage estimates, where the dependent variables are *ID_DIVERSITY*, *ID_DIVERSITY*COVID_EXPOSURE* and *ID_DIVERSITY*COVID_NET_SENTIMENT*. *ID_DIVERSITY* is defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies. *ID_DIVERSITY*COVID_EXPOSURE* is a factor variable which tests the effect of *ID_DIVERSITY* on the relationship between SARS-CoV-2 exposure and stock market return of S&P 500 firms.

$ID_DIVERSITY * COVID_NET_SENTIMENT$ is defined as a factor variable which tests the effect of $ID_DIVERSITY$ on the relationship between $COVID_NET_SENTIMENT$ and stock market return of S&P 500 firms.

The instruments includes Environmental Social and Governance (ESG) score of the firms (Chin et al, 2013), proportion of female directors ($PCNT_WOMEN$), and the average age of directors (Ave_age) following Hutton et al., 2014. Chin et al, 2013 posits that board ideology is related to ESG and social responsibility whereas Hutton et al., 2014 suggests that these instrumental variables may play a role in the firm-manager matching process, unlike personal political contributions, they cannot be changed after hiring in response to the changing business needs of the firm. Therefore, the instrumental variable approach, at least, can address potential concerns about reverse causality where the firm's needs can affect the political tilt and contributions by its actors – together with all controls.

In the second stage, Panel B We use the predicted $ID_DIVERSITY$, $ID_DIVERSITY * COVID_EXPOSURE$ and $ID_DIVERSITY * COVID_NET_SENTIMENT$ from the first-stage regression as the key explanatory variable in the second-stage regression, where the dependent variable is the cumulative weekly return of firm i in quarter t .

Table 18. 2SLS Instrumental Variable Regression Estimates

All variables are defined in Appendix B, FF48 industry and quarter effects are included. Standard errors are robust and are reported below the coefficients. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Panel A First-Stage Regressions			
VARIABLES	Dependent Variable		
	<i>ID_DIVERSITY</i>	<i>ID_DIVERSITY</i> x <i>COVID_EXPOSURE</i>	<i>ID_DIVERSITY</i> x <i>COVID_NET_SENT</i>
	(1)	(2)	(3)
ESG	0.188*** (0.0278)		
ESG x covid_exposure		0.123*** (0.00352)	
ESG x covid_net_sentiment			0.113*** (0.00252)
Ave age	0.0621*** (0.00697)	0.0688*** (0.0137)	-0.0202*** (0.00399)
PCNT_women	0.000906* (0.000546)	0.00297*** (0.00107)	0.000503* (0.000312)
Constant	-0.353*** (0.111)	-0.401** (0.171)	0.0293 (0.0497)
Observations	1,637	1,637	1,637
R-squared	0.220	0.527	0.571
ΣControls	yes	yes	yes
FF48 & Quarter-year effects	yes	yes	yes

Table 18 reports the two-stage least square (2SLS) estimates of the instrumental variable regressions. Panel A reports the first-stage estimates, where the dependent variables are: *ID_DIVERSITY* is defined as a measure of board diversity capturing the probability that any randomly selected director has different ideologies, *ID_DIVERSITY* on the relationship between SARS-CoV-2 exposure and stock market return of S&P 500 firms. & *ID_DIVERSITY***COVID_NET_SENTIMENT* is defined as a factor variable which tests the effect of *ID_DIVERSITY* on the relationship between *COVID_NET_SENTIMENT* and stock market return of S&P 500 firms. The instruments include (ESG) the overall firm score is calculated using disclosed data and the ESG pillar ratings. the average percentage of female directors (PCNT_women), and the average age of directors (Age), The control variables employed in this study are (Cash_holding) is defined as Cash and short-term investments / total assets. (F_SIZE) is the natural logarithm of total assets. (Board_Size) is the total number of directors in a given board. (LEVERAGE) Debt in current liabilities plus long-term debt divided by assets. (Profitability) is the ratio of net income (minus taxes) to total assets. We excluded (PCNT_WOMEN) The percentage of the total number of women to the total number of board directors and (AVE_AGE) the average age of inside directors. All the control variables introduced in section 4.5 are included in each model, but for brevity not reported and available upon request.

Panel B Second-Stage
Regressions

Dependent Variable: S&P 500 Stock Market Return Q1 - Q4 2020 & Q1 2021			
VARIABLES	(1)	(2)	(3)
ID_DIVERSITY (Instr.)	0.188** (0.0910)		
Covid_exposure		-0.0146*** (0.0259)	
Covid_net_sentiment			-0.109* (0.1187)
ID_DIVERSITY (Instr.) x covid_exposure		0.0752* (0.0389)	
Instr. ID_DIVERSITY x covid_net_sentiment			0.216** (0.104)
ΣControls	yes	yes	yes
FF48 & Quarter-year effects	yes	yes	yes
Cragg-Donald Wald F statistic	1203.668	645.018	771.99
^Durbin-Wu-Hausman P-val	0.3040	0.2457	0.3095
Sargan statistic	0.00	0.00	0.00
Constant	-0.329 (0.322)	-0.300 (0.321)	-0.325 (0.323)
Observations	1,132	1,132	1,132
R-squared	0.335	0.336	0.332

Panel B reports the second-stage estimates, where the dependent variable is the cumulative weekly return of firm i in quarter t . The key independent variables are predicted $ID_DIVERSITY$ (Instr.) variable and its interactions with $COVID_EXPOSURE$ and $COVID_NET_SENTIMENTS$ from the first-stage regression. The control variables are identical to those used in Panel A of Table 18. All regressions are panel regressions with year- and industry-fixed effects, where industry is defined using 48 industry definition by Fama and French.

To evaluate the instrument's explanatory value, the study conducted a partial F-test (Cragg -Donald Wald) on the first stage equations, and the results are well above the recommended minimum of 10 (Stock and Yogo, 2005), as shown in Table 18 Panel B, suggesting that the chosen instruments are a good predictor. The Sagan statistic (overidentification test) shows that the instruments are not correlated with the error term ($p = 0.9137$). Table 18 Panel B - Columns 1 and 2 shows that the second stage of 2SLS (IV) estimation of the coefficients of instrumented *ID_DIVERSITY* and their interaction(s) *ID_DIVERSITY* with *COVID_EXPOSURE* is positive and statistically significant.

Therefore, firms with a more diverse board in terms of ideology will experience less stock market decline than firms with less diverse boards. For example, in response to an average quarterly SARS-CoV-2 shock, one standard deviation (0.213) increase in a firm's *ID_DIVERSITY* is associated with 0.04 higher percentage returns in the quarter of the period under review, consistent with hypothesis 5 and 5a/b and in line with the OLS result in Table 16 & 17. Further, it also supports research on board diversity (see, e.g. Bernile et al., 2018; Kim et al., 2013), who argue, inter alia, that diverse corporate boards are linked with better firm performance.

Also, in Column 3. The study finds the interaction between *ID_DIVERSITY* and *COVID_NET_SENTIMENT* is positive but significant (0.216, $p = <0.05$). Furthermore, the Durbin-Wu-Hausman test for endogeneity ($p = 0.30, 0.25$ & 0.30) did not reject the null hypothesis that *ID_DIVERSITY* and its interactions with *COVID_EXPOSURE* and *COVID_NET_SENTIMENT* was exogenous and as such renders 2SLS regression unnecessary (Gupta & Wowak, 2017; Wooldridge, 2013). We further test the robustness of our findings by employing propensity score matching as a substitute method of accounting for endogeneity that does not necessitate the use of additional instruments.

4.6.2 *Matched Sample Analysis (Propensity score matching)*

In this section, the identification strategy operates on the principle that SARS-CoV-2 exposure was extraordinary and that some firms were more resilient than their peers due to their pre-SARS-CoV-2 hiring. There is still a possibility that performance differences during the pandemic are driven by other, unobserved firm-level characteristics that our resilience measure does not capture.

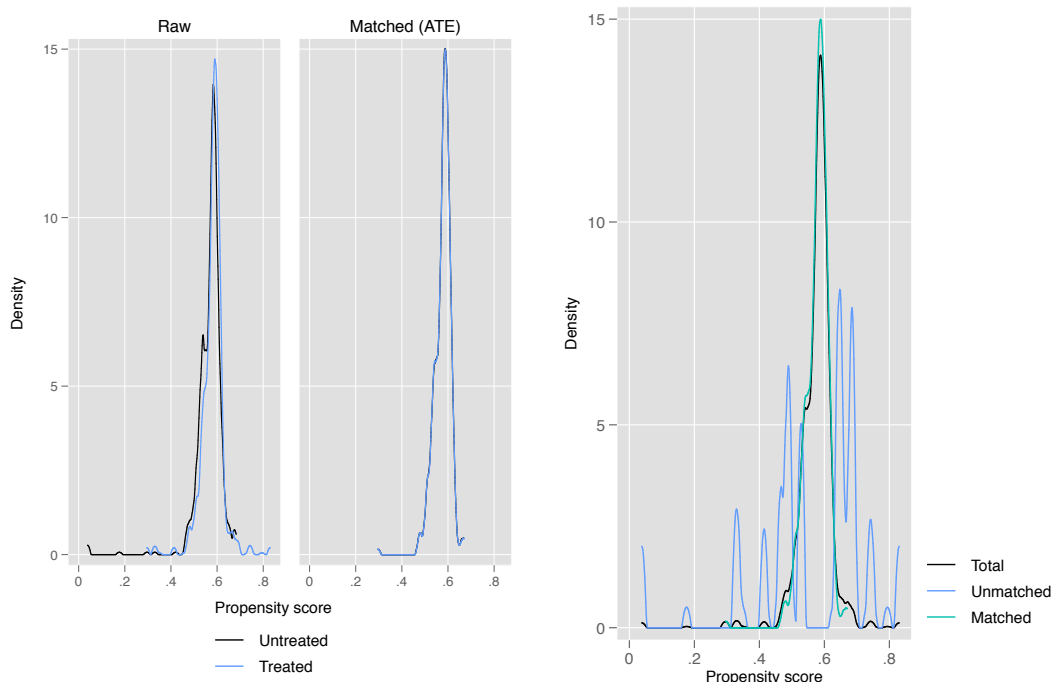
Therefore, the study performs the propensity score matching (PSM) to construct samples of similar firms (using pre-pandemic observables) with high and low *ID_DIVESRITY* firms. A firm is defined as high *ID_DIVESRITY* if it has $>$ than the median *ID_DIVESRITY* value; otherwise, it is defined as low *ID_DIVESRITY*. By generating and comparing matched pairs, we aim to reduce the bias due to confounding variables found in the *ID_DIVESRITY* estimate of the high diversity group, such that we have more confidence to conclude that the difference between the matched firms is a result of different diversity levels. We match each high diversity firm with a control firm in the same industry classification by requiring the exact matching for the industry membership. The study uses nearest neighbour matching based on propensity scores (PS), generated based on a logit regression on the variables that might affect a company's market returns, such as firm size, the measure of firm profitability, leverage, cash holding. We added the factor variables for leverage*profitability and cash holding*profitability to improve the model²¹.

The PSM is produced with replacement and a standard caliper.01. In the tabulated results (see Table 19) for the logit regression, we find that firm size, cash holding, profitability and cash holding*profitability load with a positive and significant coefficient. Figure 4 shows the matching quality and results.

²¹Applied Hosmer-Lemeshow's goodness-of-fit approach to improve propensity score model due to possible non-linearity in the relationships between the cofounders and the log odds of being treated.

For most of the confounding variables used in the PSM, the low *ID_DIVERSITY* group looks much more similar to the high *ID_DIVERSITY* group, as reflected in the mean estimates. Table 20 presents the standardised difference (Rosenbaum and Rubin, 1985), i.e., the difference in terms of standard deviation. All confounding variables used to calculate the propensity score have standardised bias less than 0.1, indicating successful matching. In other words, the high *ID_DIVERSITY* group and the matched group are very similar in terms of their firm size, the measure of firm profitability, leverage and cash holding.

Figure 4 Raw and Matched Average Treatment Effect (ATE)



Note figure 4 shows the matched sample (Matched (ATE)) as only one line, for *ID_DIVERSITY* modified variable which is good as there are no large deviations. After matching was applied, the common support is very good, so we know both groups are similar on average. Common support ensures that persons with the same X-values have a positive probability of being both treatment and non-treatment. In the second graph we see that the total sample and the matched sample are very close, so we can assume that the final sample that is used in the matching is very similar on average to the original sample.

With the matched samples, we can compare the stock market return during crises for the high *ID_DIVERSITY* group and the matched group, having more confidence that the difference between the two groups is most likely due to firms' different diversity levels no other covariates. Sensitivity test results as shown in Table 21 suggests that there is an economically meaningful and statistically significant difference in stock market return, about 0.06% ($p = <.01$), between the high *ID_DIVERSITY* group and the matched group during the period in review 2020Q1 to 2021Q1, suggesting that in the treatment group, the equity market return will improve by 0.06% for a one standard deviation increase in board ideology diversity (*ID_DIVERSITY*).

Table 19. Propensity Score Matching

*Table 19 presents the first stage for Propensity score matching sample. The sample consists of 1,494 firm-year observations over the period 2020Q1 to 2021Q1. Robust standard error is reported in brackets. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.*

Propensity Score Matching –	
First Stage	
VARIABLES	ID_diversity
Cash_holding	0.192*** (0.0579)
Profitability	0.170* (0.0896)
F_SIZE	0.0119** (0.00468)
J ²²	1.430*** (0.342)
Constant	0.250*** (0.0888)
R-squared	0.048
Observations	1,494

Note: the dependent variable is the *ID_diversity* modified variable (*Cash_holding*) is defined as Cash and short-term investments / total assets. (*Profitability*) is the ratio of net income (minus taxes) to total assets. (*F_SIZE*) is the natural logarithm of total assets. (*J*) is the factor variable cash holding x profitability (to improve propensity score model due to possible non-linearity in the relationships between the cofounders and the log odds of being treated).

