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# **Essays on Corporate Governance**

A thesis  
submitted in fulfillment  
of the requirements for the degree  
of  
**Doctor of Philosophy in Finance**

at  
**The University of Waikato**

by  
**Nawaf A. E. Almaskati**



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

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## **Summary**

Corporate governance refers to the various mechanisms governing the operations of corporations where the separation between ownership and management usually leads to the presence of different types of agency issues and costs. The different corporate governance mechanisms are looked at as the tools available to the owners of capital to protect their interests in corporations. The role of corporate governance mechanisms in controlling agency issues arising from the separation of the ownership and management of a firm has been long acknowledged by various stakeholders (Jensen and Meckling, 1976). Furthermore, several recent events have contributed to the rise of corporate governance as a mainstream topic that is discussed and debated in various boardrooms, academic seminars and policy meetings around the world. All financial and economic crises since the beginning of the 1990s have been linked in one way or another to failures of the corporate governance framework which have enabled corporations to engage in unwarranted activities that have endangered their local economies and, in many cases, the global economy. Recent scandals and insolvencies caused by the failure of the governance framework (e.g. Enron, WorldCom, Lehman Brothers) have led to widespread systemic consequences and diminished confidence in the corporate sector in many markets. Having a good and strong corporate governance framework is not only important to prevent the recurrence of such events; it is also vital to the health and sustainability of capital markets and overall economic activity (Claessens and Yurtoglu, 2013). The survival and growth of any capital market depends on the continuous flow of capital into corporations, which is also essential for economic growth and prosperity. However, the flow of capital into corporations cannot continue without the presence of strong corporate governance mechanisms to protect the rights of the providers of capital. As Shleifer and Vishny (1997) put it, corporate governance practices work to ensure that the money invested by capital providers is not pilfered by the firm's management, and that profits are repatriated to the capital providers.

This thesis contains three studies addressing three distinct topics related to corporate governance. The first study examines the role played by country-level factors in determining the characteristics of the corporate governance framework in each country. It also studies whether firm-level corporate governance mechanisms act as substitutes or complements to these country-level factors. We pay special attention to the role of financial development and firm-level financing needs in influencing the firm's governance framework. To our knowledge this is the first study that examines the different causal relationship models used in the literature in order to answer the

question of how to best represent the relationship between country-level factors and firm-level governance mechanisms and their joint effects on firm value and performance. Furthermore, our study differs from previous studies in the field in that it employs a wide range of publicly available indices as country-level factors to explain cross-country variations in firm-level governance. The study also addresses several pitfalls and methodological issues with prior studies by focusing on outcome-based external governance indicators and by employing the hierarchical linear modelling (HLM) approach and the Generalised Method of Moments (GMM) technique to account for the nested nature of the data and for potential endogeneity issues, respectively (see Aguilera et al., 2015; Essen et al., 2013; Schiehl and Martin, 2016). Overall, the study contributes to the ongoing debate on the nature of the relationships between country-level and firm-level factors and the effect of such relationships on firm value and performance.

We find that country-level factors explain a large part of the variation in firm-level governance across countries. We also find strong evidence to suggest that models which assume that country-level mechanisms act as moderators of the relationship between firm-level governance and firm performance provide the best fit for the relationship between these two groups. Moreover, we find that in contrast to several prior studies (e.g. Chen et al., 2009; Chou et al., 2011; Klapper and Love, 2004), our findings support the proposition that firm-level and country-level governance are complementary. Furthermore, we find that stronger firm-level governance is associated with higher firm value for firms which have high financing needs, and which operate in countries with high financial development. This supports the argument that a firm's governance framework is highly dependent on the financial development status of the country in which it operates, as well as its need for external financing.

The second study examines the role of corporate governance variables in improving the predictive power of bankruptcy prediction models, while analysing the classificatory powers offered by the different estimation techniques. The study is among the first to comprehensively examine the nexus between bankruptcy, corporate governance, and estimation techniques. Most prior studies have primarily focused on examining the value of adding governance variables to a bankruptcy prediction model without considering comparability across the different models or estimation techniques (e.g. Daily and Dalton, 1994; Darrat et al., 2016; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Wang and Deng, 2006). Furthermore, recent studies by Chan et al. (2016) and Liang

et al., (2016) cover a very limited set of bankruptcy models and estimation techniques. This limits the comparability of the results. We cover a more comprehensive set of models and estimation techniques. Also, we use a larger sample and a longer timeframe to examine different combinations of models and estimation techniques, and this allows for better comparison of the predictive powers of these models, and of the classificatory ability of the different estimation methods. Moreover, our study focuses on examining the role of governance attributes in predicting bankruptcy, which is different to Ashbaugh-Skaife et al. (2006) who examine the role of such attributes in influencing the firm's credit rating. The present study also addresses endogeneity concerns, which is an important issue that has been largely overlooked in similar studies (Schultz et al., 2017).

We find that the addition of governance variables that represent the firm's board attributes significantly improves the classificatory power and predictive accuracy of the different bankruptcy prediction models covered in the study. We also find that the further away in time a firm is from bankruptcy, the greater the additional explanatory power provided by adding the governance measures. This implies that governance variables tend to provide earlier and more accurate warnings of the firm's bankruptcy potential. Lastly, our analysis of six of the most frequently used estimation methods in the literature shows that regardless of the bankruptcy model used, hazard analysis provides the best classification and out-of-sample forecast accuracy among the parametric methods, the other methods being multiple discriminant analysis and regression analysis. Nevertheless, non-parametric methods such as neural networks, data envelopment analysis and classification and regression trees appear to provide better classificatory accuracy regardless of the model selected (Cielen et al., 2004; Desai et al., 1996; Malhotra and Malhotra, 2003; Premachandra et al., 2009; Wilson and Sharda, 1994; Zhang et al., 1999). Overall, hazard analysis, data envelopment analysis, neural networks and classification and regression trees add the most economic value through reducing the potential costs arising from either lending to firms that will go into bankruptcy soon and thus incurring a loss in principal (classifying bad cases as good), or not lending to healthy firms and thus foregoing the investment opportunity (classifying good cases as bad).

The last study extends the previous literature by examining the role of corporate governance mechanisms in influencing investors' initial and subsequent reactions to earnings announcements,

with special attention to one of the most persistent market anomalies, namely the post-earnings announcement drift (PEAD). When investigating the relationship between corporate governance and investor responses to earnings announcements, we control for market conditions that have been found to impact on this response, with a particular focus on market uncertainty and investor sentiment. While several explanations for PEAD based on the rational expectations model or some behavioural observations are provided in the literature (see Bartov et al., 2000; Mendenhall, 2004, Sadka, 2006), the prevailing market conditions such as market uncertainty and investor sentiment have received increasing attention in recent years as possible contributing factors to PEAD (Bird et al., 2014; Bird and Yeung, 2012; Francis et al., 2007; Ozoguz, 2009; Williams, 2015). This study is the first to look at the nexus between corporate governance, market uncertainty, investor sentiment, and PEAD, and it adds to a growing stream of research focusing on increasing our understanding of the responses of market participants to different types of news and events. The study also supplements previous attempts to understand the initial and subsequent market responses to earnings releases by providing evidence on the contributing role played by corporate governance through the effect that it has on information uncertainty.

In a sample of quarterly announcements made by US public firms between January 2006 and December 2016, we find that better governance significantly strengthens the magnitude of the initial market reaction to both positive and negative earnings announcements. This contrasts with the impact of either market uncertainty or investor sentiment which will have different effects depending on whether the response is to good news or bad news. An important finding is that during the post-announcement period the level of governance plays no role in explaining movements in share prices that are attributable to any reassessment of the initial announcement. This contrasts with the findings for uncertainty and sentiment which are both found to have an ongoing influence on the market response to an earnings announcement during the post-announcement period. Significantly, it is changes in either the level of uncertainty or sentiment, and not the level itself, that explain post-announcement drift. The implication is that corporate governance plays no role in explaining PEAD because it remains relatively stable over the post-announcement period. Our findings suggest that the immediate impact of an earnings announcement on investor expectations is conditioned by the environment existing at the time of the announcements which is determined by a number of factors including the level of corporate governance, market uncertainty and investor sentiment. One of our more important findings is that

investors only revisit their initial response to an earnings announcement if there is a change in this environment. Our findings further suggest that any correction to the initial reaction is not inevitable but rather is a response to post-announcement movements in factors such as market uncertainty and sentiment.

Consistent with previous findings that (i) better corporate governance reduces information uncertainty, and (ii) a reduction in information uncertainty increases investors' initial responses to earnings announcements, we find that information uncertainty is the major channel through which corporate governance operates to increase the market's initial reaction to earnings announcements. Overall, this result suggests that better corporate governance increases the credibility of the information which translates into a greater acceptance of, and so a response to, the information by investors (Francis et al., 2007; Kanagaretnam et al., 2007; Zhang, 2006). We are also the first study to show that investors exhibit a very different reaction to market uncertainty than they do to firm-level information uncertainty. Consistent with previous studies on macro-level uncertainty, we show that a high level of market uncertainty can assert an asymmetric effect on investors' reactions to earnings news, reducing reaction to good news but increasing their reaction to bad news. For firm-level information uncertainty, however, our results show that a high level of information uncertainty diminishes investor reaction to both good and bad news. Further, this apparent reluctance to act on information continues in the post-earnings period with high levels of information uncertainty significantly reducing PEAD.

The studies included in this thesis examine the role and characteristics of the firm's corporate governance framework from two main angles: its impact on the firm's value and returns, and its role in impacting the firm's information environment. While the results from the first study confirm the important role played by the firm's governance mechanisms in determining its value and returns, as well as its ability to access financing opportunities, the second study revisits this role by examining its impact on the firm's health. Further, the second and third studies share similar motivations regarding the role of the firm's governance framework in improving the firm's information environment and reducing uncertainty. The second study finds that weak governance can lead to misleading disclosures about the firm's poor financial health, and may thus prevent any intervention by the shareholders, causing further deterioration in the firm's health. In the third

study corporate governance is seen as playing a part in influencing how investors perceive and respond to the firm's earnings announcements through its role in reducing information uncertainty.

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Above all, I am eternally grateful for all the wonderful things God has given me and shown me.

## **Thesis-related research outcomes**

### **Refereed Publications**

1. **Almaskati, N. A.**, Bird, R., & Lu, Y. (2020) Corporate governance, institutions, markets, and social factors. *Research in International Business and Finance* 51, 1-20.
2. **Almaskati, N. A.**, Bird, R., Yeung, D., & Lu, Y. (2021) A horse race of models and estimation methods for predicting bankruptcy. *Advances in Accounting* 52, 1-18.

### **Completed and Submitted Papers**

1. **Almaskati, N. A.**, Bird, R., Yeung, D., & Lu, Y. (2021) Corporate governance, information uncertainty and market reaction to information signals. *Under Review*

### **Conference Presentations**

1. **Almaskati, N. A.**, Bird, R., Yeung, D., & Lu, Y. (2020). Corporate governance, information uncertainty and market reaction to information signals. Paper presented at 2020 New Zealand Finance Colloquium PhD Symposium, Auckland University of Technology, Auckland, New Zealand.
2. **Almaskati, N. A.**, Bird, R., & Lu, Y. (2018). Corporate governance, institutions, markets, and social factors. Paper presented at 2018 Financial Markets and Corporate Governance (FMCG) Conference, La Trobe University, Melbourne, Australia.
3. **Almaskati, N. A.**, Bird, R., Yeung, D., & Lu, Y. (2018). The role of corporate governance and estimation methods in predicting bankruptcy. Paper presented at 2018 Financial Markets and Corporate Governance (FMCG) PhD Symposium, La Trobe University, Melbourne, Australia.