²² Hosmer-Lemeshow's goodness-of-fit

Table 20. Balance test of covariates

	Raw		Matched	
Number of obs =	1,682		3,364	
Treated obs =	968		1,682	
Control obs =	714		1,682	

	Standardized differences		Variance ratio	
	Raw	Matched	Raw	Matched
Cash_holding	-.0515842	-.0182204	.9000323	.9038628
Profitability	-.0472457	.0445843	.9494331	1.037165
F_SIZE	-.0974675	.0252989	.8303244	.9099691
J	.078966	.0307917	1.052897	1.0203

Note: Table 20 presents the matched sample results indicate that matching on the estimated propensity score balanced the covariates. The standardised differences are close to zero and the variance ratios are all close to 1. First step covariates used in the analysis are: CASH_HOLDING, PROFITABILITY, F_SIZE, CASHOLDING x PROFITABILITY.

4.6.3 Sensitivity test results (PSM)

Table 21. Treatment-effects estimation ID_DIVERSITY

RI	AI Robust				
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
ATE	.0570051	.0210196	2.71	.007	.0158074 .0982028
treat (1 vs 0)					

Note: Table 21 presents the matched sample results, the outcome variable here is (RI) Total return index is the cumulative weekly return of firm i in quarter t. ATE is defined as the average treatment effect First step covariates used in the analysis are: CASH_HOLDING, PROFITABILITY, F_SIZE, CASHOLDING x PROFITABILITY.

4.7. Summary

Due to the SARS-CoV-2 pandemic, many individuals have lost their lives. The pandemic also harmed financial systems all over the world. While the effects of the SARS-CoV-2 on several industries within the S&P 500 are generally adverse, the question is to what extent investors react to the pandemic (with regards to its effect on cash flow) and whether the reaction in any given firm differs from that in another firm due to difference in their ideology.

The research findings indicate that corporate board ideology has a direct and significant impact on market gains. We discovered that the negative impact of SARS-CoV-2 in firms with high ideological diversity was significantly reduced. While our evidence on the stock market decline is consistent with the SARS-CoV-2 literature (e.g. Ali et al., 2020; Ru et al., 2020), this study shows that board ideology diversity plays an essential role in predicting changes market and investor reactions between firms. Furthermore, while the effects of board ideology diversity on firm performance have been studied (e.g., Kim et al., 2013), its repercussions on capital markets during disasters have yet to be investigated. The findings of this research indicate that corporate board ideology influences how they respond to disasters. The findings of this study assist boards in developing guidelines for determining the needs of firms in terms of board diversity levels, evaluating the suitability of the existing board structure, and specifying strategies to improve boardroom diversity.

This study also discovered that as board heterogeneity increases, so does firm performance. As a result, the board must be aware of any diversity gaps, the reasons for those gaps, and the likelihood of resolving their diversity issues. This is critical if organisations want to maximise the potential of their boards. Lastly, the observations offer guidance to government and policymakers on the role political ideology plays in financial markets when designing intervention strategies to respond to crises, notably the SARS-CoV-2 pandemic.

Chapter 5

Board Structure, Directors' IT Expertise and Cybersecurity Breaches

Boards are waking up: "finally, we're seeing that nearly everyone understands security is a business risk issue at the end of the day. I joke with my clients, 'the board gets it, so they want to do something about cyber security, that's the good news.' But the bad news is, 'the board gets it, and they want to do something about cyber security.' But of course, it really is good news." — Bruno Haring, Director, Cyber security and Privacy, PwC; President, InfraGard Atlanta, at Secure World Atlanta

5.1. Introduction

CEO duality occurs when the chief executive officer of a firm holds the dual roles of the head of the firm and the chair of its board of directors, in addition to their standard management responsibilities (Oak & Iyengar, 2009). The potential effect of CEO duality on a firm's performance has garnered significant academic interest (Wang et al., 2019). Previous studies examining CEO duality's effect on firm performance have produced conflicting outcomes. The current literature on the subject is inconclusive, with results ranging from positive to negative, and sometimes even indicating an insignificant relationship between CEO duality and firm performance (see e.g. Guillet et al., 2013; Faleye, 2007). Moreover, scholars who believe CEO duality negatively impacts firm performance use agency theory to support their claims.

According to this theory, a CEO with a dual role does not work for shareholders' interest; instead, the CEO decides to maximise his/her personal benefits, which ultimately leads to agency problems (Core & Larcker, 1999) thereby resulting in an adverse performance of the firm (Fama & Jensen, 1983; Jensen & Meckling, 1976).

On the other hand, researchers supporting the positive impact of CEO duality on firm performance refer to stewardship theory to support their stance. Stewardship theory assumes that the dual role of a CEO endorses a more concentrated and flexible governance structure, which enhances the managerial efficiency in dynamic business surroundings (Finkelstein & Aveni, 1994), thereby leading to high firm performance.

Given the contradictory findings, it is imperative to conduct a thorough examination by taking into account other factors that contribute to the correlation between CEO duality and firm performance. Follow-up research has suggested that intervening or moderating variables that affect the relationship between CEO duality and firm performance should be explored to better understand how CEO duality impacts a firm's performance (Yang et al., 2014). However, according to Tang (2017), the mediating factors have not been adequately studied to clarify this effect.

Relative to the literature as mentioned earlier, this study seeks to extend the work of Hsu and Wang (2014) by exploring the relation between board leadership configuration and the probability of information security events. In addition, this study proposes market competition, the presence of female directors and board IT expertise as the mediating mechanisms to explain how CEO duality influences the likelihood of a cyber security threat, and thus attempts to fill this gap in the literature. We rely on these variables in this study because earlier studies have found that they are significant predictors of firm performance outcomes. Studies have identified various governance mechanisms to improve corporate decisions, among which board gender diversity has been identified as an important factor that can improve board decisions and corporate governance (Adams & Ferreira, 2009; Post & Byron, 2015).

The literature related to gender diversity emphasise on the advantages of gender diversity in the boardroom on efficient decision-making (Milliken & Martins, 1996), effective monitoring and control (Adams & Ferreira, 2009; Benkraiem et al., 2017; Nielsen & Huse, 2010), and higher firms' financial performance (Terjesen et al., 2016).

This study investigates gender diversity as a moderating force to discuss the effect of CEO duality on the likelihood of cybersecurity threat. Further we draw from agency theoretic based views of director expertise (Fama & Jensen, 1983) which argue that boards should have the necessary expertise to address firm risks, and that there are negative consequences for the firm if they do not. If board IT expertise and firm risks are misaligned, intuitively we expect to see the likelihood of cybersecurity increase because boards cannot sufficiently address the risks associated with cybersecurity threat. This serves as another motivator to investigate IT expertise in the boardroom as a moderator on the effects of CEO duality on the likelihood of cybersecurity threats.

According to Giroud & Mueller (2011), market competition is a valuable resource that enables firms to create quality products and compete in an industry with the goal of achieving greater profits. Our study also sheds light on the moderating role of market competition on the effects of CEO duality on information security threats. Previous literature recommended that product market competition should not be neglected in any corporate governance setting (Walsh & Seward, 1990) . According to the authors' knowledge, there is no study available that investigates the moderating role of gender, director's IT expertise and market competition on the association of CEO duality and the likelihood of a cybersecurity threat.

Therefore, this is the first paper to highlight the impact of the aforementioned variables on the CEO duality and admissible firm risk association. Financial market participants' recent surveys on systemic risk identify cybersecurity as the most likely and demanding risk faced by firms (BoE, 2021). Additionally, financial market regulators are becoming increasingly interested in cyber monitoring and macroprudential regulation worldwide (Kashyap & Wetherilt, 2019).

Despite the ongoing interest from industry participants, regulators, and policymakers, as evidenced by the US Justice Department's newly created cyber-digital task force and the Securities and Exchange Commission's (SEC, 2018) empirical research on the role of corporate board structure and cyber security is limited.

Cybersecurity incidents²³ are growing every year, mainly due to the increasing use of the Internet, cloud computing, and mobile devices (Abbasi et al., 2016). Cybersecurity incidents can significantly damage breached firms in terms of fines and reputation (Gordon et al., 2011; Rosati et al., 2019). Data breaches are complicated and diverse, and their full consequences may not always be apparent for example, on September 7, 2017, Equifax, a credit-reporting service, announced that hacker attacks had stolen the individual data of over 140 million people in less than 4 months from May to August (Bernard et al., 2017as seen in Rosati et al., 2020).

Furthermore, cybercriminals could acquire access to social security numbers, dates of birth, driver's licence numbers, and card details by exploiting a weakness on their webpage. The attack had far-reaching ramifications. The stock price of the corporation has dropped by about 18%. Upon the first disclosure of the breach (Volz & Shepardson, 2017), court documents filed in the case settlement suggest that the minimum cost would be USD1.38 billion (Jaeger, 2020, as seen in Rosati et al., 2020). Recent empirical studies on cyber-security posit that breaches generally result in a loss of market value for the impacted organisations (Gordon et al., 2011; Kamiya et al., 2020). Rosati et al. (2017) indicate that cyber-attacks are also reflected in greater bid-ask spreads and irregular trading volume.

²³ A data breach is a “compromise of security that leads to the accidental or unlawful destruction, loss, alteration, unauthorized disclosure of, or access to protected data transmitted, stored or otherwise processed (ISO/IEC 27040). Data breaches can range from an individual hacking into a corporate data site and posting images of celebrities to stealing data for credit and debit cards to having protected documents improperly disposed of in a public trash container discovered by an outsider. Previously, the number of people affected by a data breach has ranged from one to over 100 million (Lending et al., 2018).

Overall, the research emphasises the detrimental consequences of cybersecurity incidents (Gordon et al., 2011).

This study argues that board structure, attributes, heterogeneity and market competition might affect the outcome of the decision on information technology control and information security governance, consequently affecting the effectiveness of information security management in firms; the specific goal is to investigate the association as mentioned earlier. Nonetheless, academics have noted that the efficacy of a firm's information security procedure can be difficult for both insiders and outsiders to assess. Prior literature often uses information security events to capture the consequences of information security management (e.g., Hsu & Wang, 2014; Kwon et al., 2013). This necessitates developing and testing the hypotheses for the empirical analysis using the secondary archival data of S&P 500 firms in the Bloomberg database from 2009 to 2018. This database allows for retrieval of information on board composition, such as the number, age, tenure, IT expertise and gender of independent directors.

Similar to other studies, this study will gather media reports on information security breaches from the Privacy Rights Clearinghouse. The findings demonstrate that the CEO duality is negatively linked with the likelihood of security breaches. In contrast, the proportion and weight of women on board are positively related to the probability of security breaches. We did not find support for the relevance of IT expertise in the boardroom and its effect on the probability of information security breaches. Further we find that as the proportion of females in the boardroom and director's IT expertise, increases, the association between CEO duality and the likelihood of information security breaches becomes more negative where the CEO is the same person as the chairman. Also, this study finds that market competition increases, the association between CEO duality and the likelihood of a cybersecurity breach reduces.

One key element that could impair the veracity of the conclusions is the endogeneity of CG variables (*CEO_DUALITY*).

We address this possible issue using the 2SLS instrumental variable. Following Gontarek & Belghitar (2021), this study uses as an instrument of CEO duality, the age of the CEO.

These instruments are significantly related to *Ceo_duality* yet unlikely to influence the chances of cyber security breaches, thereby meeting instrument validity's relevance and exclusion conditions. Overall, the 2SLS instrumental variable (IV) approach yields findings consistent with the main results that *CEO_DUALITY* decrease the possibility of security breaches.

The results are robust to alternative measures of *CEO_DUALITY*. Merging the extant literature on three areas of academic research, namely: governance structure, and cyber security breaches, this study makes several contributions. First, while the board size and independence has been known for its importance in information security management, the existing studies overlook the potential role of the board leadership configuration, specifically *CEO_DUALITY*. Second, prior evidence supporting the monitoring role of firms show that the quality of a company's governance, particularly ownership and control rights divergence (Lin et al., 2013), presence of institutional ownership (Boubaker et al., 2017), and the quality of external governance mechanisms (Bharath & Hertz, 2019), is linked to firm performance and risk management. This research goes beyond these well-established firm-level factors of business performance and risk management to investigate sector/industry characteristics, specifically the role of market competition.

This analysis also adds to the body of knowledge on IT governance. Prior research indicates that the presence of board-level IT governance decreases the risk of cybersecurity threats and reduces agency costs (e.g., Haislip, Masli, et al., 2016; Haislip, Peters, et al., 2016; Higgs et al., 2016; Smith et al., 2019). This research suggests that, board expertise is less important than board monitoring. As a result, non-expert board members who are effectively concerned in monitoring may be sufficiently skilled to address the chances of cyber security breaches. According to Vincent et al. (2018, pp. 24), "Boards are not required to possess all the necessary expertise in-house", as they have the option to consult subject area experts.

This aligns with the notion that the board of directors' role is not to micromanage the firm but to provide strategic direction and oversight. By seeking external expertise, Boards can gain access to specialised knowledge and perspectives that may not be available internally. As a result, this approach can enhance the board of directors' ability to make informed decisions and provide effective guidance to the firm. Therefore, it is essential for board of directors to have a robust network of IT experts to draw upon when needed.

The rest of the essay is presented as follows: Section 5.2. gives a background of the information technology governance. Section 5.3. highlights the related literature and hypothesis development. Section 5.4. presents the data as well as the measurement approach. Section 5.5. presents the empirical findings as well as Section 5.6 the robustness checks. Finally, Section 5.7. then summarises and concludes.

5.2 Information Technology Governance

According to Debreceeny's (2013, p.129) definition, ITG refers to the methods used by organisations to ensure that their information technology investments align with their strategic and tactical objectives. ITG has become an increasingly crucial aspect of overall corporate governance, and larger companies have been adopting ITG practices in a more structured manner in recent times (Debreceeny 2013).

Recently there have been calls for improved information security governance (SEC, 2018). With the increasing complexity and interconnectedness of technological infrastructure, and the corresponding dependence on digital information, it has become crucial to discuss and address information security matters at the senior management and board levels. In response, the IT Corporate Institute has published a report that includes information security governance guidelines for a firm's board of directors and executive management. The report defines information security governance as a component of enterprise governance that provides strategic direction, ensures goal achievement, manages risks appropriately, responsibly utilises organisational resources, and monitors the success or failure of the enterprise security program (p.17). The report highlights the need for senior executives and the board of directors to understand, guide, and prioritise information security management initiatives in a firm. The impact of the board of directors on the effectiveness of an information security program is significant, as evidenced by several scholarly studies. Chai et al. (2011) demonstrated a positive relationship between market value and security investment decisions, indicating that investors generally react favourably to firms' security investment decisions. Yayla and Hu (2008) investigated the role of a Chief Information Officer (CIO) in corporate governance and a firm's performance, finding that the lack of attention to IT at the board level can negatively affect CIO compensation.

Additionally, the alignment of CIO and other top management compensation packages has a significant positive effect on a firm's long-term performance.

Focusing on security threats and vulnerabilities, Cavusoglu et al. (2004) assess the impact of security breaches on the market value of breached companies. Their results indicate a negative market reaction when there is an internet security breach announcement. How are the findings above relevant to a firm's board structure? Researchers (e.g. Baysigner & Butler, 1985; Ellstrand et al., 2002), have noted the significant influence that corporate boards of directors have on a company's strategy and performance, and practitioners have called for attention to this issue. Information technology governance is crucial in enabling firms to comply with legal requirements by strengthening their internal control systems. Therefore, we argue that board members' decisions have a significant impact on a company's information security governance, including the implementation of IT controls and governance measures. As a result, their choices are critical in determining the effectiveness of information security management which in turn predicts the likelihood of security breaches. Given these points, we recommend that more attention be given to the topic of corporate board characteristics in the field of information security research.

5.3. Hypothesis Development

5.3.1. CEO Duality and Cybersecurity

The relationship between CEO duality and firm performance is well-established in agency and stewardship theories. Proponents of the agency theory have argued about whether a CEO with a dual role acts proficiently in his or her private interests, and whether the CEO may pursue profits that are not in the best interests of the investors (Fama & Jensen, 1983; Jensen & Meckling, 1976). As a result, this gives rise to agency issues between shareholders and executives, emphasising the negative impact of the CEO duality and firm performance connection (Yang et al., 2014). For example, a CEO with dual powers may consider prioritising his or her own interests over those of shareholders. The dual role primarily reduces board powers and limits board independence in order for

the board to fulfil its authority role, while also supporting CEO entrenchment (Iyengar & Zampelli, 2009). When CEOs exercise dual control, they could have too much influence over the appointment of the board and over time put in place weaker boards (Bebchuck & Fried, 2004), which has an adverse effect on the performance of the firm (Fan, Wong, & Zhang, 2007). Further to that, in a weak structure, the CEO may abuse his/her dual power by appointing a closely related person as a director who is motivated to behave in conformity with the CEO's direction (Faleye, 2007). This suggests that CEO duality collides with the board's capacity to serve as a monitor. As a result, the efficiency of organisational operations, such as monitoring activities performed by selected boards, is reduced, resulting in asset overspend (Guillet et al., 2013). As a result, agency theory emphasises the CEO's and the chairman of the board's distinct roles (Mallette & Fowler, 1992). All of these arguments imply that CEO duality undermines the organisation's monitoring architecture and has a negative impact on firm performance (Krause et al., 2014).

Furthermore, empirical research on the relationship between CEO duality and firm performance is mostly contradictory and unconvincing. Some studies have even found no significant link between CEO duality and firm performance (Mutlu et al., 2018). Wade et al. (2006) found a negative impact of the CEO duality and firm performance relationship from an agency theory perspective due to reasons such as CEO private benefits and CEO replacement cost or extra cost relevant to the CEO. Furthermore, a CEO with a dual role does not act in the best interests of shareholders, which leads to agency issues. CEOs with excess power are overconfident in the outcomes of their decisions and make financial decisions without consulting specialised experts. The stewardship theory, in opposition, asserts that "the senior managers want to be responsible stewards of the firm resources" (Donaldson & Davis, 1991). When senior managers hold dual positions in a company, they try to increase the firm's value while also reducing agency costs (Davis et al., 1997). For example, the dual structure reduces agency costs between the CEO and the board, which can improve firm performance (Brickley et al., 1997).

Moreover, regarding the precise command structure among executives, the stewardship theory advocates that CEOs with more power will play an active role in implementing the firm strategy (Finkelstein & D'Aveni, 1994).

According to Larcker & Tayan (2015), a single leadership structure may help to avoid the confusion that is common among many executive positions. Furthermore, from the perspective of corporate leadership, exceptional leadership can improve organisational proficiency and shareholder value due to the CEO's knowledge of the firm's strategic policies and challenges (see e.g., Jensen & Heckling, 1995). CEOs, for example, concentrate on business activities, while the chairman oversees the board's decision-making process. As a result of combining these roles, an experienced CEO can also serve as a sounding board chair and a vital element to the company (Dalton et al., 1998). Many studies (for example, Donaldson & Davis, 1991; Desai et al., 2003) contend that assigning the CEO and chairman roles to a single person enables firms to respond quickly to market situations and, as a result, may lead in more effective implementation of planned decision making. Consequently, arguments based on this theory suggest that the CEO duality and firm performance association has a positive effect. The CEO's dual role promotes managerial efficiency, improves communication, and provides a flexible leadership structure by safeguarding his/her interests through the linking of management structures in an organisation (Desai et al., 2003). Due to a CEO's expertise of the firm's strategic policies and challenges, CEO duality emphasises the benefits of active stewardship (Jensen & Heckling, 1995).

Several studies have examined the positive relationship between CEO duality and firm performance using various viable firm performance indicators including ROA, ROE, sales growth, and Tobin's Q. (see e.g. Guillet et al., 2013, Yang et al., 2014). Some researchers have discovered that CEO duality has no significant impact on firm performance (Elsayed, 2007). As a result of summarising all of these debates, no survey provided conclusive results as to whether CEO duality positively affects firm performance due to persuasive leadership authority or negatively affects company profitability due to the CEO's attributes.

As a result, all of these research findings indicate that the impact of CEO duality on firm performance is still an empirical issue that needs to be investigated further.

With regards to the cybersecurity setting, this study contends that the CEO is aware of the value and possible future cyber-related risks relating to internal operations and business processes. According to Hsu et al. (2015), CEOs and top leadership have better access to information relevant to strengthening user security training and certification support, as well as the incorporation of information security management. As a result, the argument is that the CEO and TMT are integral to building an appropriate information security strategy and have a greater positive influence on employees' behaviours toward cyber security. As per prior research (Ranmachandran & Rao, 2006), CEO and TMT cyber security initiatives, as well as participation in security programmes and rewards for security-related behaviour and attitude, can stimulate the development of a cyber security culture within a company.

Consequently, this study believes that having a CEO who is also the chairman of the board can enhance the strategic importance of management involvement in the organisation's security management programme. There are competing arguments regarding the role of *DUALITY*, however, both theoretical arguments from the receding literature could be true when applied to the context of information security. As a result, this research establishes the following hypothesis:

Hypothesis 6: Firms where CEO is also the chairman of the board is negatively (positively) associated with the probability of cyber security breaches ceteris paribus.

5.3.2. Moderating Effects of Gender Diversity in The Boardroom on The Relationship Between CEO Duality and The Likelihood of Cybersecurity Threat

Gender is an essential aspect of relational diversity that has received more attention than other aspects. Firms with more females have a competitive edge (Bear et al. 2010), women assist organisations in better understanding and resolving environmental problems, and they are more adept at assessing the needs of shareholders (Bravo 2018). Furthermore, they may improve corporate response to stakeholders' growing demand for cyber security risk information. Previous gender diversity studies have found that women are more risk-averse than men (Loukil and Yousfi 2016; Sila et al. 2016), and this conservatism and risk aversion can lead to enhanced risk disclosure (Eaton et al. 2019). Women prefer collaborative relationships over power and information retention (Ahmed et al., 2017). Thus, in RDT, women are likely to benefit organisations for several reasons: they increase firm legitimacy by sending the positive signal that women are represented on the board; they provide critical advice and guidance on critical topics, such as cybersecurity; and they are effective communication links with the organisational setting (Dunn 2012).

In addition, female representation in the boardroom are also known for their higher moral principles (Pan & Sparks, 2012), when considering the questions regarding unethical behaviours (Bilimoria & Wheeler, 2000); women have a teamwork effectiveness and a participative leadership style (Eagly & Johnson, 1990); usually, they discuss issues in more detail than men (Ingley & Van Der Walt, 2005).

All the mentioned factors lead to an enhanced women's performance in these situations. As seen in Jinag et al., (2021), researchers (see e.g. Campbell & Minguez-Vera (2008) showed a positive relationship between a higher percentage of female directors on the board and market performance. Similarly, (Bear et al. (2010), Borlea et al. (2017)) proved that female directors promote CSR and a better firm performance, particularly when women are three or more. Liu et al. (2014) reported that the presence of three or more women on the board may lead to a stronger impact on the board when compared

to boards with one woman. Rosener (1995) explained the positive effect of the presence of females on the board of directors by their flexibility, which leads to the better capability of managing uncertain situations.

Other scholars have developed standpoints regarding communication quality in the board decision-making process. (Delis et al., 2016; Westphal & Milton, 2000) Delis et al., 2016 and Westphal & Milton, 2000 assert that more diverse boards with varied backgrounds, ideas, and perceptions, have a mixed workplace culture that includes several subgroups based on gender, race, or nationality. As a result, having women on the board may exacerbate communication issues, degrading the board's policymaking process and increasing organisational risk. According to Westphal & Milton (2000), diversity undermines boardroom cohesion. Thus, majority viewpoints will dominate board decisions, and individual directors will not influence the boards. Since both theoretical constructs from the literature could be valid when considered in the context of cyber security and to further validate our results, we test whether the presence of female directors are more sensitive to performance as cybersecurity threats increase, we developed the following hypothesis:

Hypothesis 7: the presence of women in the boardroom may moderate the effect of CEO DUALITY on the likelihood of cybersecurity breaches ceteris paribus.

5.3.3. Moderating Effects of IT Expertise in The Boardroom on The Relationship Between CEO Duality and The Likelihood of Cybersecurity Threat

The board of directors plays a crucial role in a company's corporate governance system. They are responsible for overseeing the management team's performance and providing valuable guidance and counsel. In this regard, they serve a dual purpose of monitoring and advising top management Adams, Hermalin & Weisbach, (2010), ensuring that the company operates in a responsible, ethical, and sustainable manner.

The board's background and experience are critical factors that influence firm-level risk management practices. In particular, the board's expertise in IT governance can significantly impact a company's overall risk management strategy.

As firms face various risks that evolve over time, the board's expertise should also adapt to meet these changing needs. The risks that companies face are often unique to their operations, and the board must possess the necessary skills and knowledge to mitigate these risks effectively. By developing a diverse and experienced board, companies can ensure that their IT governance practices align with their strategic objectives, reduce risks, and increase operational efficiency. Boards must have specialist knowledge on hand in order to effectively monitor. For instance, boards may be concerned about securities fraud and have many directors with financial expertise, but they may also be concerned about cybersecurity threats. Therefore, focusing primarily on financial expertise rather than IT expertise on the board, cyber security risks may go unchallenged. As per this perspective, the board's size and scope of expertise should match the firm's unique set of threats. If a firm discloses cyber security or finance-related risk and lacks relevant expertise, the board will be unable to effectively monitor that domain, negatively impacting firm performance (Fama, 1980; Fama & Jensen, 1983). For example, if the firm identifies information security as a significant risk area and IT expertise is lacking or underrepresented on the board, it will be unable to monitor this risk if it materialises.

Consequently, the board's ability to monitor competently will be adversely affected. Since the theoretical constructs from the literature could be valid and to further validate our results, we test whether the presence of IT expertise are sensitive to CEO performance as cybersecurity threats increase by developing the following hypothesis

Hypothesis 8: Boards with IT expertise may moderate the effect of CEO DUALITY on the likelihood of cybersecurity breaches ceteris paribus.

5.3.4. Moderating Effects of Market Competition on The Relationship Between CEO Duality and The Likelihood of Cybersecurity Threat

The separation of ownership and control will induce managers to divert firms' resources for managements' own benefit (Jensen & Meckling, 1976).

Greater competition may induce firm management to engage in tax avoidance to facilitate the funding of financing and investment activities so that the firm can perform or, in fact, survive, in such a competitive market. According to Valta (2012), when product market competition is strong, the cost of borrowing for publicly traded manufacturing firms is raised. Consequently, competition may force managers to accumulate cash flows to create enough internal liquidity for firms' operations. As a result, firm investment may decline with an increase in competition. Competition in the product market can also be viewed as a governance mechanism that compels managers to restrain from engaging in conflict with shareholders. Extreme competition has the potential to decrease managerial inefficiency and make managers increase firm efficiency (Alchian, 1950; Stigler, 1958). Nickell (1996) finds that when competition is measured using the numbers of competing firms, or the levels of rent that monopolists take, the competitive process becomes linked to a considerably higher rate of growth in total factor productivity. In addition, extreme competition can aid in monitoring and appraising managers (Hart, 1983; Holmstrom, 1982; Nalebuff & Stiglitz, 1983) as managers are persuaded to increase the profits of the firm (Fee & Hadlock, 2004; Giroud & Mueller, 2010).