## List of abbreviations

<b>Abbreviation</b>	<b>Definition</b>
CAR	Cumulative abnormal returns
DEA	Data Envelopment Analysis
GMM	Generalized method of moments
GNP	Gross national product
HA	Hazard Analysis
HLM	Hierarchical linear model
IU	Information uncertainty
LR	Logistic Regression
MDA	Multiple discriminant analysis
NN	Neural Networks
PEAD	Post-earnings announcement drift
ROA	Return on assets
ROE	Return on equity

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**Chapter 1: Introduction**

# **Chapter 1**

**Introduction**

## **1. Introduction**

Corporate governance refers to the various mechanisms governing the operations of corporations where the separation between ownership and management usually leads to the presence of different types of agency issues and costs. The different corporate governance mechanisms are looked at as the tools available to the owners of capital to protect their interests in corporations. The role of corporate governance mechanisms in controlling agency issues arising from the separation of the ownership and management of a firm has been long acknowledged by various stakeholders (Jensen and Meckling, 1976). Furthermore, several recent events have contributed to the rise of corporate governance as a mainstream topic that is discussed and debated in various boardrooms, academic seminars and policy meetings around the world. All financial and economic crises since the beginning of the 1990s have been linked in one way or another to failures of the corporate governance framework which have enabled corporations to engage in unwarranted activities that have endangered their local economies and, in many cases, the global economy. Recent scandals and insolvencies caused by the failure of the governance framework (e.g. Enron, WorldCom, Lehman Brothers) have led to widespread systemic consequences and diminished confidence in the corporate sector in many markets. Having a good and strong corporate governance framework is not only important to prevent the recurrence of such events; it is also vital to the health and sustainability of capital markets and overall economic activity (Claessens and Yurtoglu, 2013). The survival and growth of any capital market depends on the continuous flow of capital into corporations, which is also essential for economic growth and prosperity. However, the flow of capital into corporations cannot continue without the presence of strong corporate governance mechanisms to protect the rights of the providers of capital. As Shleifer and Vishny (1997) put it, corporate governance practices work to ensure that the money invested by capital providers is not pilfered by the firm's management, and that profits are repatriated to the capital providers.

This thesis contains three studies addressing three distinct topics related to corporate governance. The first study assesses the impact of country-level factors on the characteristics of the corporate governance framework in each country. It also investigates whether firm-level corporate governance mechanisms substitute or complement country-level factors. Special attention is given to the impact of financial development and firm-level financing on firms' governance frameworks. This study is the first to provide a comprehensive examination of the different causal relationship

models suggested in the literature regarding the relationship between country-level factors and firm-level governance mechanisms and their joint effects on firm value and performance. It is also among the first to employ a wide range of publicly available indices as country-level factors to examine cross-country variations in firm-level governance.

We find that country-level factors explain a large part of the difference in firm-level governance across countries. Our results also suggest that country-level mechanisms moderate the relationship between firm-level governance and firm performance. Moreover, in contrast to several prior studies (e.g. Chen et al., 2009; Chou et al., 2011; Klapper and Love, 2004), our findings support the proposition that firm-level and country-level governance are complementary. We also find that stronger firm-level governance is associated with higher firm value in firms which have high financing needs and which operate in countries with high financial development. This supports the argument that a firm's governance framework is highly related to the financial development status of the country in which it operates as well as its reliance on external sources of financing.

The second study examines the role of corporate governance variables in improving the predictive power of bankruptcy prediction models and analyses the classificatory powers of different estimation techniques. The study is among the first to comprehensively examine the nexus between bankruptcy, corporate governance and estimation techniques. Most prior studies have focused primarily on examining the added value obtained by including governance variables in a bankruptcy prediction model without considering the comparability of prediction power across the different models or estimation techniques (e.g. Daily and Dalton, 1994; Darrat et al., 2016; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Wang and Deng, 2006). We examine a more comprehensive set of models and estimation techniques. We also use a larger sample and a longer timeframe than previous studies, which allows us to better compare both the predictive powers of these models and the classification ability of the different estimation methods. The study addresses several limitations observed in related previous studies, such as: focusing on a very limited set of models and/or estimation methods, using limited datasets and/or governance variables, and overlooking potential statistical and endogeneity issues (see Schultz et al., 2017).

We find that the addition of governance variables significantly improves the classificatory power and predictive accuracy of the different bankruptcy prediction models covered in the study. We also find that while adding governance variables improves the performance of bankruptcy

prediction models, the additional explanatory power provided by adding governance measures improves the further a firm is from bankruptcy. This indicates that governance variables are able to capture earlier signs of a firm's bankruptcy potential. Lastly, our analysis of some of the most-used parametric and non-parametric estimation methods in the literature show that non-parametric methods such as neural networks, data envelopment analysis and classification and regression trees provide better classificatory accuracy regardless of the model selected (Cielen et al., 2004; Desai et al., 1996; Malhotra and Malhotra, 2003; Premachandra et al., 2009; Wilson and Sharda, 1994; Zhang et al., 1999). Further, hazard analysis appears to provide the best classification and out-of-sample forecast accuracy among the parametric methods. Overall, non-parametric methods and hazard analysis appear to add the most economic value by reducing costs related to either lending to soon to be bankrupt firms and thus incurring a loss in principal, or not lending to healthy firms and thus missing the investment opportunity.

The last study extends the previous literature by examining the role of corporate governance mechanisms in influencing investors' initial and subsequent reactions to earnings announcements. We pay special attention to one of the most persistent market anomalies, namely post-earnings announcement drift (PEAD). When investigating the relationship between corporate governance and investor response to earnings announcements, we control for market conditions that have been found to impact on this response. In doing so we adopt a particular focus on market uncertainty and investor sentiment. This study is the first to examine the nexus between corporate governance, market uncertainty, investor sentiment, and PEAD. In addition to expanding the current body of literature, the study also provides evidence on the role played by corporate governance in influencing initial and subsequent market responses to earnings releases through the effect that it has on information uncertainty.

We examine quarterly announcements made by US public firms between January 2006 and December 2016 and find that better governance is associated with stronger initial market reactions to both positive and negative earnings announcements. We also find that the strength of governance plays no role in explaining movements in share prices during the post-announcement period that are related to reassessments of the initial announcements. This contrasts with the findings for uncertainty and sentiment, which are both found to have an influence on the market initial and subsequent responses to earnings announcement. These observations are explained by

the fact that corporate governance changes very little over time, in contrast to market uncertainty and investor sentiment which change frequently in response to many factors. Therefore, one of our more major findings is that investors only reassess their initial response to an earnings announcement if there is a change in this environment. This means that any correction during the post-announcement period is not inevitable but rather is a response to post-announcement movements in factors such as market uncertainty and sentiment. Further, our study is the first to show that investors exhibit a diverse reaction to market and firm-level information uncertainty. While investors respond to a high level of market uncertainty by reducing their reaction to good news but increasing their reaction to bad news, a high level of information uncertainty diminishes investors' reaction to both good and bad news. Lastly, we find that information uncertainty is the major channel through which corporate governance operates to increase the market's initial reactions to earnings announcements. Overall, this result suggests that better corporate governance enhances the informativeness of the firm's announcements which leads to a larger response by market participants to any surprise (Francis et al., 2007; Kanagaretnam et al., 2007; Zhang, 2006).

The studies in this work fall in two interrelated themes that arise from the current body of the literature on corporate governance. The first theme or trend links governance mechanisms to firm performance and value as well as the cost of finance through the impact that these mechanisms have on how the firm operates and how agency costs are mitigated. The second theme or trend in the corporate is the link between corporate governance and the firm's information environment. Both themes are important to our work in this thesis. The first essay, which looks at the relationship between both groups of governance mechanisms, internal and external, and examines their impacts on the firm's value and performance, falls within the first theme of research and adds to the growing evidence on the link between corporate governance and the firm's performance. The second essay, which looks at the role of corporate governance in predicting bankruptcy, sits in the middle of the two research themes of this thesis. Corporate governance is related to bankruptcy in two ways: its impact on how the firm is managed and how agency issues are mitigated, and its role in reducing information uncertainty through improving the quality and quantity of information disclosed, which prevents the masking of the true state of the firm's financial health. The third essay falls within the second theme, as it examines the role of corporate governance in influencing investors' responses to earnings announcements through its role in reducing information uncertainty and improving reliability of firms' disclosures. The essay also examines whether this

role extends to one of the most persistent market anomalies, post-earnings announcement drift (PEAD).

To summarise, the studies included in this thesis examine the role and characteristics of the firm's corporate governance framework from two main angles: its impact on the firm's value and returns, and its role in impacting the firm's information environment. While the results from the first study confirm the important role played by the firm's governance mechanisms in determining its value and returns, as well as its ability to access financing opportunities, the second study revisits this role by examining its impact on the firm's health. Further, the second and third studies share similar motivations regarding the role of the firm's governance framework in improving the firm's information environment and reducing uncertainty. The second study finds that weak governance can lead to misleading disclosures about the firm's poor financial health, and may thus prevent any intervention by the shareholders, causing further deterioration in the firm's health. In the third study corporate governance is seen as playing a part in influencing how investors perceive and respond to the firm's earnings announcements through its role in reducing information uncertainty.

The remainder of this thesis is organised as follows. The next chapter (Chapter 2) defines corporate governance and discusses its importance for modern corporations. It also provides an extensive general overview of the corporate governance literature. Due to the distinctive nature of each study included in this thesis in terms of literature, data and methodology, as well as the lack of much commonality between the individual studies, we have elected to not have dedicated chapters for each of the data and methodology sections; instead, we include those sections in the chapters of the individual studies. On that basis, we have allocated one chapter for each study (Chapters 3 to 5). The chapter for each study begins with a more focused introduction and literature review, followed by the research questions, and the data and methodology sections, and finishes with the results of the analysis followed by the concluding remarks. Chapter 6 provides a summary of the main findings of the three studies as well as the main contributions to the literature.

**Chapter 2: Literature review**

# **Chapter 2**

**Literature review**

## **2. Literature review**

### **2.1. What is corporate governance?**

In their seminal work, Berle and Means (1932) argue that the combination of dispersed shareholding and free-riding issues linked to the incentives provided to corporations' managers will eventually lead to the demise of the corporation as a viable form of organisation. More than eight decades since their work, the corporate structure is still considered the most viable option available in the business world, but this does not come without several major drawbacks. Although the corporation has so far prevailed in the battle against other forms of organisation, it has not yet managed to eliminate the different forms of agency costs arising from the ownership-management separation (Jensen and Meckling, 1976). Jensen and Meckling define agency costs as the costs that the principals (e.g. shareholders) incur as a result of appointing agents (e.g. managers or directors) to act on their behalf. Their definition of agency costs includes costs incurred to monitor agents, incentives provided to ensure the alignment of the interests of the principals and the interests of the agents, and any residual losses to the principals from the agents' utility-maximising actions. Jensen and Meckling (1976) claim that the level of agency costs depends on several factors, such as the regulatory environment and the roles of various human factors in devising contracts and providing incentives.

The issue of the agency costs in the modern organisation has given rise to corporate governance mechanisms as essential means to bridge this gap and to reduce the effect of such costs on the corporation. The Cadbury Committee (Cadbury Report, 1992, para. 2.5) defines corporate governance as "the system by which companies are directed and controlled". Another well-known description of corporate governance is provided by Shleifer and Vishny (1997, p. 737) who refer to corporate governance as "the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment". Both definitions focus on the protection of shareholders' interests against the executives' self-interests, which has been the primary focus of numerous studies in corporate governance during the last several decades.

The firm's corporate governance framework consists of interrelated and interlinked external (country-level) and internal (or firm-level) mechanisms that influence and control the relationship between the firm's management and shareholders, and as a result define the way the firm is managed and operated. The internal governance mechanisms are "those that result from the

decisions and actions of the shareholders and the board” (Brown et al., 2011, p.111), such as the structure and composition of the board and the firm’s ownership and compensation structures. The external governance mechanisms are those related to outside forces, such as: national or regional regulations, external auditors and analysts and the market for corporate control. The different mechanisms are discussed in later sections.

## **2.2. Why does corporate governance matter?**

As highlighted earlier, the separation between ownership and management in contemporary organisations creates a number of challenges with regards to ensuring the alignment of the interests of the two groups (Jensen and Meckling, 1976). Agency theory highlights the possibility that the managers of a corporation may use every opportunity to maximise their self-interest, which normally comes at the expense of the real owners of the entity (Jensen and Meckling, 1976). The owners, who bear the financial risks without being involved in the daily operations of the firm, are exposed to the presence of self-serving managers who manage the owners’ firm without bearing any of the financial risks. Due to bearing virtually none of the financial risks associated with the firm’s failure, the firm’s management may be motivated to pursue activities that would serve their own interests and maximise their personal wealth at the expense of the shareholders’ wealth and interests, a problem otherwise known as the moral hazard problem (Jensen and Meckling, 1976). Managerial actions related to agency issues and the moral hazard problem include: shirking responsibilities, over-compensation, empire building, and focusing on short-term gains rather than long-term value maximising goals. Such actions increase agency risk and can be detrimental to the firm (Jensen, 1986; Jensen and Meckling, 1976). Additionally, the dispersion in the ownership of today’s corporations reduces both the incentive and the power of each shareholder to monitor and control the actions of the managers. This indicates an urgent need for a framework to align the interests of the firm’s shareholders and managers, and it justifies the application of a range of corporate governance mechanisms (Fama and Jensen, 1983). For example, the strong scrutiny and monitoring of managers’ actions provided by effective and strong boards will likely prevent the initiation of value-destroying projects or acquisitions by the firm’s managers (Jiang et al., 2016). Strong boards will also design compensation schemes that focus on the long-term benefits to the shareholders rather than the short-term gains of the managers (e.g. higher equity-based portion of total compensation) and will be more effective at replacing underperforming managers.

Furthermore, active investors play an important role in disciplining managers through board decisions as well as various market actions (e.g. selling/buying shares, mergers and acquisitions).

Stronger governance mechanisms also help reduce uncertainty and information asymmetry through a range of means, such as: increasing voluntary disclosures (Beekes and Brown, 2006; Beekes et al., 2016), enhancing the quality of information (Bhat et al., 2006; Cai et al., 2006; Elbadry et al., 2015), and improving the reception of a firm's announcements (Kanagaretnam et al., 2007), among others. This not only improves our ability to value the firm and assess the performance of its management, but also reduces the risk of misrepresenting the true conditions of the firm. Such misrepresentations enabled struggling firms such as Enron or WorldCom to continue to appear healthy through the manipulation of accounting and financial data. Such manipulation of the firm's results masks its actual situation and allows the firm's management to continue its operations without any discipline or intervention by the different stakeholders (e.g. owners, creditors). The role played by corporate governance in improving the firm's informational environment allows the different stakeholders to undertake earlier and more prompt actions to discipline the firm's management and potentially achieve a turnaround in order to save the firm from failing or going into financial distress.

Overall, the role of corporate governance mechanisms in controlling agency issues such as those identified by Jensen and Meckling (1976) and others have been long acknowledged by shareholders and various groups including academics, analysts and regulators. In the last four decades, the role of corporate governance practices in reducing agency issues, as well as their effect on firms' valuations and performances has been a major research area for academics and practitioners. Corporate governance practices have also been a major concern for investors and regulators in recent times due to the detrimental effects that the failure of these mechanisms has on financial markets, economic activity and society as a whole. Furthermore, market regulators and law makers around the world have been looking at different ways to strengthen governance practices in corporations in order to restore faith in financial markets and reduce the likelihood of the occurrence of corporate scandals in the future. These efforts have resulted in the introduction of corporate governance codes and guidelines in many countries.

### **2.3. Structure of the review of past literature on corporate governance**

A considerable amount of research has been done on corporate governance and its impact on the firm's performance and valuation. The next few sections provide a general review of the corporate governance literature in order to introduce the reader to the various elements of the firm's corporate governance framework (internal and external) as well as the theory behind them, while discussing relevant empirical findings. This chapter provides the basis for the literature reviews presented before each essay in the upcoming chapters. For instance, the discussion in this chapter of the various internal and external governance mechanisms sets the scene for the literature review preceding our first essay which studies the relationship between country-level or external factors and firm-specific or internal factors in determining the characteristics of the corporate governance framework in each country. Also, the discussion in this chapter regarding the relationship between corporate governance and firm performance represents an important introduction to the literature leading to our second essay which looks at the role of corporate governance variables in improving the predictive power of bankruptcy prediction models. Finally, the discussion regarding the relationship between the various corporate governance mechanisms and firm valuation and information disclosure provides a basis for the discussion of the literature preceding our last essay which examines the potential role of corporate governance mechanisms in influencing investors' initial and subsequent reactions to earnings announcements.

In line with the established classifications in the literature, we split the discussion of the literature into internal (or firm-level) and external (country-level) corporate governance mechanisms. In the internal mechanisms discussion we divide our category further into three sub-groups of mechanisms: ownership structure, board structure, and compensation structure, while in the discussion of the external mechanisms we divide our category into four subgroups, which are: legal systems and national institutions, media and journalism, cultural and social factors, and market and product competition.

#### **2.3.1. Internal governance mechanisms**

As mentioned earlier, the firm's corporate governance framework consists of a combination of external (country-level) and internal (or firm-level) mechanisms. The internal governance mechanisms are specific to the firm and arise as a result of the actions of its shareholders and its board. The internal governance mechanisms identified in the literature can be divided into three

main groups: ownership structure, board structure and compensation structure. The first group of internal mechanisms includes the roles played by the various types of investors (e.g. institutions, blockholders, active investors) in determining the firm's governance framework, while the second group of mechanisms covers the role of the characteristics and composition of the board and its committees in governing the firm. The last group comprises the different incentives given to the firm's executives and board members to align their interests with those of the shareholders. The next sections will examine the relevant corporate governance literature with regards to each of these three groups of mechanisms.

### **2.3.1.1. Ownership structure**

The composition of a corporation's ownership contributes to its value and performance through the direct and indirect influence that the different types of owners have over how the corporation is operated. Research in this area has focused on how each category of owners (e.g. blockholders, institutions, insiders) influences the firm's value and performance and how this effect changes at different levels of ownership. A large number of studies have also looked at the nature of the interactions between the different owners in an attempt to arrive at an optimal combination of owners that reduces agency issues and protects the interests of both debtholders and shareholders.

#### **2.3.1.1.1. Insider ownership**

In an influential work, Jensen and Meckling (1976) claim that a manager who owns 100% of a firm will bear a welfare loss due to his highly concentrated position and thus may be willing to incur some costs (e.g. selling equity stake at a discount) in order to reduce his exposure, giving rise to agency costs (i.e. monitoring) in the process. Jensen and Meckling suggest that the reactions of the bondholders and the stockholders to these agency issues will cause the owner to incur large wealth losses as he continues to reduce his holdings at a deeper discount due to the rise in monitoring costs. Empirically, Morck et al. (1988) find a significant monotonic relationship between board and managerial ownership and firm valuation using Tobin's Q as a proxy. The results of their study suggest that the value of the firm increases as the level of managerial and board ownership rises from 0% to 5% due to the convergence of the interests of the managers and directors with those of the shareholders. As the holdings of these managers and directors increase beyond the 5% level, they become more entrenched in the firm and thus their interests may start to diverge from the shareholders' interests, causing the firm's value to decrease. However, Morck

et al. further show that the value of the firm will start to increase beyond the 25% level of ownership as the interests of the managers and the directors again start to converge with the interests of the shareholders due to their high stakes in the firm. McConnell et al. (2008) examine stock price responses to announcements of changes in insider ownership levels and find a similar relationship between firm value and insider ownership levels. Moreover, Stulz (1988) finds that firm value will increase initially before it decreases as insider ownership levels move beyond certain levels. In contrast, Cui and Mak (2002) document the presence of a W-shaped relationship rather than a monotonic relationship between managerial ownership and Tobin's Q in firms with a high research and development component.

In a more comprehensive study with regards to classes of owners, McConnell and Servaes (1990) find a strong curvilinear relationship between insider ownership and Tobin's Q where the relationship is strongly positive up to 40–50% ownership levels and slightly negative after that (see also Hermalin and Weisbach, 1991). Further, in line with Pound's (1988) efficient-monitoring hypothesis, they also find evidence of the presence of a positive relationship between Tobin's Q and institutional ownership. However, their study finds no evidence of any association between block ownership levels and Tobin's Q. McConnell and Servaes argue that their conclusions cannot be explained by the presence of a potential endogeneity bias. They point out that although insiders are more likely to increase their holdings of highly valued firms, thus supporting endogeneity concerns, this does not explain the second part of the curve where higher ownership levels are associated with lower firm value. More recently, Bhagat and Bolton (2019) found that higher ownership levels by the firm directors are almost always related to better future performance. They also report a significant negative relationship between director ownership levels and risk taking in financial firms.

In a study that examines the endogeneity issue in the relationship between ownership and firm value, Cho (1998) finds that using simultaneous regressions rather than the ordinary regression models yields findings that contradict those of prior studies (e.g. Hermalin and Weisbach, 1991; McConnell and Servaes, 1990; Morck et al., 1988). Cho's results suggest that the ownership structure is determined by firm value, and not the reverse. In a supporting study, Demsetz and Villalonga (2001) find that the ownership structure is an endogenous rather than an exogenous variable, and thus has no influence on firm performance or valuation. Furthermore, Demsetz and

Villalonga argue that the market for corporate control plays a pivotal role in determining the most suitable ownership structure for each firm based on its characteristics. They also argue that the market responds to forces that contribute to the creation of the optimal ownership structure in each firm, which consequently removes any relationship between performance and ownership. Additionally, Himmelberg et al. (1999) report that after controlling for fixed effects and known firm characteristics, no significant relation between firm performance and managerial ownership exists.

In contrast to the findings of Cho (1998), Demsetz and Villalonga (2001) and others, Fahlenbrach and Stulz (2009) find that when using the change in Tobin's Q and a lagged managerial ownership measure to account for potential endogeneity issues, the causal relationship between ownership and value persists. The results of their study show an asymmetrical relationship between changes in managerial ownership and Tobin's Q as a large increase in ownership leads to an increase in Tobin's Q but not vice versa. Fahlenbrach and Stulz suggest the asymmetric relationship is caused by the fact that managers tend to own highly concentrated positions in the firm when it starts due to financing constraints, but as the firm grows the managers diversify their ownership interests using strategies that avoid jeopardising the firm's value. They also suggest that when managers buy shares in the firm they are more likely to pursue policies that benefit minority shareholders unless they have accumulated enough stake to entrench themselves. Similarly, Benson and Davidson (2009) confirm the presence of a strong inverted U-shaped relationship between managerial ownership and Tobin's Q, even after controlling for endogeneity. Benson and Davidson contend that this shape is explained by the alignment of interests between shareholders and managers when managers' ownership levels are low and by managers' aversion to risk at higher levels of ownership. In a study of public firms in the United Kingdom (UK), Short and Keasey (1999) confirm the presence of a non-linear relationship between firm performance and managerial ownership, in line with what has been observed in the United States (e.g. Hermalin and Weisbach, 1991; Morck et al., 1988). However, they find that in comparison to US managers, the entrenchment of UK managers occurs at higher levels of ownership due to their having less freedom to establish takeover defences as well as the likelihood of more coordinated monitoring by institutional shareholders in the UK.

Another view of the relationship between managerial ownership and firm value is provided by Davies et al. (2005) who argue that the relationship is co-deterministic. The results of their study suggest that the relationship between managerial ownership and firm value has two humps (M-shaped) rather than one hump as shown in other studies (e.g. Hermalin and Weisbach, 1991; McConnell and Servaes, 1990; Morck et al., 1988). Davies et al. further claim that the second hump, which occurs at or around the 50% level of managerial ownership, is caused by the failure of external market controls due to the managers' ability to marginalise such mechanisms at these levels of ownership. However, as the stakes of the manager increase beyond the 50% level, his or her interests will again converge with those of the shareholders due to their ownership of a majority stake in the firm. Moreover, Core and Larcker (2002) argue that firms with relatively poor performance could employ managerial ownership plans as a way to incentivise managers to improve firm performance. They point out that for some firms, the benefits from these actions would outweigh the associated costs to the extent that such actions could be worth pursuing. An empirical test of this argument revealed that two years after the adoption of target ownership plans, firms with low managerial ownership and low stock returns experienced a substantial increase in managerial ownership, coupled with a significant increase in accounting returns. In clear support to the above argument, their results also show significant excess stock returns only six months after the plan was adopted.