Corporate competitive strategies determine those corporate strategies that are used to gain a competitive advantage (Hitt et al., 1996), expand market share Franko (1989), and increase firm performance (Giroud & Mueller, 2010) . Because market competition is vital to achieving firm goals, scholars have increasingly studied the link between competitive strategies and governance (see e.g Giroud & Mueller, 2010 ; Ko et al., 2016; Tian & Twite, 2011); for instance, governance structure influences market competition by aligning increments (bonus) for executives (Mutlu et al., 2018).

There is also reason to believe that the executive's teams should affect market competition. For instance, when an executive makes the firm's strategic decisions, he/she is influenced by his/her creative ideas to stay in business for a long time (see Bloom et al., 2010;). Schmidt (1997) support for the notion that CEO duality should be related to market competition.

This idea provides support for the stewardship theory (Brickley et al., 1997), which suggests that decision-making processes can impact market competition in industries. Experimental studies on decision-making have shown that a CEO with a dual role as the chairman of the board of directors makes better and faster decisions as compared to CEOs in a single role in a competitive market (Finkelstein & D'Aveni, 1994). When firms have a good governance structure, they are better able to compete in a market (Desai et al., 2003). Having a dual structure enables executives to overcome decision biases and to improve the decision-making process, including decisions related to a market (Fama & Jensen, 1983).

Further, Guadalupe & Pérez-González (2006) posit that extreme competition in the product market limits the degree of private control gains that corporate insiders extract. In sum, these arguments put forward that extreme competition in the product market will constrain managers from acting in ways that conflict with the interests of shareholders (Hart, 1983). Based on the aforementioned evidence, product market competition may have mediating effects on how CEO duality affects the likelihood of a cybersecurity threat. On the above analysis and in the context of information security, the study establishes the following hypothesis.

Hypothesis 9: Product market competition may moderate the effect of CEO DUALITY on the probability of cyber security breaches ceteris paribus.

5.4. Sample and Data

Using the Privacy Rights Clearinghouse data, the study pinpoints 3,770 firm-year observations in the total sample, including 162 cyber security breaches. Table 22 Panel A outlines the sampling techniques. Since cyber security breaches do not necessarily occur homogeneously over time, Table 22 Panel B shows a yearly distribution of the sample.

Similar to the cyber security breach measures examined in Lankton et al., (2021), the research investigates cyber security breaches using the following: "DISC" implies accidental disclosure, "PHYS" implies a physical loss of an IT asset, "INSD" implies that the data breach involves the company's insiders, "CARD" indicates that the observed breach included financial details, for example – credit and debit card fraud, "HACK" represents a breach involving hacker attacks or ransomware, "PORT" indicates the removal of a handheld device (theft), and "STAT" indicates a breach involving theft of a fixed item (e.g., a server). Moreover, "Other" indicates that the nature of the breach is unknown. Following the collection of these data, it is imperative to ensure that each firm's financial data is available on Refinitiv databases.

The sample selection procedure is reported in Table 22. To begin with, Cybersecurity incidents from 2009 to 2018 can be mapped to Bloomberg, and Refinitiv. There is an exclusion of observations from the software and computer industries (SIC 3570–3579 and 7370–7379) in eliminating any impact of IT expertise among employees, which is abundant in this sector. The research only includes one incident in the sample for firms that experienced multiple data breaches in the same year (e.g. T-Mobile US).²⁴ Finally, the study nullifies observations with missing data on any explanatory variables. In total, there are 3,608 on-breached observations and 168 Breached observations in the sampling size.

²⁴ Hsu & Wang (2014) document that similar results are obtained when all multiple breaches for a single firm in a specific year are deleted.

5.4.1. *Independent Variables*

There is a separation of the four variables of interest, CEO_DUALITY, to test the hypotheses (H6 – H9) Following Gul et al. (2011), it is important to define CEO_DUALITY with dummy values; 1 if the CEO is also the same person as the chairman of the board of directors; otherwise, 0.

5.4.2. *Moderator Variables*

In this paper, we used gender, IT expertise and market competition as moderators to investigate their mediating role in the association between CEO duality and the likelihood of cyber security threat. We measured *GENDER* variables in two distinct ways: (i) the total number of female directors, and (ii) the proportion of female directors among all directors. These variables are supplemented with indicator variables indicating the presence of at least one female director on the board. Furthermore, we employ an indicator variable for boards with two or more female directors. The preference for three female directors is based on Radu and Smaili's (2020) findings that three or more women are the benchmark for effective governance.

Table 22. Sample selection process

Panel A: Sample selection		Number of observations		
Sample of cyber security incidents from 2009 to 2018		6,880		
(-) Non-S&P 500 company breaches		6,591		
Total number of S&P 500 breaches from 2009 to 2018		290		
(-) Sample with zero financial data from Refinitiv and Bloomberg		102		
Sample of firm breaches from 2009 to 2018 with the relevant data		188		
(-) Sample of S&P 500 companies within the IT Industry		26		
Total observations with necessary data that are outside the IT Industry		3,770		
<hr/>				
Panel B: Sample year distribution				
Year	All observations		Total breaches	
	Frequency	Percent %	Frequency	Percent %
2009	377	10.00	11	7
2010	377	10.00	12	7
2011	377	10.00	21	13
2012	377	10.00	13	8
2013	377	10.00	21	13
2014	377	10.00	27	17
2015	377	10.00	11	7
2016	377	10.00	17	10
2017	377	10.00	18	11
2018	377	10.00	11	7
Total	3,770	100.00	162	100

Further, to measure IT expertise (*Dir_EXPERTISE*), there is first the use of the SEC database to identify the boards of directors in the sample firms. SEC (DEF 14A) contains information on the board of directors; we review the biographies of the directors online from SEC documents (DEF 14A). *Dir_EXPERTISE* comprises dummy values; coded as 1 if at least one member of the board biography has keywords suggesting they had a specific type of IT expertise and 0 otherwise.

We follow Haislip and Richardson (2018)'s taxonomy to determine if any board member have IT expertise that is, directors biographies contain an academic degree in computer science, electrical engineering, or information systems, any previous IT-related position of employment (e.g. chief information officers or equivalent IT executives, such as Chief Technology Officer (CTO), vice president of information technology, or IT consultant, or worked in an IT firm/industry as an employee. IT industry is defined using 12 SIC code Fama and French 3570–3579 and 7370–7379) Following Peress (2010) and (Lerner, 1934), the study defines PMC using Lerner Index (LI) this index originated in economics (Lerner, 1934) and measures a company's ability to price its goods above their marginal cost. As a result, LI, also known as the price-cost margin, implies pricing power.

Under perfect competition, firms must set their selling prices very close to their marginal cost, resulting in a profit of zero. When a firm has low (high) pricing power, it faces fierce (weak) competition from other companies in the same sector. A lower LI value indicates that the firm faces more competition, and vice versa. The index is calculated using the formula below.

$$Lerner\ Index = \frac{Profit}{Sales} \dots\dots\dots (7)$$

Here, *Profit* = (Sales – COGS (cost of goods sold) – SGAs (selling, general & administrative)).

5.4.3. *Control Variables*

The control variables employed in equation (8) are predominantly derived from prior empirical evidence on the subject. By intuition, firms with better CG are also preemptively more active in attempting to understand, report, and manage their risks, including the risk of litigation and cyber-attacks. Based on that, the research follows existing studies (Hsu and Wang, 2014; Lankton et al., 2021), and controlled for *B_SIZE*

using the total number of board of directors' members sitting on the board. *IND_DIR* is measured by the percentage of outside director's relative to the number of total directors on the board. In addition, Wintoki et al. (2012), posits that a firm's board structure is influenced by factors such as the extent and intricacy of its operations, monitoring costs, and a manager's personal gains. To reduce the risk of misspecification in our analysis, we incorporated various control variables that are frequently employed in the literature (see e.g. Black et al., 2012; Higgs et al. 2016).

Firm size is one such variable we control for, as it may impact governance practices, performance and the risk of cyber security threat. Larger firms have access to more resources and economies of scale, making them more likely to perform better and implement good governance systems. Leverage is another variable we control for, in line with previous studies (see eg. Black et al., 2012; Fairchild et al., 2014). Firms with lower debt ratios tend to perform better, while highly geared firms may face closer monitoring by debt providers, which could pressure them to adopt specific governance practices. Performance is linked to factors like profitability and growth prospects (Black et al., 2012; Yermack, 1996), which affects market valuation and Zscore. We controlled for the aforementioned variables because more prominent and more successful firms are more attractive targets for potential cybersecurity (Higgs et al. 2016). To further refine our analysis, we also include year and industry dummies. We also controlled for sensitive (i.e., energy, semiconductor and financial firms), non-sensitive firms (i.e., others excluding IT) and firms that spend more on research and development.

These variables identify the firm's potential of utilising IT within their operations, which might make them more susceptible to a cyber-attack. In terms of measurement of control variables, Firm size: (*F_SIZE*) is measured by natural logarithm of total assets (Haislip, Lim & Pinsker, 2021). Performance: (*ROA*) is measured by return on assets. Leverage: (*Leverage*) is measured by percentage of total liabilities divided by book value of equity (Ntim et al., 2019) and ZScore (*Zscore*) is measured Firm's distress risk proxied by Altman's (1968) z-score.

5.5. Empirical Analysis

To test these *hypotheses* about the association between the four explanatory variables of interest and the occurrence of a reportable cybersecurity threat, we specify the following OLS regression models:

$$\begin{aligned}
 \text{OLS(IF_BREACH} = 1) = & \\
 & \alpha + \beta_1 \text{CEODUALITY} + \beta_2 \text{DIREXP} + \beta_3 \text{LINDEX}_{it} + \beta_4 \text{PCNTWOMAN} \\
 & + \phi_5 \text{BSIZE} + \phi_6 \text{INDDIR} + \phi_7 \text{AVEAGE} + \phi_8 \text{ZSCORE} + \phi_9 \text{ROA} \\
 & + \phi_{10} \text{LEVERAGE} + \phi_{11} \text{FSIZE} + \phi_{12} \text{R\&DEXP} + \sum_{i=1}^{11} \varphi + \varepsilon
 \end{aligned}
 \tag{8}$$

Where: CEO_DUALITY is an indicator variable equal to 1 if CEO is also the same person as the chairman of the board, and 0 otherwise. Dir EXPERTISE is also an indicator variable coded as 1 if at least one member of the board biographies contains keywords suggesting they had a specific type of expertise, in this case IT and 0 otherwise.

Lerner Index (LI): 0 measures the listed company's competitive advantage. The study adopts the Peress (2010) method to estimate Lerner index as net operating income, divided by sales, i.e., $PCM = (\text{net operating income}) / \text{Sales}$. A higher value of PCM indicates more product pricing power and a higher competitive advantage of a company. PCNTWOMAN is the percentage of female directors out of all directors. B_SIZE is the natural log of the total number of board members in any given board. IND_DIR is the proportion of outside directors to insiders. BOARD_AVE_AGE is the average age of members of the board. ZSCORE is firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{earnings before interest and taxes} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$. ROA is firm profitability defined as the ratio of operating income before depreciation to total assets. LEVERAGE measured as the ratio of total liabilities to total assets. F_SIZE is firm size, measures as the natural log of total assets.

$R\&D_{EXP}$ is the natural logarithm of research and development expenses. φ are the industry-year effects, and ε is the idiosyncratic error term. The empirical results, including the summary statistics, and regression analysis are presented in the following sections.

5.5.1. *Multivariate Results*

5.5.1.1. *Descriptive Statistics*

The descriptive statistics and the correlation of the variables are presented in Table 23 and Table 24. As presented in Table 23, there are significantly fewer observations for the research and development expenditure measure due to missing values in the database. In Table 24, note that the number of independent directors (IND_DIR) is positive and significantly correlated with the board size ($BOARD_SIZE$) (0.636, $p < 0.01$). The proportion of independent directors (IND_DIR) is positively and significantly correlated with average board age ($BOARD_AVE_AGE$) (0.660, $p < 0.01$). The number of women on board is greater than or equal to two ($(\geq) TWOFEMALES$) is positively and significantly correlated with the proportion of women ($PCNT_WOMAN$) (0.610, $p < 0.01$), and the profitability measure ($ZSCORE$) is positively and significantly correlated with (ROA) (0.693, $p < 0.01$). Further, the size of the firm (F_SIZE) is positive and significantly correlated with research and development expenditure ($R\&D_EXP$) (0.633, $p < 0.01$). This study acknowledges that such a correlation could be problematic if these variables are used in the same model. The study further checked the Variance Inflation Factor (VIF) values for the variables included in the regression models to investigate this issue further. The VIF values in the models have an average of 2.06. Generally speaking, the correlation coefficients between both the main explanatory and outcome variables are low, indicating that there is no severe multicollinearity.