To sum up, while findings in the literature on the relationship between insider ownership and firm value and performance seem to be mixed, especially with regards to the form of the relationship, the vast majority of prior research confirms the presence of such relationships. Prior research also confirms that such relationships are nonlinear and take different forms (e.g. M-shaped, U-shaped) as a result of the changes in managers' behaviour as their ownership levels change. Furthermore, earlier concerns about the endogenous nature of such relationships have been addressed by several later studies that confirm the presence of such a relationship even after controlling for endogeneity (Benson and Davidson, 2009; Core and Larcker, 2002). Basically, at low ownership levels, the increase in insider ownership leads to a higher firm value or performance as a result of the increased alignment of interests between the shareholders and the managers which reduces the effect of agency issues. However, as the managers become more entrenched due to their higher ownership levels, their interests may start to diverge from those of the shareholders for reasons such as higher risk aversion or lack of effective external controls at these ownership levels. This

causes the relationship to invert, as managers start to pursue their own interests rather than those of the shareholders. Nevertheless, as managers continue to increase their ownership levels further, their interests again converge with those of the shareholders, which brings back the positive association between ownership and firm value or return. At high managerial ownership levels, the interests of the managers and the shareholders are more aligned due to managers' high exposure to the firm, which forces them to behave more like principals than agents. This reduces agency issues. The ownership levels at which the nature of the relationship changes, or the turning points, vary based on various external factors (e.g. the regulatory environment, the market for corporate control) and internal factors (e.g. presence of institutional owners, high research and development component) ( Cui and Mak, 2002; Hermalin and Weisbach, 1991; Morck et al., 1988; Short and Keasey; 1999).

#### **2.3.1.1.2. Institutional and block ownership**

The roles of institutional investors and blockholders have also attracted major attention in the literature. In their influential work, Shleifer and Vishny (1986) suggest that it might not be worthwhile for owners of small stakes in a firm with dispersed ownership to incur the total costs of monitoring the firm's managers due to their relatively insignificant individual interests. This may lead to the presence of the well-known 'free-rider' issue, whereby small investors free ride on the gains of the monitoring and control expenditures by the larger investors. Shleifer and Vishny argue that as a result of these benefits, small investors may be willing to change the firm's policies in order to attract and retain the larger investors. While large institutional shareholders tend to be better equipped to monitor and challenge managers' actions than most small individual investors, Shleifer and Vishny claim that the level of monitoring provided by large shareholders is largely dependent upon the additional utility that these shareholders expect from such actions. In a related empirical work, Smith (1996) finds evidence that shareholder activism by large institutional shareholders (in this case the California Public Employees' Retirement System) was largely successful in improving governance structure, which in turn has resulted in significant wealth gains for all shareholders. Nevertheless, Burkart et al. (1997) argue that even when strong monitoring by large shareholders might bring some ex post benefits, it might represent an ex ante threat that reduces managers' initiative. They also claim that the presence of monitoring mechanisms such as concentrated ownership might reduce the effectiveness of incentive-based compensation schemes. These arguments are indirectly supported by the findings of Duggal and Millar (1999) who study

the role of institutional investors in takeovers and find that the presence of such investors does not improve efficiency in the market for corporate control. They also find that no relationship exists between bidder gains and institutional ownership.

While many firms tend to have one influential major shareholder, a large fraction of the remaining firms tend to have multiple active major shareholders. The interactions between these major shareholders and their effect on firm's performance and valuation were the focus of several recent studies. In a sample of Finnish listed firms, Maury and Pajuste (2005) report positive effects on firm value as the voting power became more equally distributed among the large blockholders. Their results were more significant in family-controlled firms, implying that the presence of another powerful blockholder might prevent private benefit extraction in these firms (see also Attig et al., 2008). Moreover, Cornett et al. (2007) confirm the existence of a significant positive relationship between operating cash flow returns and both the percentage of institutional ownership and the number of institutional investors. Their results, however, indicate that the significant relationship between operating cash flow returns and the number of institutional investors is largely limited to firms where no business relationship exists with these institutions. This suggests that the monitoring roles of these shareholders may be negatively affected by their business dealings with the firm. Conversely, Laeven and Levine's (2008) study of European firms finds a negative connection between firm value and dispersion of cash-flow rights among multiple large shareholders. They find that this relationship becomes stronger when the categories of these shareholders are dissimilar. According to Laeven and Levine, this observation could be explained by the fact that the investors may not consider shareholder protection laws as strong as they would like them to be, and thus the dispersion of cash-flow rights hurts the firm more than it benefits it.

Using a new panel dataset to track all unique blockholders in large US public firms, Cronqvist and Fahlenbrach (2009) document the presence of a statistically and economically significant positive influence by blockholders on firm policies and performance. Their results further suggest that the investment and governance styles of blockholders, and their influence on firm's performance, may differ based on the blockholder's category (e.g. other firms, pension funds, individuals). Furthermore, Elyasiani and Jia (2010) report that institutional ownership stability has a strong positive relationship with firm performance. Elyasiani and Jia claim that this influence is exerted by reducing information asymmetry and improving incentives in executive compensation. These

findings support the proposition that the presence, as well as the stability, of institutional ownership levels are beneficial to the firm and its shareholders. Additionally, through analysing Swiss listed firms, Casado et al. (2016) find that conflict between large shareholders leads to the adoption of better governance structures and provides more protection to all shareholders. According to Casado et al., this is because a large shareholder in a firm with at least one other large shareholder has an interest in improving the governance mechanisms in the firm in order to prevent the other large shareholders from extracting any private benefits. Additionally, Cai et al. (2016) report that for Chinese firms, the greater the differences in the holding levels of the large shareholders, the more positive it is for the firm as it prevents large shareholders from colluding. They argue that similar holding levels may facilitate complicity between large shareholders at the expense of minority shareholders and other stakeholders. Further, Paniagua et al. (2018) report the presence of a negative relationship between ownership dispersion and the firm's performance in an international sample of firms from 59 countries.

To summarise, the roles played by several key shareholders and their influence on the firm's value and performance have been the focus of numerous studies in the last few decades. Many studies have found strong positive relationships between institutional and blockholder ownership levels and firm value and performance (e.g. Burkart et al., 1997; Cornett et al., 2007; Elyasiani and Jia, 2010; Smith, 1996). The monitoring role played by these sophisticated and powerful investors brings more discipline to the firm and reduces the probability of private rent extraction. The findings of these studies seem to be sensitive to various factors such as the types of major investors involved and the dispersion of ownership among them (e.g. Cronqvist and Fahlenbrach, 2009; Laeven and Levine, 2008).

Overall, a firm's ownership structure is believed to be a significant corporate governance mechanism that may replace or complement other governance mechanisms (e.g. Casado et al., 2016; Pergola and Joseph, 2011). Since the influence of ownership structure is primarily manifested in the firm's governing policies and board structure, we next review board structure variables that contribute to a firm's value and performance. We also recognise the effect that the structures of both ownership and board have on compensation practices in our section on compensation structure.

### **2.3.1.2. Board structure**

As representatives of the shareholders and their interests, members of the board of directors are responsible for monitoring managers' actions and for ensuring the alignment of interests between shareholders and managers. As a result, numerous studies have examined the role of the board composition and the unique characteristics of board members in improving board's monitoring powers. In general, board members would delegate management responsibilities to expert managers while retaining control of other powers such as approving strategic decisions as well as hiring, firing and deciding on the compensation of these managers (Fama and Jensen, 1983). Fama and Jensen (1983) argue that the expertise as well as the informational advantage possessed by the internal members of the board (i.e. senior managers) can give them significant control over the board. They point out that a board cannot be considered an effective governance mechanism unless it is able to control the influence of these senior managers and thus reduce or eliminate self-dealing behaviour.

#### **2.3.1.2.1. Board independence**

Although the board benefits from the expertise and information provided by its internal members, the presence of external directors helps to reduce conflicts between internal members and it helps the board make effective decisions about compensation schemes (see also Boone et al., 2007; Raheja, 2005). External board members also bring outside expertise and knowledge which can complement the skills of the internal members. Fama and Jensen (1983) claim that external directors' incentives to develop reputations as decision experts prevents any potential collusion with the senior managers (see Yermack, 2006). Empirically, Baysinger and Butler (1985) examine the relationship between the proportion of independent board members and firm performance in US firms during the 1970s and find that firms with more independent boards had achieved better performance. Baysinger and Butler also point out that no universal optimal level of board independence exists. They contend that the ideal level of board independence for any firm is largely dependent upon its unique characteristics and the industry in which it operates. Moreover, Weisbach (1988) reports a significant negative relationship between firm performance measures and CEO turnover in firms with outsider-dominated boards, while firms with insider-dominated boards showed no relationship between these two variables. These results lend support to the argument that outsider-dominated boards are more effective in monitoring senior managers' activities, and they are therefore more likely to fire unsuccessful ones. In a related study,

Rosenstein and Wyatt (1990) find that although most firms in their sample had outsider-dominated boards, the effect on firm value from adding an extra external director to its board was still positive and significantly so.

In a sample of 142 US firms, Hermalin and Weisbach (1991) find no evidence of the presence of any association between the proportion of outsiders on the board and firm performance. However Hermalin and Weisbach point out that these results may be explained through the argument that there are some positive outcomes from appointing both types of directors, and hence it will be hard to capture the differences in the effect that either type has on firm performance. Using a sample of tender offer bids, Byrd and Hickman (1992) document that bidding firms with outsider-dominated boards report significantly higher abnormal returns on the announcement date than other bidders. However, the relationship between the proportion of outside directors on the board and abnormal returns is nonlinear, indicating that it is possible for a firm to have too many outsiders on its board. Moreover, Chhaochharia and Grinstein (2009) find that the application of new rules requiring US listed firms to have more independent boards and committees have resulted in a significant decrease in CEO compensation in firms which previously had less independent boards, suggesting there is less potential for rent extraction by senior managers as the boards become more independent. Furthermore, Gupta and Fields (2009) report that the resignation of an outside director seems to send a more negative signal to the market than the resignation of an insider. Gupta and Fields state that this negative signal is weaker when institutional ownership levels are high and stronger when insider ownership levels and CEO compensation are high. Using board voting data in a sample of Chinese firms, Jiang et al. (2016) report that independent directors who are concerned about their careers and reputations are less likely to worry about confronting the firm's management through voting against their proposals (also see Levit and Malenko, 2016). They also report that such compliant behaviour leads to the dissemination of value-relevant information and is rewarded in the marketplace by more external directorships and a lower possibility of regulatory actions. Overall, there appears to be a general agreement in the literature on the benefits that a firm can extract from increasing the number of external directors on its board. Boards with more external directors tend to be less subject to the influence of insiders, and thus they provide more effective monitoring of the management's actions. Furthermore, as highlighted earlier, external directors tend to bring an additional set of knowledge and expertise, which can

complement those of the internal directors and improve the decision-making process within the board.

#### **2.3.1.2.2. CEO-chairman duality**

A fair number of studies have looked at the duality issue where the CEO of a firm is also the chairman of its board, which leads to a considerable concentration of power in one individual. The argument about whether or not duality is harmful for the firm is yet to be settled. On one hand, Baliga et al. (1996) were unable to find any significant evidence that moving away from duality had any positive effect on the firm's short-term operating performance. Similarly, Brickley et al. (1997) find that in most large firms the costs of separating the two titles are greater than the benefits. They also find little evidence that duality causes managerial entrenchment in large firms. Brickley et al. argue that many firms employ duality as a succession plan and use the title as a reward to a successful CEO.

On the other hand, Goyal and Park (2002) find that duality reduces the board's ability to monitor managers' actions and fire those that underperform. Their results show a significantly lower correlation between CEO turnover and firm performance in firms where the same person holds the titles of CEO and chairman. Moreover, Adams et al. (2005) find a strong association between measures of CEO power (such as duality) and volatility in stock returns. Further, Dey et al. (2011) find that the separation between the titles of CEO and chairman improves the board's monitoring ability, which reduces the need for other controlling mechanisms such as an incentive-based compensation. However, although the results lend some support to the argument against CEO-chairman duality, Dey et al. argue that the leadership structure in any firm is the result of the economic environment and the unique circumstances that each firm faces, and thus one cannot assume that CEO duality is bad for all firms. In general, while there seem to be some costs arising from the separation of CEO and chairman roles (Brickley et al., 1997), the evidence suggests that the separation reduces the CEO's influence on the decision-making process and improves the board's monitoring powers (Goyal and Park, 2002).

#### **2.3.1.2.3. Board size**

The size of the board of directors has also attracted a large amount of attention in the literature due to its role in determining the effectiveness of the communication and decision-making processes within the board itself. Yermack (1996) find a negative relation between board size and Tobin's Q

in a sample of large US industrial firms. Yermack reports that firms with smaller boards tended to have better performance as well as more effective monitoring of their CEOs through various compensation and dismissal threats. This is in line with the arguments of Lipton and Lorsch (1992) and Jensen (1993) that larger boards tend to have issues with poor communication and ineffective decision-making which impede their monitoring roles. Extending Yermack's (1996) findings to smaller firms, Eisenberg et al. (1998) find a significant negative association between board size and firm profitability in a sample of small and mid-size Finnish firms (see also Mak and Kusnadi, 2005). In contrast, Boone et al. (2007) find a positive relation between board size and measures of firm complexity, suggesting that as the operations of firms become more complex, the net benefits of increased specialisation and monitoring brought by larger boards increase as well. Similarly, Coles et al. (2008) find that Tobin's Q increases as board size increases in complex firms and increases as board size decreases in simple ones. They also report that due to the increased counselling requirements of complex firms, these firms tend to have larger and more outsider-dominated boards. Likewise, Cheng (2008) finds that firms with larger boards tend to experience lower performance variability. Cheng states that this finding is explained by the fact that large boards require more compromises to reach agreement, and thus decisions taken by such boards tend to be less extreme, and this leads to lower variability in the performance of the firm. Further, Paniagua et al. (2018) document the presence of a negative relationship between board size and the firm's performance in an international sample of firms from 59 countries. Also, Ongsakul et al. (2021) find that firms reduce board size in the presence of higher economic policy uncertainty to mitigate the impact of increasing agency issues in this climate. On the whole, findings in the literature appear to confirm that smaller boards provide better monitoring and decision-making in simple firms and thus contribute to better performance, while complex firms appear to benefit from the additional expertise and knowledge brought by larger boards.

#### **2.3.1.2.4. Staggered boards**

Firms either have a unitary board in which all board members are up for re-election in every election cycle, or a staggered one (also called a classified board) where only a portion of board members are up for re-election in each election cycle. The latter board type makes it more difficult to remove incumbent board members and to take control of the board. Nevertheless, having a staggered board creates more stability by reducing the potential disruption brought by the frequent turnover of the whole board. Bebchuk and Cohen (2005) find that staggered boards have a negative

causal relationship with firm value. They also report that this relationship is more significant when shareholders do not have any powerful means to change staggered boards into unitary ones, such as when the classification of boards is included in the firm's charter rather than its bylaws (see also Cohen and Wang, 2013). Moreover, Gompers et al. (2003) find a strong positive association between staggered boards and other provisions that weaken shareholder rights. Furthermore, Faleye (2007) used a large sample of US firms to study the effect of board classification on the firm. Faleye's results show that classified boards entrench managers and reduce directors' monitoring effectiveness through protecting managers from market discipline, which in turn leads to the destruction of firm value. Additionally, Faleye (2009) refutes the argument that staggered boards improve independent directors' stability and continuity in firms by analysing these two indicators in a large sample of US firms using hand-collected data. The results show no difference in the stability or continuity of independent directors between firms with classified and unitary boards. Also, contrary to other studies, Faleye finds no support for the argument that staggered boards benefit complex firms. Nevertheless, Ahn and Shrestha (2013) find significant evidence that staggered boards may be beneficial to firms with high advisory needs and low monitoring costs. In line with other studies, their results also suggest that staggered boards are harmful to firms with low advisory needs and high monitoring costs. Ahn and Shrestha claim that the most plausible explanation for these results is that the advisory benefits gained from classified boards tend to outweigh the costs associated with such boards in the former group of firms. Overall, the evidence from the literature seems to support the idea that staggered boards are less effective at monitoring the actions of the firm's management and thus are linked to lower firm performance and value. However, the evidence from the literature seems to disagree on whether staggered boards can be beneficial for firms with more complex operations.

#### **2.3.1.2.5. Multiple directorships**

An individual's holding of multiple directorships, or what is called director busyness, may be a sign that a director will be ineffective due to a lack of time. Adams et al. (2010) point out that director busyness could also be a sign of the high quality of the director. Fich and Shivdasani (2006) report that firms in which most external directors each hold three or more directorships (i.e. busy directors) had weak corporate governance characteristics. In general, these firms had inferior market-to-book ratios, poor profitability, and weak links between CEO turnover and firm performance. Fich and Shivdasani also report a positive effect on stock price upon the departure

of a busy director. They also find a negative effect on stock price as more directorships are acquired by the 'busy' director. Furthermore, Adams and Ferreira (2008) document that busy directors tend to have attendance issues, which means that these directors spend less time in each firm compared to other directors. This finding is further supported by Jiraporn et al. (2009) who also report that neither higher ownership levels nor monetary compensation seems to improve the situation. In a sample of more than 1400 firms, Jiraporn et al. (2009) find evidence that busy directors participate in less board committees. They also report that the likelihood of serving in the audit or compensation committees decreases as the number of directorships held by the director increases. Studying the effects of mergers and acquisitions, Ahn et al. (2010) report that acquirers with more busy directors exhibit more negative abnormal returns after an acquisition. Nonetheless, they point out that this effect is only observed after the number of external directorships exceeds a certain threshold, suggesting that busy directors only permit value-destroying acquisitions when they become very busy with other directorships. To summarise, prior findings support the argument that the effectiveness of external directors on the board diminishes as they acquire more external directorships which causes them to devote less time to each firm. This has resulted in a negative relationship between firm value and performance and the busyness of external directors.

#### **2.3.1.2.6. Summary**

The structures and characteristics of boards have attracted major attention in the literature. First of all, a large number of studies have documented positive effects of board independence on firm value, operating performance and the sensitivity of CEO turnover to performance (Baysinger and Butler, 1985; Boone et al., 2007; Raheja, 2005; Rosenstein and Wyatt, 1990; Weisbach, 1988; Yermack, 2006). Secondly, findings in the literature on CEO-chairman duality seem to be mixed. While some studies find that the separation costs are larger than the benefits gained (Baliga et al., 1996; Brickley et al., 1997), others argue that the duality weakens the board's monitoring powers and reduces the likelihood of firing underperforming managers (Adams et al., 2005; Dey et al., 2011; Goyal and Park, 2002). Thirdly, many studies have found a negative relationship between board size and firm value or performance (Eisenberg et al., 1998; Mak and Kusnadi, 2005; Yermack, 1996). This is supported by claims in the literature that larger boards tend to have issues related to poor communication and ineffective decision-making processes (Lipton and Lorsch, 1992; Jensen, 1993). Other studies, however, provide some support for the arguments that larger boards tend to take less extreme decisions and that they are beneficial for complex firms (Boone

et al., 2007; Cheng, 2008; Coles et al., 2008). Fourthly, staggered boards have been found to be harmful to firm value through contributing to managers' entrenchment and to reductions in the board's monitoring powers (Bebchuk and Cohen, 2005; Cohen and Wang, 2013; Faleye, 2007; Faleye, 2009). Lastly, several studies find a negative link between director busyness and one or more of: firm value, operating performance, membership on board committees and attendance (Adams and Ferreira, 2008; Ahn et al., 2010; Fich and Shivdasani, 2006; Jiraporn et al., 2009). Together, these findings suggest that the structure of the board plays a major role in determining its effectiveness in governing the firm and monitoring its management as well as its influence on other governance mechanisms (e.g. compensation structure). These findings also support the view that no single board structure is appropriate for all types of firms as the ideal board structure depends on the firm's needs and characteristics as well as the environment in which it operates. As highlighted earlier, both ownership and board structure play an important role in determining the firm's compensation policies. The importance of such policies stems from the incentives they provide to directors and executives to act in the shareholders' best interests. The next section discusses compensation and incentive mechanisms in detail.

### **2.3.1.3. Compensation structure**

Even in the presence of other monitoring and controlling mechanisms, compensation schemes play a major role in aligning the incentives of managers and directors with those of shareholders. Both the size and composition of a compensation scheme have been the subject of many studies in the last few decades. Abowd (1990) use a sample of 250 large US listed firms over a five-year period to study whether the sensitivity of managerial compensation to operating performance in one year is positively linked to the next year's operating performance. The results of the study show that an increase in managerial compensation by 10% due to good performance in one year is associated with an increase in after-tax economic returns (0.3–0.9%) and total shareholder return (4–12%) the following year. Moreover, Jensen and Murphy (1990) report that ownership of the firm's equity is the largest component of CEO performance incentives. Jensen and Murphy document an increase in the sensitivity of CEOs' pay and wealth to shareholders' wealth when considering the incentives generated by equity holdings. Also, they find no significant relationship between bonus levels and performance measures, suggesting that equity-based compensation may be the best way to ensure the alignment of interests in the firm. In regard to outsider directors, Yermack (2004)

report that more than half of the overall incentives offered to these directors come from changes in the value of equity-related holdings (stocks and options).

In a related study, Mehran (1995) finds that managers are motivated more by the form rather than level of compensation. His study reports the presence of a significant positive association between firm performance, represented by Tobin's Q, and return on assets, and the percentage of managers' equity-related compensation. Mehran observes a similar relationship between firm performance and the size of managers' equity holdings. Mehran further points out that firms with a majority of outsiders on their boards tend to favour equity-based compensation, whereas firms with high levels of insider or blockholding ownership tend to put less reliance on this type of compensation. Ryan and Wiggins (2004) report similar findings to Mehran (1995) and others, as their results show that firms with more independent directors and less influence of the CEO over the board tend to use more equity-based forms of compensation. Moreover, Bryan et al. (2006) report that the shift towards more equity-based compensation during the 1990s was caused by the increase in agency costs of equity due to the increased difficulty in monitoring firms. Datta et al. (2011) also find a significant positive relationship between equity-based compensation levels and an acquiring firm's stock return around acquisition announcements. Datta's results show that managers with higher equity-based compensation structures pay lower acquisition premiums, acquire firms with better growth prospects, and follow acquisitions that increase firms' risks.

In a more comprehensive attempt to explain the cross-sectional variation in CEO compensation, Core et al. (1999) find that CEOs' compensation levels tend to be higher in poorly governed firms. More specifically, they report that CEO compensation is positively correlated with several governance measures, including: board size, CEO-chairman duality, percentage of busy directors, percentage of directors beyond 69 years old, and percentage of directors indirectly influenced by the CEO. Core et al. argue that excess CEO compensation beyond the levels suggested by economic factors is mainly related to the firm's governance structure (see also Chhaochharia and Grinstein, 2009). Core et al. also report a negative association between excess compensation and the return-on-assets measure which remains significant for at least five years following the granting of the compensation. Similarly, Ozkan (2011) documents the presence of a negative (positive) relation between the pay-performance sensitivity of option plans and CEO tenure (institutional ownership levels) in a large sample of UK listed firms. Similarly, Brick et al. (2006)

report a negative relationship between firm performance and excess compensation to the CEO and the directors. Their results strongly suggest that excessive compensation to directors and CEOs is caused by cronyism or reciprocal back scratching. Matolcsy and Wright (2011) use a model based on firm characteristics to predict the firm's need to use cash or equity-based compensation schemes to reward its managers. The results of their model show that firms that do not have a compensation structure that matches their characteristics tend to exhibit low performance. Based on their finding, Matolcsy and Wright claim that both cash and equity-based compensations can be efficient when the compensation schemes are designed to be consistent with the firm's characteristics.

Overall, both the level and composition of the compensation schemes for firms' managers and directors play a significant role in aligning their interests with those of the shareholders and therefore in improving value and performance (see Abowd, 1990). Most studies in the literature have found a strong link between equity-based compensation and firm performance (Datta et al., 2011, Jensen and Murphy, 1990; Mehran, 1995; Yermack, 2004). Nevertheless, several studies have found that poor corporate governance structures may result in lower sensitivity of compensation to firm performance and value (Brick et al., 2006; Chhaochharia and Grinstein, 2009; Core et al., 1999; Ozkan, 2011). As with other internal governance mechanisms, findings in the literature suggest that firms need different compensation structures based on their characteristics and the environments in which they operate (Matolcsy and Wright, 2011).