Table 23. Summary statistics 3

This table presents summary statistics for the variables used in the regressions. The sample comprises approximately 3770 unique firms' observations for the period spanning 2009 - 2018. The list of variables, definitions are provided in the Appendix C. † winsorized variables

	N	min	max	Mean	St.Dev	Median
IF_BREACH	3770	0	1	.043	.203	0
Board_size†	3607	5	17	11.052	2.177	11
CEO duality	3770	0	1	0.541	0.498	1
Ind dir	3770	0	1	0.792	0.208	0.87
Nb woman	3770	0	7	1.995	1.22	2
(=) One female	3770	0	1	0.221	0.415	0
(>=) Two females	3770	0	1	0.711	0.453	1
Pcnt woman	3770	0	0.63	0.177	0.102	0.18
Board_ave_age	36320	37	77.8	62.5	3.6	62.6
Dir expertise	3770	0	1	0.525	0.499	1
Z score †	3706	-0.77	5.804	1.738	1.267	1.555
L index †	3715	-1.078	0.801	0.136	0.145	0.117
ROA †	3770	-23.021	31.111	6.068	6.289	4.953
Leverage †	3699	-42.472	55.909	1.074	4.175	0.693
FSIZE (ln) ta †	3706	4.606	14.771	9.878	1.471	9.805
R&D_Exp †	1394	.095	10.269	5.624	1.621	5.504

Note Table 23 presents the main results of the effect of CEO duality on the probability of cyber security threat the dependent variable is (*IF_BREACH*). *IF_Breach* is defined as Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise. The main explanatory variable is (*CEO_DUALITY*) defined as A dummy variable with a value of one (or zero) if the CEO also is Chairman The control variables employed in this study are (*Board_size*) defined as Number of persons on the board of directors, (*IND_DIR*) Board independence measured by the percentage of independent directors on the board, (*Board ave age*) defined as the The average age of the board members, (*Nb woman*) Number of board members who are women, ((=) one female) defined as dummy value that takes the value 1 if there is one woman on the board and 0 otherwise, ((>=) *TWO_FEMALES*) define as dummy variable that takes the value 1 if there are greater than two or equal to two females on the board and 0 otherwise, (*Pcnt woman*) defined as the Proportion of women board members, (*L_INDEX*) Lerner index is net operating income, divided by sales, i.e., $PCM = (\text{Sales} - \text{COGS} - \text{Selling Expenses} - \text{Administrative expenses}) / \text{Sales}$. A higher value of PCM indicates more product pricing power and a higher competitive advantage of a company, (*DIR_EXPERTISE*) Comprises dummy values; coded as 1 if at least one member of the board bio has keywords suggesting they had a specific type of expertise and 0 otherwise, (*Z_SCORE*) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$, (*ROA*) defined as the Firm profitability measured by return on assets, (*LEVERAGE*) defined as

by total liabilities divided by book value of equity, (F_SIZE) defined as natural logarithm of total assets, and ($R\&D_EXP$) defined as the natural log of the research and development expenditure

5.5.1.2 Correlation

Table 24. Correlation table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) IF_BREACH	1.000														
(2) Board_size	0.032*	1.000													
(3) CEO_duality	-	0.262***	1.000												
	0.055***														
(4) Ind_dir	0.004	0.636***	0.267***	1.000											
(5) (=) one_female	-0.037**	-	0.033**	0.040**	1.000										
		0.089***													
(6) (>=) two_females	0.049***	0.175***	-0.009	0.016	-	1.000									
					0.836***										
(7) Pcnt_woman	0.035**	0.372***	0.154***	0.466***	-	0.610***	1.000								
					0.384***										
(8) Board_ave_age	0.002	0.527***	0.480***	0.660***	0.101***	-	0.287***	1.000							
						0.101***									
(9) Dir_expertise	-0.011	0.095***	0.155***	0.149***	-	0.175***	0.291***	0.204***	1.000						
					0.101***										
(10) Z_score	0.041**	-	-0.034**	0.002	0.083***	-	-0.026	0.001	0.000	1.000					
		0.070***				0.085***									
(11) L_index	-0.033**	0.053***	0.037**	0.028*	-0.038**	0.035**	0.038**	0.071***	0.033**	-	1.000				
										0.165***					
(12) ROA	-0.007	-0.013	0.029*	0.033**	0.064***	-	0.010	0.096***	0.054***	0.693***	0.284***	1.000			
						0.080***									
(13) Leverage	0.012	0.040**	0.046***	0.036**	-0.004	0.014	0.030*	0.032**	0.030*	-	-0.011	-	1.000		
										0.056***		0.055***			
(14) F_SIZE (log)	0.162***	0.423***	0.172***	0.193***	-	0.327***	0.272***	0.166***	0.109***	-	0.152***	-	0.066***	1.000	
					0.207***					0.398***		0.338***			
(15) R&D_Exp(log)	0.152***	0.284***	-	0.109***	-	0.208***	0.228***	0.104***	0.108***	-0.061**	0.058**	-0.022	0.037	0.633***	1.000
			0.070***		0.138***										

Notes: This table presents correlation coefficients between the probability of information security breach, and Ceo_duality. The sample comprises 3770 unique firms' observations for the period spanning 2009 - 2018. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively

5.5.2. Main Empirical results

Table 25 reports the results of Hypothesis 6. To facilitate comparative analyses, we report this study's analysis by running an ordinary least squares (OLS) regression unreported of cyber security threats against *CEO_DUALITY*, and other control variables by adjusting standard errors heteroskedasticity and clustering at the firm level excluding IT, software and computer industries. The coefficient on the main variables of interest *CEO_DUALITY* identify whether cyber-related threats are influenced by a firm's leadership configuration. We address this issue in the column (2) by estimating a Probit regression.

The results displayed in Table 25 column (2) support a negative relation between *CEO_DUALITY* and the chances of information security breaches. Specifically, the coefficients on *CEO_DUALITY* (coefficient = -0.018 , $p < 0.05$) is negative and statistically significant at the 5% levels suggesting that where CEO is also chairman and there is less likelihood of information security breaches. As an additional test, we posit that firms in IT-intensive industries may have greater technical capability to quickly discover and remedy attacks. Therefore, we perform the analysis of our IT firms in column (6) and found evidence of the benefit of board members with IT expertise (coefficient = -0.024 , $p < 0.05$) Also, we still found support of Hypothesis 6, suggesting that firms with CEO who is also chair of the board are less likely to be associated with cyber related threats regardless of IT expertise available in the board or in the firms.

Next, we check if our results are influenced by our chosen control variables – the findings here suggests that the presence of women in the boardroom is positively (coefficients = 0.097 , 0.0895 , 0.0879 , $p < 0.01$, $p < 0.01$, $p < 0.01$ respectively) associated with the possibility of security breaches, as *PCNT_WOMAN* is consistently positive and significant in Table 25 columns (2), (3) & (4) suggesting that the proportion of females on board further exacerbate the chances of a cybersecurity threat.

Further *L_INDEX* is consistently negative and significant (coefficients = -0.008, -0.0156, -0.0156, $p < 0.05$, $p < 0.01$, $p < 0.01$ respectively), indicating that intensification of competition decreases the likelihood of a cyber security threat.

The study also tests the robustness of the primary evidence to alternative methods of estimating standard errors. More specifically, there is the use of the Prais-Winsten regression in column (3) and Newey–West robust standard errors to correct for heteroscedasticity and first-order autocorrelation in column (4). The study finds that the results remain unchanged. Based on this evidence, this study infers that CEO also serving as the chairman of the board, and market competition serves as the key to securing IT systems and is accountable for mitigating cyber security incidents.

Table 25. The effect of CEO_DUALITY on the probability of cybersecurity threat

This table provides the main results of the study - regressions of Ceo_duality, internal and external governance mechanisms including product market competition and other firm financial characteristics on the chances of information security breaches using, Probit, Prais-Winsten and Newey-West regression estimation techniques. Robust standard errors adjusted for heteroskedasticity and clustered by firm. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	Dependent variable = IF_BREACH					
	(1)	Observations non-IT industry firms			IT industry firms	
	Probit Coeff	MFX	Prais- Winsten	Newey-West	Probit Coeff	MFX
CEO_duality	-0.291** (0.138)	-0.018** (0.009)	-0.0222** (0.00893)	-0.0212** (0.00872)	-0.658** (0.297)	-0.057** (0.026)
Board size	-0.0435 (0.0303)	-0.003 (0.002)	-0.00231 (0.00212)	-0.00222 (0.00244)	-0.0124 (0.0556)	-0.001 (0.005)
Ind dir	-0.639 (0.447)	-0.040 (0.028)	-0.0376 (0.0323)	-0.0380 (0.0396)	0.716 (0.914)	0.062 (0.079)
Board ave age	-0.00252 (0.00633)	-0.000 (0.000)	0.000155 (0.000524)	0.000175 (0.000613)	-0.0139 (0.0123)	-0.001 (0.001)
Pcnt woman	1.552** (0.745)	0.097** (0.047)	0.0895* (0.0494)	0.0879* (0.0484)	0.581 (1.486)	0.050 (0.130)
L_index	-0.135** (0.0601)	-0.008** (0.004)	-0.0156** (0.00724)	-0.0156* (0.00916)	-4.006** (1.882)	-0.348** (0.166)
Dir expertise	0.0685 (0.305)	0.004 (0.019)	-0.000221 (0.0241)	-0.00183 (0.0270)	-0.274*** (0.536)	-0.024*** (0.047)
Z score	-0.0373 (0.0604)	-0.002 (0.004)	-0.00102 (0.00320)	-0.00104 (0.00506)	-0.0638 (0.0893)	-0.006 (0.008)
ROA	0.0150 (0.0110)	0.001 (0.001)	0.00146** (0.000639)	0.00152* (0.000880)	0.0710*** (0.0262)	0.006*** (0.002)
Leverage	-0.00199 (0.00185)	-0.000 (0.000)	-0.0000565 (0.000166)	-0.0000576 (0.000108)	-0.0437** (0.0195)	-0.004** (0.002)
F size	0.0957	0.006	0.0159***	0.0159**	-0.134	-0.012

	(0.0704)	(0.004)	(0.00510)	(0.00639)	(0.180)	(0.016)
R&D exp	0.221***	0.014***	0.00381	0.00403	0.601***	0.052***
	(0.0596)	(0.004)	(0.00458)	(0.00444)	(0.204)	(0.020)
Constant	-3.876***		-0.150**	-0.161**	-5.179***	
	(0.662)		(0.0748)	(0.0676)	(1.104)	
R-squared			0.110			
Pseudo R2	0.167				0.251	
X ²	90.01					
Industry effects	YES	YES	YES	YES	NO	NO
Year effects	YES	YES	YES	YES	YES	YES
Observations	1,860	1,860	1,860	1,860	260	260

Note Table 25 presents the main results of the effect of CEO duality on the probability of cyber security threat the dependent variable is (*IF_BREACH*). *IF_Breach* is defined as Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise. The main explanatory variable is (*CEO_DUALITY*) defined as A dummy variable with a value of one (or zero) if the CEO also is Chairman The control variables employed in this study are (*Board_size*) defined as Number of persons on the board of directors, (*IND_DIR*) Board independence measured by the percentage of independent directors on the board, (*Board ave age*) defined as the average age of the board members (*Pcnt woman*) defined as the Proportion of women board members, (*L_INDEX*) Lerner index is net operating income, divided by sales, i.e., PCM (Sales–COGS–Selling Expenses–Administrative expenses)/Sales. A higher value of PCM indicates more product pricing power and a higher competitive advantage of a company, (*DIR_EXPERTISE*) Comprises dummy values; coded as 1 if at least one member of the board bio has keywords suggesting they had a specific type of expertise and 0 otherwise, (*Z_SCORE*) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: (1.2 * working capital + 1.4 * retained earnings + 3.3 * EBIT + 0.999 * sales) / total assets + 0.6 * (market value of equity / book value of debt), (*ROA*) defined as the Firm profitability measured by return on assets, (*LEVERAGE*) defined as by total liabilities divided by book value of equity, (*F_SIZE*) defined as natural logarithm of total assets, and (*R&D_EXP*) defined as the natural log of the research and development expenditure

Table 26. Moderating effect of presence of female directors, IT expertise, PMC and CEO_DUALITY on the probability of cyber security threat

To test these hypotheses (Hypotheses 7 – 9) about the association between the interactions of the three explanatory variables of interest and CEO DUALITY on the occurrence of a reportable cyber security threat, we specify the following probit regression model:

$$\begin{aligned}
 \text{Probit (IF_BREACH = 1) =} \\
 & \alpha + \beta_1 \text{CEODUALITY} + \beta_2 \text{DIREXP} + \beta_3 \text{LINDEX}_{it} + \beta_4 \text{PCNTWOMAN} + \beta_5 \text{CEODUALITY} \times \text{DIREXP} \\
 & + \beta_6 \text{CEODUALITY} \times \text{L_INDEX} + \beta_7 \text{CEODUALITY} \times \text{PCNTWOMAN} + \phi_5 \text{BSIZE} + \phi_6 \text{INDDIR} + \phi_7 \text{AVEAGE} + \phi_8 \text{ZSCORE} \\
 & + \phi_9 \text{ROA} + \phi_{10} \text{LEVERAGE} + \phi_{11} \text{FSIZE} + \phi_{12} \text{R\&DEXP} + \sum \varphi + \varepsilon
 \end{aligned}
 \tag{8}$$

VARIABLES	Dependent variable = IF_BREACH		
	Probit Coeff (1)	Probit Coeff (2)	Probit Coeff (3)
CEO duality =0	0.346 (0.250)		
CEO duality =1		0.964** (0.475)	0.0654 (0.111)
L_index	-3.617*** (0.749)		
Pcnt woman		1.084*** (0.413)	
Dir expertise			-0.246 (0.209)

CEO duality x L_index	-1.912*		
	(1.067)		
CEO duality x Pcnt woman		-1.390***	
		(0.491)	
CEO duality x Dir_exp			-0.287*
			(0.155)
Constant	-6.437***	-6.914***	-2.618***
	(1.040)	(0.898)	(0.422)
Pseudo R2	.35	.36	.074
Observations	1,331	1,331	1,331
Controls	Yes	Yes	Yes
Industry and year effects	Yes	Yes	Yes
Chi-square (WALD)	105.57	114.51	90.95

Note Table 26 presents *results of the moderating effect of female directors, director's expertise, PMC and Ceo_duality* on the probability of cyber security threat *using, Probit regression estimation techniques.* the dependent variable is (*IF_BREACH*). *IF_Breach* is defined as Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise. The main explanatory variable is the interaction between *CEO_DUALITY* and presence of women, (*CEO_DUALITY x Pcnt_woman*) *CEO_DUALITY* and IT expertise (*CEO_DUALITY x Dir expertise*) and *CEO_DUALITY* and Lerner's index (*CEO_DUALITY x L_INDEX*) (*CEO_DUALITY*) defined as A dummy variable with a value of one (or zero) if the CEO also is Chairman, (*Pcnt woman*) defined as the Proportion of women board members, (*DIR_EXPERTISE*) Comprises dummy values; coded as 1 if at least one member of the board bio has keywords suggesting they had a specific type of expertise and 0 otherwise, (*L_INDEX*) Lerner index is net operating income, divided by sales, i.e., $PCM = (\text{Sales} - \text{COGS} - \text{Selling Expenses} - \text{Administrative expenses}) / \text{Sales}$. A higher value of PCM indicates more product pricing power and a higher competitive advantage of a company. The control variables employed in this study are (*Board_size*) defined as Number of persons on the board of directors, (*IND_DIR*) Board independence measured by the percentage of independent directors on the board, (*Board ave age*) defined as the average age of the board members, (*Z_SCORE*) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$, (*ROA*) defined as the Firm profitability measured by return on assets, (*LEVERAGE*) defined as by total liabilities divided by book value of equity, (*F_SIZE*) defined as natural logarithm of total assets, and (*R&D_EXP*) defined as the natural log of the research and development expenditure. *Robust standard errors adjusted for heteroskedasticity and clustered by firm in parenthesis.* *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Table 26 shows evidence that it is also possible that the presence of females, director's, IT expertise in the boardroom and market competition may moderate the effect of leadership configuration *CEO_DUALITY* on the likelihood of information security breaches. The results in Table 26 column (1) suggest that *L_INDEX* negatively affect the association between *CEO_DUALITY* and the possibility of information security breach the coefficients of *CEO_DUALITY X L_INDEX* are significantly negative (coefficients = -1.912 , P <0.1), Similarly, the presence of women in the boardroom (*PCNT WOMAN*) also negatively affects the relationship between *CEO_DUALITY* and the likelihood of cybersecurity threat. The coefficients of *CEO_DUALITY X PCNT WOMAN* loaded as significantly negative (coefficients = -1.390, P <0.01) . In addition, director's IT expertise interestingly negatively affect the association between *CEO_DUALITY* and possibility of information security breach. The coefficients of *CEO_DUALITY X Dir EXPERTISE* are significantly negative (coefficients = -0.287, P <0.1)

In summary, interestingly as the proportion of females in the boardroom and director's IT expertise increase the association between CEO duality and the likelihood of information security breaches becomes more negative where the CEO is the same person as the chairman Also, as market competition increases, the association between CEO duality and the likelihood of a cybersecurity breach reduces, interestingly, where the CEO is not the same person as the chairman. We did not find a statistically significant relationship of the finding where the CEO is also chairman. The moderation effect of market competition (*L_INDEX*) means that CEOs work positively in the presence of competition, , undoubtedly consistent with the work of (Dalton et al., 1998; Donaldson & Davis, 1991; Desai et al., 2003 and Sheikh, 2018), as good governance structure is compatible with market competition.

5.6. Robustness Test

5.6.1. *2SLS Regression Estimates*

It is widely assumed that endogeneity can negatively impact corporate governance studies, resulting in bias and inaccuracy (Hermalin and Weisbach, 2003; Berger et al., 2016). Endogeneity can be caused by reverse causality, that is, there is a possibility that excessive cybersecurity threat levels determine the choice of governance leadership structure (in this case, CEO_duality). As a result, one rational answer is that higher levels of information security threat may drive boards to integrate control in the hands of one person in order to reap the benefits of coordination and improved communication (Tang 2016). Reverse causality is addressed by reporting results from a single-equation instrumental variable estimation framework and results from a simultaneous equation framework. Instrumental Variable estimators are frequently used to address endogeneity issues, such as reverse causality (Gontarek & Belghitar, 2020).

According to Adams and Mehran (2012), the instrument used in this analysis should be correlated with duality but uncorrelated with cyber security threats except through variables already in the regression. Furthermore, identifying valid instruments in corporate governance research is never easy (Antonakis et al., 2010). Indeed, the literature allows for the identification of a Duality instrument. Following Yang & Zhou (2014), who also investigated Duality, the natural logarithm of CEO Age was chosen as the instrument in this study. Empirical findings (Boone et al., 2007; Coles et al., 2008 and Linck et al., 2008) the theoretical studies (Adams & Ferreira, 2007; Hermalin & Weisbach, 1998) have shown that board structure and firm performance are endogenously determined. Linck et al. (2008) reported that the CEO Duality role is significantly and robustly related to CEO Age. However, it is not apparent that CEO Age is related to the dependent variables used in this study. Therefore, meeting the necessary conditions for instrument validity, CEO Age, on the other hand, has also been employed as an instrument by Gontarek & Belghitar (2020), Cornett et al. (2009), Brick et al. (2006) and others in corporate governance research. Table 27 adopts the instrumental variable

reporting set-up used by researchers (see, e.g. Gontarek & Belghitar, 2020; Berger et al., 2016). In column (1) of Table 27, the first stage results of the 2SLS estimation are presented, indicating that the instrument, CEO Age, (coefficient = 0.108, $p < 0.01$) is positively and significantly related to Duality at the 1% level.

The second stage column (2) of the 2SLS analysis validate the earlier findings observed in Table 19 that *CEO_DUALITY* is negatively and significantly related to the chances of cyber security threats. Also, the instrumental variable coefficient value in column (2) is also consistently similar to the previously reported values in the OLS coefficient estimates unreported. This validates the models when compared to the earlier results in the analysis. The second stage regression indicates that *CEO_DUALITY* is negatively related to the chances of cybersecurity threats. This finding is consistent with the earlier examinations reported in Table 27, providing further evidence of the robustness of this relationship. Other noteworthy results include the first stage F-statistic, which is highly significant ($CEO_DUALITY = 1786.79$), thus providing solid statistical support for the relevance of this research instrument. In the second stage, the study further confirms the significant and negative effect of *CEO_DUALITY* and competitive pressure on the chances of cyber security threats.

Table 27. Instrumental variable regression analysis with 2SLS

Table 27 provides the results of the regressions from 2SLS instrumental variable (IV) regressions.

VARIABLES	Dependant variable =CEO Duality	Dependant variable = IF_BREACH
	(1)	(2)
	First stage	Second stage
CEO_age	0.108*** (0.00355)	
CEO duality instrumented		-0.0458*** (0.00692)
Constant	-7.623*** (0.214)	-0.0924** (0.0463)
Industry effects	No	Yes
Year effects	No	Yes
Firm level controls	Yes	Yes
K-Paap (Cragg- Donald) F statistics	41997	
Hansen J		0
Observations	3,770	1,387
R-squared		0.075

Note Table 27 presents results of the instrumental variable regression of modified Ceo_duality on the probability of cyber security threat using, 2SLS instrumental variable technique. in the first stage the dependent variable is CEO_DUALITY (CEO_DUALITY) is defined as A dummy variable with a value of one (or zero) if the CEO also is Chairman, in the second stage the predicted CEO DUALITY values from the first stage is used as the explanatory variable where the dependant variable is (IF_BREACH). IF_Breach is defined as Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise. The control variables employed in this study are (Board_size) defined as Number of persons on the board of directors, (IND_DIR) Board independence measured by the percentage of independent directors on the board, (Board ave age) defined as the average age of the board members, (Z_SCORE) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$, (ROA) defined as the Firm profitability measured by return on assets, (LEVERAGE) defined as by total liabilities divided by book value of equity, (F_SIZE) defined as natural logarithm of total assets, and (R&D_EXP) defined as the natural log of the research and development expenditure. Robust standard errors adjusted for heteroskedasticity and clustered by firm in parenthesis. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

5.6.2. *Alternative Causality tests*

In this section, we present several additional tests to further demonstrate that alternative measures of duality, and its moderators influence on the likelihood of cybersecurity threat. While the earlier conducted 2SLS tests using instrumental variables are likely to be more appropriate method to apply, however, an alternative view based on other approaches provides additional robustness test to the analysis.

5.6.2.1. *Alternative measure of CEO duality*

Next, to confirm the robustness of our main results this study further acknowledge that other CEO-related characteristics other than duality could serve the same purpose as where the CEO is also the chairman of the board. For example, the CEO may exhibit board power, industry networking skills or other characteristics that drive firm outcomes (Gontarek, & Belghitar, 2021; King et al., 2016). To address this, the study builds a robust *CEO_DUALITY* (power) indices using statistical methods following the works of Black et al. (2017); Chen, Lu, and Sougiannis (2012); Egwuonwu et al. (2021); Karpoff et al. (2016), and Larcker et al. (2007). That is, this study combined five CEO duality attributes (including *CEO_DUALITY*) to proxy for CEO_duality. Following Egwuonwu et al. (2021), this study created a CEO “bundle” as an alternative determinant of the probability of cyber security threats using Principal Component Analysis (PCA)²⁵. PCA is a form of factor analysis used in governance research that produces insights from data to reveal patterns of similarity. The advantage of PCA is that it facilitates the construction of a CEO bundle without assigning arbitrary weightings for each variable (Tetlock 2007).

²⁵ The transformation of a set of covariates (e.g., a_1, a_2, \dots, a_n) into a new set of uncorrelated variables, (b_1, b_2, \dots, b_n) , each of which is a linear combination of the a variables, is known as principal component analysis (Everitt and Hothorn, 2011). The transformed components account for enough variance in the initial a_1, a_2, \dots, a_n variables to give representative measures.

In this study we use the PCA to produce a new variable termed *CEO_duality_bundle* by construction these combined variables are orthogonally correlated and the weighting assigned to each index is determined by the eigenvector as seen in Table 28 panel B. The variables relating to the *CEO_duality_bundle* are constructed by employing the PCA following Gontarek & Belghitar (2020) are as follows: 1) CEO appointed from within. CEO appointed from within is a dummy variable assigned 1 (otherwise 0) if the CEO directly preceding role was within the individual firms under review (or not), following Gontarek and Belghitar (2021). 2) CEO Busyness. CEO Busyness is a variable that measures the number of total board memberships held by the CEO. 3) CEO founder. CEO founder is an indicator variable that equals 1 if the CEO is either founder or related to the founding family following Sheikh (2018). 4) CEO_chair. CEO_chair is defined as the concentration of the titles of “CEO” and “chair” of the board and equals 1 if the CEO is also the chair of the board and 0 otherwise for the new *CEO_duality_bundle*.) CEO Age is defined as the natural log of the Chief Executive Officer’s age. As a robustness check, the CEO duality bundle variable is introduced to the main regression model in this analysis. The estimates given in Table 29, columns (1) and (2), confirm Duality as a powerful predictor of cybersecurity threats. Duality is still prominent and has a negative relationship with the probability of information security threats.

5.6.2.2. *Alternative measure of gender diversity*

To further validate our results, we performed our analysis based on different gender diversity measures. The results in Table 30 shows that where *GENDER* representation is equal to one female in the boardroom that a moderation effect is prevalent only where the CEO is not the same person as the chairman of the board. Theoretically, this supports the view that good corporate governance practice on the basis of separation between CEO and chairman in the presence of female directors influences firm outcomes.

Secondly, we reconstruct the *GENDER* variable looking at where the female representation in the boardroom is equal to two and greater than two (\geq) The regression results reported in Table 30 indicate our results remain similar to the result estimates in Table 26.

5.6.2.3. *Alternative measure of product market competition*

We further examine the data on the relationship between competition and its influence on the likelihood of a breach. The study re-estimates the primary regression (results in Tables 25 and 26), using a substitute metric for evaluating product market competition. Following extant literature (Boubaker et al., 2018; Chen et al., 2020;) this study calculates the log transformation of the total number of publicly traded companies within the same industry. A higher number of firms (*lnNUMFIRMS*) value implies a greater number of industry rivals and a higher level of competition intensity.²⁶ The data as reported in Table 30 provides insignificant different results from the result estimates in Table 25.

²⁶ The current study does not differentiate between firms that operate in high/low competition environment as the sample relies on the largest 500 listed firms in the US – intuitively, competition is intense across industries in the S&P 500.

Table 28. Principal Component Analysis

Panel A

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.30477	.163564	0.2610	0.2610
Comp2	1.14121	.178201	0.2282	0.4892
Comp3	.963005	.128579	0.1926	0.6818
Comp4	.834427	.0778336	0.1669	0.8487
Comp5	.756593	.	0.1513	1.0000

Panel B
(eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
ceo_apw	0.4364	-0.3405	0.6070	-0.4857	0.2987	0
ceo_bsyn	-0.1310	0.5701	0.6794	0.4193	0.1426	0
ceo_foun	0.4916	-0.4153	-0.0485	0.7526	0.1306	0
ceo_chair	0.6039	0.3330	0.0393	-0.0835	-0.7183	0
ceo_age	0.4313	0.5250	-0.4075	-0.1221	0.5978	0

Note: PCA produces a new variable called CEO bundle, which is made up of the components of the index. The newly formed variables, called principal components, are by construction orthogonally related and the first linear combination that explains the maximum variation in the variables (Gontarek & Belghitar, 2020 p.704). The Kaiser-Meyer-Olkin measure of sampling adequacy 0.5189 is noted for this measure. The first eigenvector defines the relevant weightings. The index that results facilitates the reduction in variables used to one measure. The weighting assigned to each index component is determined by the eigenvector.