#### **2.3.1.4. Summary**

While the different internal governance mechanisms appear to reduce agency issues and align the incentives of the managers with those of the shareholders, thus contributing to firm value and performance, the degree to which this happens is still debated. Past research has also shown some disagreement on the effect, positive or negative, of various mechanisms (e.g. CEO-chairman duality, board size) on firm value and performance. Many of these studies have linked these differences in findings to firm-specific needs and characteristics, which have been found to influence the firm's governance framework and its potential effect on firm value and performance. Furthermore, past research also confirms that governance mechanisms should be considered collectively as part of an overall governance framework rather than individually. Individual governance mechanisms do not work alone, but rather influence and get influenced by other governance mechanisms which affect their final impact on firm value and performance. In addition

to firm-specific characteristics, the firm's internal governance framework is also influenced by the environment in which it operates as well as several external governance mechanisms. After having reviewed the literature on three groups of the most-studied internal governance mechanisms, we turn next to reviewing the literature on the external mechanisms of governance. This sets the scene for our first study on the interaction between these two groups of mechanisms.

### **2.3.2. External governance mechanisms**

While each firm's internal governance mechanisms are unique and are directly determined by its shareholders and its board, the external governance mechanisms are determined by forces outside the firm (e.g. national traditions, legal frameworks, politicians) and tend to influence the governance of all firms operating within the same environment. The next sections examine the literature related to the different external governance mechanisms.

#### **2.3.2.1. Legal systems and national institutions**

Before the influential works of La Porta et al. (1997) and La Porta et al. (1998) most, if not all, studies in corporate governance focused on examining corporate governance practices in firms within one country. The seminal works of La Porta et al. opened the door for many later studies on international comparisons between corporate governance practices, investor protection and country-specific factors. La Porta et al. (1997) and La Porta et al. (1998) examine the laws and the enforcement status of legal rules related to investor protection in a diverse sample of 49 countries. The results of their investigation show that common law countries (e.g. the US and the UK) tend to provide far better investor protection than French-civil-law countries (e.g. France and Italy). Their results also show that the level of investor protection provided by German-civil-law (e.g. Germany and Japan) and Scandinavian (e.g. Denmark and Sweden) countries fall in between these two extremes. La Porta et al. (1998) show that, compared to laws with civil law origins, laws that have common law origins tend to have a significantly stronger focus on the protection of all investors and private property rights, especially in terms of protecting minority shareholders and ensuring stronger voting rights. These results suggest that shareholders or creditors will enjoy different levels and bundles of protection depending on the jurisdiction in which they operate and the particular security they hold. The results also show that law enforcement is strongest in German-civil-law and Scandinavian countries, followed by common law countries, and lastly French-civil law countries which have the weakest enforcement levels. Furthermore, Bebchuk and

Neeman (2010) argue that growing economies with large capital needs tend to have high investor protection in order to attract the capital needed to fuel growth (see also Castro et al., 2004). In a related study, Giannetti (2003) find that firms with volatile returns or high intangible asset components that are operating in countries with good creditor protection have better access to bank loans than equivalent firms in countries with weak creditor protection. Moreover, Wurgler (2000) documents the presence of a positive association between the protection of minority shareholders and the efficiency of capital allocation and finds that investments in underperforming industries are limited by these protection mechanisms.

Furthermore, La Porta et al. (1998) find that countries which have poor investor protections tend to introduce mechanism which are intended to compensate for this lack. These mechanisms include: legal rules such as mandatory reserves and reserve requirements and robust accounting standards (see also Denis and McConnell, 2003). With regards to ownership concentration, the results suggest that the presence of strong accounting standards and good investor protection leads to lower ownership concentration levels, and vice versa. La Porta et al. (1998) also point out that the adoption of such mechanisms is more apparent in civil-law countries where investor protection is the weakest. La Porta et al. (2000) argue that using measures of investor protection is a better way to explain differences in corporate governance practices across different jurisdictions than applying the usual market-versus-bank arguments. La Porta et al. also argue that the protection of outside investors must not be left completely to the market but rather instituted and safeguarded by courts and official authorities. They further claim that major corporate governance reforms in some territories are likely to bring significant benefits.

In a study examining 14 emerging markets, Klapper and Love (2004) find that good governance scores are significantly and positively correlated with measures of value and performance, and that this correlation is more significant in countries with weaker legal systems. This suggests that the absence of sufficient protection by the legal system gives rise to the role of corporate governance practices as another source of protection. Klapper and Love further argue that although firms may be able to significantly improve shareholders' rights and the protection of minority investors by adopting stronger governance mechanisms, these mechanisms cannot fully replace the role of the country's legal system in protecting investors' interests. In another study of emerging markets, Chen et al. (2009) find evidence that firm-level governance is negatively related to the cost of

equity capital, and that this relationship tends to be more significant when country-level investor protection is weak. This suggests that firm-level governance and country-level protection could act as substitutes for each other in regard to reducing the cost of equity in these markets. Chen et al. also report that other surveys have found that investors are more likely to pay a premium to acquire the shares of better-governed firms in markets with weak investor protection. Renders et al. (2010) reach similar conclusions after studying a large sample of European firms, as their results confirm the presence of a positive relationship between firm-level governance ratings and performance that is stronger in countries with less investor protection.

Doidge et al. (2007) report that in comparison to firm-specific factors, country characteristics explain a much larger amount of the variation in firm-level governance ratings across countries, suggesting that country characteristics are the most important determinants of a firm's corporate governance structure. They also document the presence of a complementary relationship between country-level and firm-level (i.e. corporate governance) investor protection mechanisms. In the same vein, Anderson and Gupta (2009) find that in any country, the legal system and its financial structure are equally important in determining the relationship between performance and overall corporate governance level. They also find that firms with similar corporate governance levels are valued more if they are operating under the combination of market-based/common law systems as opposed to bank-based/civil law systems. These results suggest that firms may be better off improving their governance levels only up to the levels required and rewarded by their financial and law systems, as any improvements beyond that level would be very costly for the firm. This also means that regulators should not mandate corporate governance changes in a country without considering the combination of these two systems first (see also Yoshikawa and Rasheed, 2009).

In another set of supporting results, Aggarwal et al. (2010) report that foreign firms in countries with less investor protection invest less in corporate governance than their US counterparts. This supports the argument that firm-level governance and country-level investor protection complement rather than replace each other. It also supports the hypothesis that underinvestment in governance is more related to country characteristics than it is to firm-specific factors. In a large sample of firms from 26 European countries, Essen et al. (2013) find strong evidence that country-specific institutions explain a significant amount of the variation in firm performance during a crisis (around 25%). They also find a positive relationship between firm performance and the

quality of the legal system as well as the level of protection of creditor rights in a country. As a result, Essen et al. claim that the effectiveness of firm-level corporate governance mechanisms is highly dependent upon the country-level environment and institutions. This is also in line with other findings in the literature regarding the important role played by public enforcement mechanisms as compared to private ones (Jackson and Roe, 2009). Furthermore, country-specific characteristics such as shareholder and creditor protection, as well as the legal system and enforcement quality, have been found to influence items such as firm cash holding levels (Dittmar et al., 2003) and earnings management practices (Leuz et al., 2003). Dittmar et al. (2003) argue that investors in countries with less shareholder protection have fewer means to force managers to disburse excess cash holdings. Additionally, Leuz et al. (2003) find a negative link between earnings management and investor protection levels, suggesting that higher investor protection reduces managers' ability to extract private benefits and thus provides less incentive for managers to misrepresent firm performance.

In summary, prior evidence in the literature suggests that legal and institutional protections play a major role as external governance mechanisms, and this explains a large part of the differences observed in firm-level governance practices across countries. Previous research supports the notion that common law countries (e.g. the US and the UK) tend to provide far better investor protection than civil-law countries (e.g. France and Italy). The results further suggest that the growth of local capital markets is directly related to the protections offered to investors through the legal system and national institutions. However, findings regarding the relationship between legal and institutional protections and firms' internal governance frameworks and their effects on firm value and performance seem to be mixed. While several studies report that firm-level governance complements legal and institutional protections (Aggarwal et al., 2010; Anderson and Gupta, 2009; Doidge et al., 2007), another group of studies find that firm-level governance substitutes for the absence of such protections (Chen et al., 2009; Klapper and Love, 2004; Renders et al., 2010). Nevertheless, the evidence suggests that firm-level governance cannot fully substitute for the absence of legal and institutional protections at the national level, and that a combination of both types of mechanisms is needed for a healthy capital market (Klapper and Love, 2004).

### **2.3.2.2. Media and Journalism**

Although the media's role as an important external corporate governance mechanism has only been recognised very recently in the literature, the media in their different forms have long been major providers of information for investors as well as important sources of scrutiny on the actions of managers and directors. Through analysing and spreading information about the firm and its actions, media outlets help educate and guide investors and other market players to arrive at more informed decisions. Additionally, the scrutiny provided by the public coverage of the actions of the firm's managers and directors, and the monitoring role played by investigative journalism, add another layer of control over the decision-making process within the firm. In an investigation into the role played by the press in monitoring and reporting accounting fraud, Miller (2006) finds that the press plays a major role by distributing information from different sources (analysts, auditors, and law cases) and by undertaking original investigations. Furthermore, Miller documents that the press was involved in the early detection of accounting fraud in almost one-third of the cases he studied. Furthermore, Dyck et al. (2008) find that in a sample of Russian firms, the increase in Anglo-American coverage of corporate governance violations due to investors' lobbying have led to the removal of these violations in many cases. Dyck et al. estimate that one article in the *Wall Street Journal* or *Financial Times* increases the chance of removing these violations by five percentage points, and they argue that this works by affecting the reputation of these firms abroad and by forcing local regulators to act. They claim, however, that the role played by the press in shaming firms for committing violations of corporate governance would not have any power without society's strong beliefs about how wrong these violations are. The fact that these beliefs are stronger in Anglo-American societies than in Russian society explains why the Russian press has failed to bring about a reduction in corporate governance violations by local firms. Furthermore, Bebchuk and Neeman (2010) argue that investor protection is more likely to be higher in economies where the media are active in exposing rent extraction attempts by insiders.

Core et al. (2008) examine more than 11,000 press articles about executive compensation published over an eight-year period and find that negative coverage is significantly related to excess pay levels rather than absolute pay levels. This implies that the media selects its stories using an analytical approach. However, their investigation finds little evidence to indicate the presence of any influence of negative coverage on compensation levels or CEO turnover. In the same vein, Bednar (2012) finds that media respond positively to the appointment of more

independent board members in a firm, suggesting that media reports value actions that are perceived to reduce agency issues. Also, Bednar finds evidence that media reports can influence CEO turnover and compensation as well as board composition. As a result, CEOs might try to defuse the impact of media coverage by undertaking actions that may be perceived to reduce agency costs. Bednar, however, points out that although these actions might appear to reporters as agency cost-reducing decisions, the true intentions of the CEO and the actual effects of these decisions may not match media's perceptions. Furthermore, Liu and McConnell (2013) analyse more than 600 value-reducing acquisition attempts in the period between 1990 and 2010 and find evidence that managers' reactions to the negative effects of price on the announcement day are related to the level and tone of media coverage. The results suggest the presence of reputational risk for managers from undertaking such acquisitions. This effect appears to intensify with the level and tone of media stories. Liu and McConnell argue that media can align the interests of managers and shareholders by forcing managers to abandon some of these acquisitions (see also Aguilera et al., 2015; Wiesenfeld et al., 2008).

Furthermore, Bednar et al. (2013) find evidence that in some cases negative media coverage of a firm indicates to its managers the need for a strategy shift. They also find that negative coverage is more likely to lead to a change when the firm's performance is weak or when the number of outsiders on the board increases. Moreover, media coverage can also promote corporate governance enhancements. For example, Lauterbach and Pajuste (2016) report that media coverage of a sample of European firms with dual-class shares helped reduce the wedge between equity ownership and control created by the presence of these two classes through increasing the likelihood of merging them. Lauterbach and Pajuste point out that this is achieved through the negative effect on value and reputation that negative media coverage brings, which in turn pushes the controlling shareholders to unify the classes. Similarly, Joe et al. (2009) document that boards that were classified as bad in a media outlet ranking were subject to major improvements in their structures following the publication of the rankings. Their results also show that individual investors responded to the publication of the rankings by putting a downward pressure on the prices of the firms with bad boards.

Westphal and Deephouse (2011) point out that journalists' roles in analysing and criticising weak performance may be greatly affected by CEOs' threats to limit or cut off communication following

the publishing of a negative story. They further argue that the threat of retaliation by a CEO may lead to the issuance of more positive reports in many cases. Wang and Ye (2015), however, find that even when media reports may be influenced by external factors such as state influence and censorship, the role of the media as a corporate governance mechanism remains significant. In their study of domestic media coverage of controlling shareholders in a sample of Chinese listed firms, Wang and Ye find evidence that negative media coverage results in negative effects on firm value. This indicates that media can punish controlling shareholders' misbehaviour through publicising such actions and influencing firm value. Furthermore, the results show that positive media coverage is not likely to result in an increase in firm value, suggesting that controlling shareholders would not be able to influence firm value through bribing or coercing journalists to publish positive stories. In another study on the Chinese market, Zhang and Su (2015) confirm the important monitoring role played by the media by documenting the presence of a negative link between the strength of media outlets in a district and levels of overinvestment in firms within the same district. Additionally, Zhang and Su find that this relationship becomes more significant when the internal governance mechanisms are weak, confirming that media coverage complements the role played by other governance mechanisms.

Overall, prior findings in the literature confirm the important role played by the media in scrutinising and disciplining the firm's managers and directors. In addition to its role in disseminating information to various investors, the media plays an important role in disciplining the firm's managers and directors through the threat of negative coverage and related reputational damage (Aguilera et al., 2015; Wiesenfeld et al., 2008). Furthermore, findings in the literature suggest that negative media coverage can push the firm to improve its internal governance framework and reduce agency issues to avoid further reputational damage (Bednar et al., 2013; Lauterbach and Pajuste, 2016).

### **2.3.2.3. Cultural and social environment**

The effectiveness and structure of firm-level corporate governance mechanisms and country-level investor protection are also highly influenced by the political environment and the cultural values prevailing in a country. Bebchuk and Neeman (2010) argue that investor protection is more likely to be greater in economies where investors are more educated financially due to their active role in forcing public officials to undertake decisions that increase such protection. They also argue

that in economies where a large proportion of the voters directly or indirectly hold shares in public firms, public officials will try to improve investors' protection out of fear of losing their votes if they fail to do so. To this effect, the influence that the general population has on the appointment of public officials, and the threat they pose to ineffective ones, determine to a large extent the degree of investor protection offered in different regulations. Furthermore, Stulz and Williamson (2003) find strong evidence that cultural differences in features such as language and prevailing religion play a significant role in explaining cross-country variations in investor protection. For instance, their results show that when compared to Protestant countries, Catholic countries have significantly weaker creditor and shareholder rights. Stulz and Williamson also show that higher openness to international trade reduces the influence of religion on the protection of creditors (see also La Porta et al., 1999). In the same vein, Licht et al. (2005) find that in comparison to legal families (e.g. civil or common law), prevailing cultural values and norms explain a larger portion of cross-country variations in corporate governance and investor protection. They also find evidence that cultural values persist in spite of any legal reforms, suggesting that culture may influence or even hinder reforms, and that this in turn impacts national corporate governance practices. Equally, Boytsun et al. (2011) studied the relationship between social norms and social cohesion using the different provinces of Ukraine as examples. The results of their study suggest the presence of a significant positive influence of strong social norms and social cohesion on firm-level corporate governance. Boytsun et al. point out that communities with stronger social norms and cohesion tend to reward good behaviour, or punish a bad behaviour, in a more efficient and effective manner, which influences the structure of firm-level governance positively.

Similarly, Licht et al. (2007) employ techniques and datasets from the field of psychology in another attempt to better understand the relationship between culture and governance. The results of their study show that cultures that emphasise autonomy (e.g. North American) rather than embeddedness (e.g. Asian) tend to value very highly the rule of law, non-corruption and democratic practices in a country. Licht et al. point out that many cultural profiles around the world are less compatible with 'good governance' practices as defined and accepted in the western European and North American cultures, suggesting that a 'one-size-fits-all' approach may not bring the desired results in all countries. Along the same lines, Estrin and Prevezer (2011) find that informal governance institutions in China and some parts of India compensate for the ineffectiveness of formal state institutions. Their analysis showed that in contrast, the informal

institutions in Russia undermine the effectiveness of the well-established formal institutions. Overall, the prior literature suggests that characteristics such as education, religion and local traditions play an important role in explaining variations in corporate governance practices across countries.

#### **2.3.2.4. Market and product competition**

To ensure their survival, firms operating in competitive environments are more likely to only appoint and keep highly trained and well-performing managers who are also expected to run the firms as efficiently as possible. As a result, corporate governance problems are expected to be less acute in firms operating in competitive environments (see Claessens and Yurtoglu, 2013). For instance, DeFond and Park (1999) find that CEO turnover levels were significantly higher in firms operating in highly competitive industries compared to firms operating in less competitive industries, suggesting less CEO power. They also report the presence of higher correlations between evaluation metrics and CEO turnover in highly competitive environments than in less competitive ones, suggesting that the CEOs of firms operating in highly competitive environments are more likely to be fired as a result of underperforming. Similarly, Fee and Hadlock (2000) studied the newspapers industry and report that more competitive markets had higher CEO turnover rates, and that these rates were higher for underperforming newspapers. Using a unique Canadian dataset, Baggs and De Bettignies (2007) find that competition for market and product share increases the pressure on managers to improve quality and operate more efficiently. They also find that the competition effect reduces the additional cost needed to provide managerial incentives in firms with more serious agency issues.

Giroud and Mueller (2010) report that firms in non-competitive industries experience a drop in their operating performance upon the passage of laws that reduce hostile takeover threats, whereas firms in competitive industries see no change to their performance. Giroud and Mueller claim that firms operating in competitive industries are less likely to suffer from increases in managerial slackness brought by reductions in takeover threats. Moreover, Tian and Twite (2011) document the presence of a substitution effect between internal governance mechanisms and market competition in a sample of Australian firms. More precisely, they find that the strong positive association between firm performance and internal governance mechanisms becomes weaker in firms operating in competitive industries, suggesting that competition substitutes for part of the

role played by internal governance mechanisms. Similar results were found in a sample of US firms by Chou et al. (2011) who report that the strong positive relationship between corporate governance quality and firm performance is largely limited to markets with weak competition, confirming the presence of a substitution effect between internal governance mechanisms and market competition.

#### **2.3.2.5. Summary**

Overall, many of the external governance mechanisms identified and examined in the literature are found to be important contributors to corporate governance practices across the world. The influential work of La Porta et al., as well as the studies following their studies, have contributed significantly to our understanding of how the different legal systems and country-level institutions shape corporate governance practices across countries and regions (see for example: Aggarwal et al., 2010; Doidge et al., 2007; Klapper and Love, 2004). Furthermore, studies of other mechanisms such as: media (Bednar, 2012; Core et al., 2008; Dyck et al., 2008; Miller, 2006), cultural values (Boytsun et al., 2011; Djankov et al., 2003; Licht et al, 2005; Stulz and Williamson, 2003), and industry competition (DeFond and Park, 1999; Fee and Hadlock, 2000; Giroud and Mueller, 2010), have also helped us understand the role played by these mechanisms in influencing firm-level governance and in providing another layer of monitoring.

#### **2.4. Final notes**

The corporate governance literature is vast and deals with different types of mechanisms and tools that are seen as ways to control agency issues and protect the interests of the shareholders against potential misappropriation or mismanagement by the firm's executives. There are two main themes that arise from the current body of the literature. The first theme or trend links governance mechanisms to firm performance and value as well as the cost of finance through the impact that these mechanisms have on how the firm operates and how agency costs are mitigated. Most studies in the literature suggest that stronger boards and more active and knowledgeable investors will provide a more effective monitoring and control of the firm's activities and its management. It is worth noting that the definition of what makes a board strong depends to a large extent on the firm's characteristics and its external environment. The board's contribution to a firm's value and performance comes mainly from implementing strategies and compensation policies as well as controlling and monitoring management's actions, all of which require a special set of skills and a

complex design, negotiation and enforcement process that varies from one firm to the next. For instance, while a smaller, less busy, and staggered board might be beneficial for one firm, a bigger and busier board with higher turnover might be more beneficial for another firm. The contributions of active investors to the firm's governance framework come through participation in strategy setting, management hiring decisions, other board duties, and market actions (e.g. selling and buying of the stock). The impacts of these contributions depend on how active the local equity markets are and the protections afforded by external factors.

The second theme or trend in the corporate governance literature is the link between corporate governance and the firm's information environment. The strength of the firm's corporate governance framework influences the firm's information environment through several channels such as improving the quality as well as the quantity and frequency of its disclosures. The current body of research suggests that better-governed firms make more informative and reliable mandatory or voluntary disclosures, which in turn improve the accuracy of analysts' forecasts and result in a timelier price discovery (Beekes and Brown, 2006; Beekes et al., 2016; Byard et al., 2006; Cai et al., 2006). While the firm's management may be incentivised to limit disclosures about the firm in order to reduce external scrutiny of their actions or to avoid dismissal due to poor performance, a firm with a stronger board may improve the quantity and quality of disclosures for reasons such as the protection of the reputations of board members or to gain the trust of the market and potential future financiers, among other reasons (Jiang et al., 2016; Levit and Malenko, 2016).

# Chapter 3

## **Essay I: Corporate governance, institutions, markets and social factors**

### **3. Essay I: Corporate governance, institutions, markets and social factors**

#### **3.1. Introduction**

The level of protection provided to a firm's investors and other stakeholders is impacted by both external (country-level) and internal (firm-level) governance mechanisms. The interaction between these two sets of mechanisms can influence the selection process of the firm's directors and executives, the structure of its board, its compensation scheme and any other incentive alignment mechanisms, and the protections given to its creditors and minority shareholders. As a result, these mechanisms have a major impact on the daily operations of a firm and its value (Daily et al., 2003; Shleifer and Vishny, 1997; Walsh and Seward, 1990).

There are many direct benefits that a firm can extract from the adoption of good governance practices. One of them is better access to capital markets, leading to improved terms of financing. This benefit will differ *across countries* for reasons such as that good governance brings less benefits to firms operating in less developed markets due to the limited financing expected from capital markets (Aggarwal et al., 2010; Doidge et al., 2007). Benefits will also be greater for firms that require more frequent access to external funding opportunities (Aggarwal et al., 2010; Doidge et al., 2007).

Agency theory highlights that the adoption of firm-level mechanisms is a costly investment that the firm undertakes to protect the rights of its shareholders (Aggarwal et al. 2010; Jensen and Meckling, 1976). As a result, the differences in the benefits and the costs of adopting good governance practices across countries, as well as the possibility that firm-level mechanisms are not complete substitutes for country-level mechanisms, could explain to a large extent the observed differences in governance practices across countries (Aggarwal et al., 2010; Doidge et al., 2007). There appears to be no clear consensus on the nature or form of the relationship between country-level factors and firm-level mechanisms (Schiehll and Martin, 2016). While several studies report that firm-level governance complements country-level factors (Aggarwal et al., 2010; Anderson and Gupta, 2009; Doidge et al., 2007), another group of studies find that firm-level governance substitutes for country-level mechanisms (Chen et al., 2009; Chou et al., 2011; Klapper and Love, 2004; Renders et al., 2010; Tian and Twite, 2011).