Table 29. Alternative CEO duality variable

Table 29 provides the results of the regressions from our main regression model in Table 19 using alternative measures for *Ceo_duality*. Robust standard error adjusted for heteroskedasticity. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1) IF_BREACH
CEO_duality_bundle	-0.0403*** (0.0105)
Constant	-0.0716 (0.0653)
Observations	1,387
R-squared	0.076
Controls	Yes
Industry effects	Yes
Year effects	Yes

Note: CEO_duality_bundle comprises of 1) CEO appointed from within. CEO appointed from within is a dummy variable assigned 1 (otherwise 0) if the CEO directly preceding role was within the individual firms under review (or not), following Gontarek and Belghitar (2021) 2) CEO Busyness, CEO Busyness is a variable the measures the number of total board memberships held by the CEO, 3) CEO founder. CEO founder is an indicator variable that equals 1 if the CEO is either founder or related to the founding family following Sheikh (2018). 4) CEO chair. CEO chair is defined as the concentration of the titles of “CEO” and “chair” of the board and equals 1 if the CEO is also the chair of the board and 0 otherwise for the new *CEO_duality_bundle*. 5) CEO Age is defined as the natural log of the Chief Executive Officer’s age. The control variables employed in this study are (*Board_size*) defined as Number of persons on the board of directors, (*IND_DIR*) Board independence measured by the percentage of independent directors on the board, (*Board ave age*) defined as the The average age of the board members (*Pcnt woman*) defined as the Proportion of women board members, (*L_INDEX*) Lerner index is net operating income, divided by sales, i.e., $\frac{PCM}{Sales}$ (Sales–COGS–Selling Expenses–Administrative expenses)/Sales. A higher value of PCM indicates more product pricing power and a higher competitive advantage of a company, (*DIR_EXPERTISE*) Comprises dummy values; coded as 1 if at least one member of the board bio has keywords suggesting they had a specific type of expertise and 0 otherwise, (*Z_SCORE*) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$, (*ROA*) defined as the Firm profitability measured by return on assets, (*LEVERAGE*) defined as by total liabilities divided by book value of equity, (*F_SIZE*) defined as natural logarithm of total assets, and (*R&D_EXP*) defined as the natural log of the research and development expenditure

Table 30. Alternative Gender and PMC variables

Table 30 provides the results from our main regression using alternative measures of gender and PMC. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	Dependent variable = If BREACH		
	(1)	(2)	(3)
†CEO duality	0.499** (0.209)		
(=) One female	0.702*** (0.264)		
†CEO duality x (=) One female	-1.676*** (0.538)		
CEO duality		0.963* (0.496)	-1.346 (1.541)
(>=) Two females		1.022** (0.457)	
CEO duality x (>=) Two females		-1.369*** (0.514)	
Ln_num_firms			-0.201** (0.533)
CEO duality x Ln_num_firms			-0.307* (0.436)
Constant	-5.342*** (1.088)	-5.340*** (1.065)	-5.631** (2.197)
Controls	Yes	Yes	Yes
Pseudo R ²	0.117	0.366	0.329
Observations	1,198	1,331	1,198

Note Table 30 presents results of the regression from our main regression using alternative measures for gender diversity and product market competition on the probability of cyber security threat using, probit regression technique. The dependant variable is (*IF_BREACH*). IF Breach is defined as Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise. The explanatory variables are *CEO_DUALITY* (*CEO_DUALITY*) is defined as A dummy variable with a value of one (or zero) if the CEO also is Chairman. (*(=) ONE FEMALE*) takes the value 1 if there is one woman on the board and 0 otherwise, (*(>=) TWO FEMALES*) takes the value 1 if there are greater than two or equal to two females on the board and 0 otherwise, (*LN_NUM_FIRMS*) The number of firms operating in each firm's industry, (*† CEO duality*) is where CEO duality = 0 (*CEO_duality x (=) ONE FEMALE*) is the interaction variable between CEO duality and where the female representation is = 1, (*CEO_duality x (>=) TWO FEMALES*), is the interaction variable between CEO duality and where the female representation is >=2, (*CEO_duality x LN_NUM_FIRMS*) is the interaction variable between CEO duality and the number of firms operating in each firm's industry. The control variables employed in this study are (*Board_size*) defined as Number of persons on the board of directors, (*IND_DIR*) Board independence measured by the percentage of independent directors on the board, (*Board ave age*) defined as the average age of the board

members, (*Z_SCORE*) defined as Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$, (*ROA*) defined as the Firm profitability measured by return on assets, (*LEVERAGE*) defined as by total liabilities divided by book value of equity, (*F_SIZE*) defined as natural logarithm of total assets, and (*R&D_EXP*) defined as the natural log of the research and development expenditure. *Robust standard errors adjusted for heteroskedasticity and clustered by firm in parenthesis. *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.*

5.7. Summary

This study focuses on internal and external CG mechanisms and investigates how CEO duality influences the effectiveness of preventing or reacting to cyber security breaches. The findings evidenced in this study have multiple theoretical and practical implications.

First, the experimental results indicate that board leadership structure play a role in information security management. Second, we investigated whether other corporate governance mechanisms (internal and external) specifically gender, board IT expertise and market competition moderates the relationship between CEO duality and the likelihood of cybersecurity breach. We find a negative relationship between the aforementioned internal and external governance mechanisms and CEO duality on the likelihood of cybersecurity threat. These findings add theoretical value to the existing organisational approach to information security management research. As indicated earlier, the involvement of management and end-user has been examined and studied concerning cyber security. Emphasis on the board composition exists, but to the best of the author's knowledge, no investigation has been studied in the context of CEO duality, gender, IT expertise in the boardroom and product market competition on cyber security breaches. Furthermore, the results of this study show that board leadership configurations (stewardship theory) significantly lessen the probability of cybersecurity breaches in the firms.

Apart from the leadership configurations, this study considers whether gender, IT expertise and competitive pressure affects the risk of an information security breach; that is, will the aforementioned play a role in the context of information security governance? The results show that market competition through agency costs significantly reduces the risk of cyber security breaches in the firms. Using a sample of 3,779 firm-year observations from the S&P 500 from 2009 to 2018, the study finds that CEO_duality and market competition are less likely to be associated with cyber security breaches.

Third, the study considers the research as adding to the extant CG literature for the following reasons: this study responds to a call for more ITG research by Hsu and Wang (2014), the scope of CG research has focused on the analysis between the board and firm performance. Traditionally, information security governance and control elements have been debated within the board concept of CG. Nonetheless, we believe that with the increasing demand for regulatory compliance and the role of technology in internal control, the board is assigned with an additional responsibility to ensure that firm actors are acting responsibly to safeguard the critical information assets in the organisation. This work here might add a fresh perspective to the role of board leadership structure and competition for firms in the post- SARS-CoV-2 era. In addition, this examination is an essential step towards understanding the cost and benefits of a single corporate governance structure for a firm.

Chapter 6

Summary of the Thesis

6.1. Introduction

This dissertation provides the first empirical information to validate crucial corporate and IT governance questions. In the first empirical chapter, the study investigates the influence of corporate governance monitoring and incentive alignment provisions as a bundle on stock price comovement and, as a result, determine whether the relationship is moderated by the US national governance quality (NGQ). In the second essay, this study examines how variations in diversity within boardrooms, as measured by board members' ideological positions, can predict a company's resilience. Finally, in the last essay, the study evaluates the impact of board leadership and structure, precisely CEO duality, on the effectiveness of information security management of corporations in the S&P 500. This final summary provided an in-depth outline of the findings. Furthermore, the limitations and future research directions are discussed. At the end of this chapter, there are also practical recommendations for the academic community and management practice.

This thesis aims to accomplish nine hypotheses developed. First, it determines if the effect of board monitoring mechanisms as a bundle (i.e., board independence and leadership configuration and gender diversity) can scale back the comovement of stock prices. Second, it seeks to examine at the firm level whether the effect of TMT and CEO incentive alignment as a bundle can scale back the comovement of stock prices.

Third, it attempts to determine at the country level whether NGQs (i.e., quality of voice and accountability and the quality of the political stability and quality of government effectiveness and related regulatory quality and the rule of law and corruption control) moderate the relationship between board monitoring mechanisms as a bundle and stock price comovement. Fourth, it attempts to establish, at the country level, the degree to which NGQ as a bundle (i.e., quality of voice and accountability and the quality of the political stability and quality of government effectiveness and related regulatory quality and the rule of law and corruption control) moderate the relationship between CEO and TMT incentive alignment provisions and stock price comovement. Fifth, it ascertains at the firm level whether diversity in the boardroom based on ideology helps or hinders firms in dealing with pandemic-induced uncertainties.

Fifth first alternative, it examines if board ideology diversity has a moderating influence on the relationship between disease exposure (i.e., SARS-CoV-2 exposure) and stock price return. Fifth second alternative, it explores whether board ideology diversity moderates disease sentiment (i.e., SARS-CoV-2 net sentiment) and equity price performance nexus. Sixth, it explores whether board leadership configuration (i.e., where the CEO also serves as the board chair) is associated with the probability of cybersecurity breaches. Seventh, it seeks to examine at the firm level whether board diversity based on gender moderates the relationship between CEO duality and the probability of cybersecurity breaches. Eighth, it examines whether IT expertise moderates the relationship between CEO duality and the probability of cybersecurity breaches. Ninth, it examines if product market competition moderates the relationship or effect of CEO duality on the probability of cyber security breaches *ceteris paribus*.

The multi-theoretical outlook of this thesis suggests that effective governance structures can decrease the information asymmetry problems between shareholders and managers, curb uncertainties in the market by facilitating greater corporate accountability; this sends signals to the market and, therefore, lowers comovement, making firms' share prices more resilient to shocks (pandemic related) and potential IT information breaches.

The findings are summarised below.

6.2. Summary of Key Findings

The investigation of the relevance of the structure of the board of directors as a corporate governance mechanism is motivated by research that posits that the board of directors is in charge of overseeing the top management team and is the "apex of the firm's decision-making system." The study is also motivated by the fact that nowadays, the board of directors face corporate challenges, including but not limited to an unsettling economic environment moving away from the financial crises' era to the SARS-CoV-2 induced crises and risks of cyber security. In the first empirical chapter, this study investigates the relationships between board monitoring mechanisms and incentive alignment provision as a bundle and the comovement of stock prices. The regression results show that monitoring mechanisms and incentive alignment provisions as a bundle of corporate governance mechanisms weaken the comovement of stock prices.

A firm's board monitoring mechanisms as a bundle (board independence, leadership configuration, and gender diversity) are negatively associated with the R-square value of individual stock returns on market and industry indexes. This suggests that board monitoring mechanisms as a bundle allow more firm-specific information to be incorporated into firms' share prices as opposed to industry and market information. Secondly, the study documents a complementary relationship between NGQ and firm board monitoring at the country level. Finally, the findings suggest that NGQ moderates the association between the effect of board monitoring power and comovement. Specifically, for smaller or firms with lesser growth opportunities, the influence of incentive alignment provision is most apparent in firms with more significant growth opportunities. This study found no evidence of a link between incentive alignment and NGQ. This chapter's results align with the CG bundles view and theoretical framework incorporating agency theory insights. The second empirical chapter examines whether a relationship exists between heterogeneity in the boardroom based on ideology and stock price performance in times of uncertainty.

The results confirm that board ideology is statistically significant and positively influences share prices during uncertainty, specifically SARS-CoV-2 induced uncertainty. The results imply that board ideology has a moderating effect on disease exposure and disease sentiment–nexus. Again, the results are mainly in line with the expectations of agency and social psychology theories. Tests of instrumental variables that take advantage of exogenous variations in diversity levels suggest that these relations are causal.

The third empirical chapter examines whether CEO_duality, and the moderating role of gender diversity, board IT expertise, and product market competition on the effectiveness of preventing or reacting to cyber security breaches. The result argues that firstly when considering information security governance, one might need to waive the benefit of transparency and accountability prevalent where the CEO and chair are two separate individuals for the value of a consolidated CEO-chair which holds the in-depth and firm-specific knowledge about the firm's risks. Secondly, this study suggests that market competition is linked with less possibility of information security breaches. The findings demonstrate that market competition's disciplinary power lessens the necessity for alternative types of board supervision that have equal impacts. (for, e.g. the proportion of independent directors). Thirdly, this study's findings suggest that the board of directors' IT expertise negatively influences the probability of information security breaches in IT firms. That is, this study did not support the relevance of IT expertise in the boardroom and its effect on the probability of information security breaches outside of IT industries. Lastly, the results supported the literature of a negative influence between women in the boardroom and firm value (Earley & Mosakowski, 2000; Forbes & Milliken, 1999). We find a positive relationship between the probability of cyber security-related threats and gender diversity in corporate governance.

These findings agree with the predictions of (Delis et al., 2016; Westphal & Milton, 2000), who asserts that having women on the board may exacerbate communication issues, degrading the board's policymaking process and increasing organisational risk.

6.3. Contributions to Knowledge

The thesis results extend and make several new additions to the existing studies. To the author's best knowledge, the empirical chapter 1 provides first-time empirical evidence firstly, employing a PCA technique to develop and introduce a new alternative board monitoring (incentive alignment) proxies containing one key component out of three (two) widely used governance proxies for board monitoring (incentive alignment provision). Secondly, the study also adds to the existing literature by exploring the influence of governance mechanisms as a bundle on stock return comovement.

Thirdly, this study also contributes to the corporate governance literature on the relationship between female directors and firm risk. The majority of previous studies have focused on corporate performance (Adams & Ferreira 2009; Campbell & Mínguez-Vera 2008; Carter et al. 2008). However, the evidence on how female directors interact with other governance mechanisms to influence corporate outcomes are very limited. The psychology and sociology studies indicate that males and females are different with respect to risk-taking behaviour (Croson & Gneezy 2009). Moreover, the previous literature investigates gender differences under risk using event study experiments (Eckel & Grossman 2008; Holt & Laury 2002; Schubert et al. 1999). The samples of these studies include females from the general population. Thus, understanding if the females who are in high leadership positions determine corporate risk is an important economic question. Therefore, this study examines how the female directors in the S&P 500 work in *pari passu* with other governance mechanisms for e.g independent directors and the CEO.

Fourthly, the study further contributes to existing studies by providing insights into how NGQ-Board monitoring connection can affect stock price performance. Specifically, the results highlight that NGQs moderate the association between board monitoring power and stock return comovement, mainly in smaller firms with lower market conditions defined by market capitalisation, whilst the effects of incentive alignment provision are most noticeable in firms with greater market conditions.

Fifth, the finding opens a new line of enquiry on the association between firm size and incentive alignment provision. Sixth, the study contributes to the extant literature by investigating the influence of diversity in the boardroom based on the ideology that helps firms deal with pandemic-induced uncertainties. Seventh, the study contributes to the literature by providing first-time evidence on the moderating effect of board ideology diversity on the relationship between disease exposure (i.e. SARS-CoV-2 exposure) and stock price return. Eighth, the research shows evidence of the moderating influence of board ideology diversity on disease sentiment (i.e. SARS-CoV-2 net sentiment) and share price performance nexus. Ninth, this chapter/empirical chapter 2, contributes to the existing body of knowledge - bridging the research lacuna by studying the ideology-economic effect of infectious disease nexus on capital markets.

Tenth, this study contributes to the corporate governance literature on the effect of group ideological composition on the firm's strategic outcomes. Examining if the ideologies of directors in the boardroom who are already in high leadership positions in the business environment that are politically similar to those in the general population may have several important implications. The findings of this study may serve as a motive for the policymakers to include more ideologically diverse directors on corporate boards as a result of their competence. In addition, it is not only a matter of social justice to increase ideologically diverse representation but also because of their economic value on corporate boards.

Eleventh, given the importance of the recent global crisis as a result of the pandemic and how the event exacerbated the discussion of cybersecurity threats as a results of increased use outside of organisation premises (i.e., the increased working from home culture), this study contributes to the literature through providing empirical evidence on the role of board leadership configuration and the likelihood of cybersecurity threat. Our investigation no doubt provides important early step in identifying the appropriate governance structure for addressing information technology risks. Twelfth, while the board_size and independence have been known for their importance in information security management (see, e.g. Hsu & Wang).

We add to this field of inquiry by extending this line of literature that has been largely overlooked, that is, the potential role of the leadership configuration, specifically *CEO_duality*, prior evidence supporting the supervisory function of firms shows that the quality of a company's governance, particularly ownership and control rights divergence (Lin et al., 2013), the existence of institutional ownership (Boubaker et al., 2017), and the effectiveness of external governance practices, is linked to firm performance and risk management (Bharath & Hertzl, 2016). Thirteenth, theoretically this work deepens our understanding of the relationship between CEO duality and the likelihood of cybersecurity threat in a couple of ways. From an agency theory and stewardship perspective, we emphasise that CEOs who are also chairpersons of their firms have an instrumental role in combatting IT risks by employing their managerial skill. Also, empirical support is provided on the moderating effect of other governance mechanisms. Specifically, we determined that the presence of women, IT expertise and market competition moderates this relationship. The examination, therefore, provides essential step toward understanding the benefits of the interconnectedness of governance mechanisms as a bundle.

6.4. Practical Implications

This thesis contains information that scholars, regulatory authorities, and shareholders may find helpful. First, some CG strategies can accomplish specific outcomes with firm effectiveness. Second, for corporations to create an open financial system, policymakers should, inter alia, find a balance between corporate governance oversight frameworks and incentive alignment provisions, specifying how each bundle best suits them.

Third, the findings of our study assist boards in developing guidelines for determining the needs of firms in terms of board diversity levels, evaluating the suitability of the existing board structure, and specifying strategies to improve boardroom diversity.

This study also discovered that as board heterogeneity increases, so does firm performance. As a result, the board must be aware of any diversity gaps, the reasons for those gaps, and the likelihood of resolving their diversity issues. This is critical if organisations want to maximise the potential of their boards. Fourth, my observations offer direction to government and decision makers on the contribution of political ideology in financial markets while designing strategies to respond to crises, notably the SARS-CoV-2 pandemic. Fifth, when considering information security governance, firms might need to waive the benefit of transparency and accountability prevalent where the CEO and chair are two separate individuals for the value of a consolidated CEO – chair which holds the in-depth and firm-specific knowledge about the firm risks. Also, results affirm that the disciplinary power of market competition acts as a substitute CG mechanism for outside directors' strict monitoring.

Lastly, results from this study are essential to regulators and investors who want to understand the level of expertise of the board in its oversight role. According to this study, board IT expertise is not as necessary as board monitoring. Consequently, non-expert independent directors who are sufficiently engaged in monitoring may well be sufficiently skilled to address the likelihood of cybersecurity breaches.

6.5. Limitations of Studies and implications for further research

Like all empirical studies, the present study has limitations, which provide opportunities for future research. First, in empirical chapter 1, the selection comprises the largest 500 US firms. This study, therefore, recommends that readers moderately extrapolate the conclusions of the current analysis to a broader context. While the study controlled for size and other firm-specific characteristics, future research could look at a broader range of firms. Second, the lack of alternative measures of stock price comovement is acknowledged as one of the significant limitations of this study. In this study, stock price comovement is measured by idiosyncratic volatility, as guided by previous empirical literature (Piotroski & Roulstone, 2004; Crawford et al., 2012).

The confidence of the exegesis of the findings relating stock price comovement to corporate governance mechanisms is primarily determined by whether price comovement adequately captures private information in asset prices. To alleviate this concern, robustness tests are performed by employing alternative measures of price comovement generated by various models.²⁷ Regrettably, none of the additional comovement measures is used in this study to test the developed hypothesis. Furthermore, the analyses were based on data from Datastream. While other scholars have used this database, any inconsistencies could impact the results. Third, in the second empirical chapter, while using quantitative information has some benefits, it also restricts one's power to examine the motivations for diversity. Primary research (using interviews and questionnaires) may, therefore, provide a path toward determining whether directors who do not donate. (this study's measure of ideological diversity) to political parties do so on purpose or not.

Fourth, leveraging data from the FEC compels me to confine the examination to the United States. Nevertheless, Malka et al. (2017) show that the personal political ideologies' effect on tolerance and its similarity differs across cultural settings where the liberal-conservative divide is not clearly defined. Further to that, as in previous studies, the study does not consider the ideologies of directors who contribute to third parties – even though social science research indicates that a more nuanced categorisation of party affiliation could also provide valuable insights about individuals' attitudes and ideologies.

For instance, while democrats and republicans in the United States are often economically aligned due to a shared emphasis on pure capitalism and individual liberty, they still exhibit significant gaps in their acceptance of new concepts and respect for accepted social conventions (Iyer et al., 2012). Then, the distinctive features of the American ideological landscape may have contributed to the findings.

²⁷ Previous empirical research uses the measure of Probability of Informed Trading (PIN) and simple the coefficient of correlation between weekly firm return and weekly stock returns as a proxy for stock return comovement (see, e.g. Ferreira & Laux, 2007; Ferreira et al., 2011; Ding et al., 2020).

Future investigation in other areas of social discourse with a wide range of potential political leanings (for instance, emerging economies jurisdictions) could clarify our findings while also offering insight as to whether the impacts this study discerns here seem to be prevalent under multiple international corporate governance mechanisms. Fifth, in the third empirical chapter, this research is aware of the study's limitations, including some that provide future research directions. Although secondary data has been a common practice in studying board composition, the analyses were based on data from privacyrights.org and Bloomberg. While other scholars have used these databases, any inconsistencies could impact the results.

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Appendix 1

Appendix 1: Variable definitions Empirical Chapter 1

Dependent variable	
COMOVE	Stock price comovement, is defined as the log-transformation of the adjusted R2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns
Independent variables	
CEO DUALITY	Boolean dummy variable of 1 wherever CEO is also the same person as the chairman, and zero otherwise
CEO PAY	The log of the total CEO remuneration
DIR PAY	The log of the remuneration of all directors scaled by the number of directors
DIVERSITY	The proportion of females on the board
INDEPENDENT DIR.	The proportion of outside directors to insiders
CG & NGQ Bundles variables	
BOARD_INCENTIVE	The first principal component of TMT incentive alignment comprising dir_pay and CEO pay
BOARD_MON.	The first principal component of board governance comprising independent director, CEO duality, and gender board diversity
NGQ	The first principal component of the six NGQ dimensions (Kaufman et al., 2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption
Control variables	
AUDITQ	Proxied by the likelihood of loss avoidance is defined as earnings scaled by total assets
BOARD SIZE	the total number of directors on board
INFLATION	the annual inflation rate in percentages per year
LEV	the total debt scaled by total assets at the end of the last fiscal year
MV	the log of the firm's market capitalisation at the end of the last fiscal year
PINDEX	Proxy for good governance is the sum of 6 parsimonious index from GIM namely limitations of directors' liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority
PERF	Operating income divided by total assets at the end of the last fiscal year

SDROA	the standard deviation of the ratio between operating income and total assets over seven years
SIZE	the log of total assets at the end of the last fiscal year
IND_DUM	Industry dummies for the industries used in the analysis
Yr_DUM	Year dummies from 2009 to 2018

Instrumental variables

INSTR_BI	The predicted value from the estimated models of board incentive alignment
INSTR_BM	The predicted value from the estimated models of board monitoring

Alt. measures of Board monitoring and Incentive alignment

BM_DUMMY	is a Boolean dummy of 1 if firm has a board monitoring value above the median, and zero otherwise
IA_DUMMY	is a Boolean dummy of 1 if firm has an incentive alignment value above the sample median, and zero otherwise

Appendix 2

Appendix 2: Variable definitions Empirical Chapter 2

Dependent Variable	
RI	cumulative weekly return of firm <i>i</i> in quarter <i>t</i> .
Independent variables	
COVID_EXPOSURE	Is the number of times the covid_19 and its synonyms are used in the earnings conference call between the board and investors scaled by the number of sentences in the transcript
COVID_NET_SENTIMENTS	Is the difference in the number of negative or positive tone words (associated with SARS-CoV-2 and its believed effect about the firm's future cash flows and investment risk) used in the earnings conference call between the board and investors
ID_DIVERSITY	Is a measure of board diversity capturing the probability that any randomly selected director has different ideologies
Control variables	
AVE_AGE	The average age of inside directors
BOARD_SIZE	Total number of directors in a given board.
CASH_HOLDING	Cash and short-term investments / total assets
F_SIZE	The natural logarithm of total assets
LEVERAGE	Debt in current liabilities plus long-term debt divided by assets
PCNT_WOMEN	The percentage of the total number of women to the total number of board directors
PROFITABILITY	The ratio of net income (minus taxes) to total assets

IND_DUM	Industry dummies for the industries used in the analysis
Q_DUM	Quarter dummies from q12020 to q12021

Instrumental variables

ESG	The overall firm score is calculated using disclosed data and the ESG pillar ratings.
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Appendix 3

Appendix 3: Variable definitions Empirical Chapter 3

Dependent Variable	
IF_BREACH	Dummy variable that equals 1 if a firm declared it had been breached (breach type is Hack, Stationary Computer Loss, or Portable Device or Insider, Physical, Disc or Phys, or Card, or Other) in the financial year and 0 otherwise.
Independent variables	
CEO DUALITY	A dummy variable with a value of one (or zero) if the CEO also is Chairman
Control variables	
BOARD_AVE_AGE	The average age of the board members
BOARD_SIZE	Number of persons on the board of directors
F_SIZE	Firm size measured by the natural logarithm of total assets
IND. DIR	Board independence measured by the percentage of independent directors on the board
LEVERAGE	Firm leverage measured by total liabilities divided by book value of equity
R&D_EXP	The natural log of the research and development expenditure.
ROA	Firm profitability measured by return on assets
ZSCORE	Firm's distress risk proxied by Altman's (1968) z-score, calculated as follows: $(1.2 * \text{working capital} + 1.4 * \text{retained earnings} + 3.3 * \text{EBIT} + 0.999 * \text{sales}) / \text{total assets} + 0.6 * (\text{market value of equity} / \text{book value of debt})$.
L_INDEX	Lerner index is net operating income, divided by sales, i.e., $\text{PCM} = (\text{Sales} - \text{COGS} - \text{Selling Expenses} - \text{Administrative expenses}) / \text{Sales}$. A higher value of PCM

	indicates more product pricing power and a higher competitive advantage of a company
DIR. EXP.	Comprises dummy values; coded as 1 if at least one member of the board bio has keywords suggesting they had a specific type of expertise and 0 otherwise
PCNT_WOMAN	Proportion of women board members
Instrumental variables	
CEO AGE	Age of the Chief Executive Officer
Alt. measure of CEO duality	
CEO_DUALITY_BUNDLE	The first principal component of CEO power comprising CEO appointed from within, CEO Busyness, CEO founder, CEO chair and CEO age
Alt. measure of product market competition	
Ln_NUM_FIRMS	The number of firms operating in each firm's industry
Alt. measure of proportion of women in the boardroom	
(=) ONE FEMALE	Takes the value 1 if there is one woman on the board and 0 otherwise
(>=) TWO FEMALES	Takes the value 1 if there are greater than two or equal to two females on the board and 0 otherwise