This essay studies the role played by country-level factors in determining the characteristics of the corporate governance framework in each country. It also examines whether firm-level corporate governance mechanisms act as substitutes or complements to these country-level factors. We pay special attention to the role of financial development and firm-level financing needs in influencing the firm's governance framework. To our knowledge this is the first study that examines the different causal relationship models used in the literature in order to answer the question of how to best represent the relationship between country-level factors and firm-level governance mechanisms and their joint effects on firm value and performance. Furthermore, our study differs from previous studies in the field in that it employs a wide range of publicly available indices as country-level factors to explain cross-country variations in firm-level governance. The study also addresses several pitfalls and methodological issues with prior studies by focusing on outcome-based external governance indicators and by employing the hierarchical linear modelling (HLM) approach and the Generalised Method of Moments (GMM) technique to account for the nested nature of the data and for potential endogeneity issues, respectively (see Aguilera et al., 2015; Essen et al., 2013; Schiehl and Martin, 2016). Overall, the study contributes to the ongoing debate on the nature of the relationships between country-level and firm-level factors and the effect of such relationships on firm value and performance.

We find that country-level factors explain a large part of the variation in firm-level governance across countries. We also find strong evidence to suggest that models which assume that country-level mechanisms act as moderators of the relationship between firm-level governance and firm performance provide the best fit for the relationship between these two groups. Moreover, we find that in contrast to several prior studies (e.g. Chen et al., 2009; Chou et al., 2011; Klapper and Love, 2004), our findings support the proposition that firm-level and country-level governance are complementary. Furthermore, we find that stronger firm-level governance is associated with higher firm value for firms which have high financing needs, and which operate in countries with high financial development. This supports the argument that a firm's governance framework is highly dependent on the financial development status of the country in which it operates, as well

as its need for external financing. Lastly, we find that our main findings hold true even after controlling for endogeneity.

### **3.2. Literature review**

Before the influential works of La Porta et al. (1997, 1998), most studies in corporate governance focused on examining corporate governance practices in firms within one country. More specifically, research on corporate governance has historically focused on internal governance mechanisms, such as ownership, board structure and compensation (Aguilera et al., 2015; Essen et al., 2013; Schiehl and Martin, 2016). As a result of this focus, our understanding of the role played by the country-level (external) mechanisms in influencing firms' governance characteristics, whether directly or indirectly, is still fairly limited (Aguilera et al., 2015).

Many recent studies have focused on examining the effectiveness of different internal and external mechanisms by measuring their effect on a firm's value, performance and/or overall decision-making process. However, agreement on the nature of the relationship between the internal and the external mechanisms and their joint influence on firm performance or value does not seem to exist in the literature (see Aggarwal et al., 2010; Aguilera et al., 2015; Schiehl and Martin, 2016). Schiehl and Martin (2016) classify the causal relationship models used in previous studies into four main categories: additive (e.g., Aggarwal et al., 2011), intervening (e.g., García-Castro et al., 2013), independent (e.g., Durnev and Kim, 2005; Essen et al., 2013), and moderating (e.g., Chua et al., 2007). While additive models treat country-level mechanisms as control variables, intervening models assume that these mechanisms have a significant influence on firm-level mechanisms which in turn has a direct influence on firm performance. Independent models, on the other hand, assume that both external and internal mechanisms exert a significant influence on firm performance, with the magnitude of the influence of each mechanism being dependent on the magnitude of the influence of the other. The last category of models, moderating models, assume that country-level mechanisms do not affect a firm's performance directly, but rather act as moderators of the effect of firm-level mechanisms on firm performance. This study contributes to this debate by re-examining the validity of the different causal relationship models identified by Schiehl and Martin (2016).

The current body of literature suffers from several gaps in coverage. Schiehl and Martin (2016) point out that for many countries, mainly emerging ones, there is little empirical evidence on the

role of external governance mechanisms in influencing the firm's governance framework. Aguilera et al. (2015) highlight the scarcity of studies examining the interactions between different external governance mechanisms. Schiehl and Martin (2016) and Kaufmann et al. (2011) report that one of the deficiencies of the literature is the lack of a clear distinction between rule-based and outcome-based indicators of external governance. While the rule-based indicators measure whether there are adequate rules to protect investors, outcome-based indicators reflect the actual outcomes of these rules. They point out that a finer distinction between these two indicator groups in empirical research will most likely improve the reliability of our models and enhance our understanding of the nature of the relationship between internal and external mechanisms.

There are a number of methodological issues relating to past research. Aguilera et al. (2015) and Schiehl and Martin (2016) raise concerns about the usual treatment of governance mechanisms as exogenous variables even though evidence from the literature suggests the potential presence of unobservable heterogeneity and simultaneity.<sup>1</sup> Essen et al. (2013) also raise concerns about the reliance on ordinary least squares (OLS) regressions to analyse the relationships between internal and external governance mechanisms and firm performance. They point out that because firms are nested within countries, the standard assumption of observation independence is most likely to be violated. This happens because firms within one country are generally more similar than firms from different countries. A violation of the independence assumption causes the standard errors of the model parameters to be too small, which in turn leads to erroneous conclusions about the statistical significance of such parameters.

### **3.3. Research questions**

#### **3.3.1. Cross-country differences and firm-level governance**

Two recent reviews by Aguilera et al. (2015) and Schiehl and Martin (2016) classify the different external governance mechanisms studied in the literature into six main categories: the legal system, the media, stakeholder activism, corporate control, external auditing, and rating organisations. With regards to the legal system, La Porta et al. (1998) show that common law countries (e.g. the US and the UK) tend to provide far better investor protection than French-civil-law countries (e.g.

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<sup>1</sup> Heterogeneity arises when unobservable factors affect both the dependent and the independent variables, whereas simultaneity arises when the independent variables are a function of the dependent variable or its expected value.

France and Italy). Their results also show that the level of investor protection provided by German-civil-law countries (e.g. Germany and Japan) and Scandinavian countries (e.g. Denmark and Sweden) fall in the middle between these two extremes. This suggests that a shareholder or a creditor will enjoy different levels of protection depending on the jurisdiction in which he or she operates rather than the particular security he or she holds (see also Denis and McConnell, 2003; Wurgler, 2000). Besides that, La Porta et al. (2000) argue that using measures of investor protection is a better way to explain differences in corporate governance practices across different jurisdictions than applying the usual market-versus-bank centric argument (see also Anderson and Gupta, 2009).

In emerging markets, Klapper and Love (2004) report that countries with weaker legal systems have lower average firm-level governance scores. They also report that governance scores are significantly and positively correlated with measures of value and performance, and this correlation is more significant in countries with weaker legal systems. This suggests that the absence of sufficient protection by the legal system gives rise to the role of governance practices as another source of protection. Klapper and Love further argue that although firms may be able to significantly improve shareholders' rights and the protection of minority investors by adopting stronger governance mechanisms, these mechanisms cannot fully replace the role of the country's legal system in protecting investors' interests (see also Chen et al., 2009; Doidge et al., 2007; Morey et al., 2009; Renders et al., 2010). Based on prior findings in the literature, our first research question is:

*1a.* Do differences in the origins of law and the strength of law enforcement contribute to explaining variation in corporate governance characteristics across countries?

Although the media's role as an important external corporate governance mechanism has only been recognised recently in the literature, the media in its different forms has long been a major provider of information for investors as well as an important source of scrutiny for the actions of managers and directors. Through analysing and spreading information about the firm and its actions, media outlets help educate and guide investors and other market players to arrive at more informed decisions (Bebchuk and Neeman, 2010). Additionally, the scrutiny provided by the public coverage of the actions of the firm's managers and directors, and the monitoring role played

by investigative journalism, add another layer of control over the decision-making process within the firm (Lauterbach and Pajuste, 2016; Wang and Ye, 2015; Zhang and Su, 2015).

Bebchuk and Neeman (2010) argue that investor protection is more likely to be higher in economies where media is active due to media's role in exposing rent extraction attempts by insiders. Empirically, Miller (2006) reports that the press plays a major role by distributing information from different sources (analysts, auditors, and law cases) and by undertaking original investigations. He reports that the press was involved in the early detection of accounting fraud in almost one-third of the cases he studied (see also Aguilera et al., 2015; Core et al., 2008; Dyck et al., 2008; Liu and McConnell, 2013; Wiesenfeld et al., 2008). Furthermore, Bednar et al. (2013) show evidence that in some cases negative media coverage of a firm indicates to its managers the need for a strategy shift. They also show that negative coverage is more likely to lead to a change when the firm's performance is weak or when the number of outsiders on the board increases. Moreover, media coverage can also promote corporate governance enhancements. For example, Joe et al. (2009) report that boards that were classified as bad in a media outlet ranking were subject to major improvements in their structures following the publication of the ranking. The results also show that individual investors responded to the publication of the ranking by putting downward pressure on the prices of the firms with bad boards. Hence, our next question is:

***1b.*** Do differences in media freedom and strength contribute to explaining variations in corporate governance characteristics across countries?

The effectiveness and structure of firm-level corporate governance mechanisms and country-level investor protection are also highly influenced by the social characteristics and the cultural values prevailing in a country. Bebchuk and Neeman (2010) theorise that investor protection is more likely to be higher in economies where investors are more educated financially due to their active role in forcing public officials to undertake decisions that increase such protection. They also argue that public officials in economies where a large proportion of voters directly or indirectly hold shares in public firms will try to improve investor protection out of a fear of losing their votes if they fail to do so. To this effect, the influence that the general population has on the appointment of public officials, and the threat they pose to ineffective ones, determines to a large extent the degree of investor protection offered in different regulations.

Empirically, Licht et al. (2005) document that in comparison to legal families (e.g. civil or common law), prevailing cultural values and norms explain a larger portion of cross-country variations in corporate governance and investor protection. They also provide evidence that cultural values persist in spite of any legal reforms, suggesting that culture may influence or even hinder reforms and that this may in turn impact national corporate governance practices. This confirms the important role played by social institutions and values in shaping corporate governance practices in a country (see also Boytsun et al., 2011; Estrin and Prevezer, 2011; Djankov et al., 2003; Licht et al., 2007). In the same vein, Stulz and Williamson (2003) present strong evidence that cultural differences in features such as language and prevailing religion play a significant role in explaining cross-country variations in investor protection. For instance, the results show that when compared to Protestant countries, Catholic countries have significantly weaker creditor and shareholder rights. Furthermore, the results also show that greater openness to international trade reduces the influence of religion on the protection of creditors (see also La Porta et al., 1999). On this basis, our next question is:

*Ic.* Do differences in social or cultural characteristics contribute to explaining variations in corporate governance characteristics across countries?

Furthermore, to ensure their survival, firms operating in competitive environments are more likely to only appoint and keep highly trained and well-performing managers who are also expected to run the firms as efficiently as possible. As a result, corporate governance problems are expected to be less acute in firms operating in competitive environments (see Claessens and Yurtoglu, 2015). For instance, Baggs and De Bettignies (2007) report that competition for market and product share puts more pressure on the managers to improve quality and operate more efficiently. They also show that in firms with more serious agency issues, the competition effect reduces the marginal cost needed to provide managerial incentives. Moreover, Giroud and Mueller (2010) show that firms in non-competitive industries experienced a drop in their operating performance following the passage of law that reduced hostile takeover threats, whereas firms in competitive industries experienced no change to their performance. The results also show that in non-competitive industries only, there were increases in overhead costs, wages and input costs following the passage of the law. Giroud and Mueller argue that this supports the argument that competition prevents managerial slack, and thus firms operating in competitive industries are less

likely to suffer from an increased likelihood of slackness brought about by the reduction in takeover threats (see also Baggs and De Bettignies, 2007; DeFond and Park, 1999; Fee and Hadlock, 2000; Giroud and Mueller, 2010). Hence, the next research question is:

*Id.* Do differences in market competition and efficiency levels contribute to explaining variations in corporate governance characteristics across countries?

### **3.3.2. The relationship between firm-level and country-level governance**

Firm-level governance mechanisms play an important role in determining the firm's performance through their role in controlling agency costs as well as monitoring and controlling the firm's management (Fich and Slezak, 2008; Jensen, 1986; Jensen and Meckling, 1976). Many studies in the literature suggest that stronger boards and more active and knowledgeable investors will provide a more effective monitoring and control of the firm's activities and its management through several venues such as strategy setting, management hiring decisions, other board duties, and market actions (e.g. selling and buying of the stock) (Jensen, 1986; Jensen and Meckling, 1976). For example, the strong scrutiny and monitoring of managers' actions provided by effective and strong boards will likely prevent the initiation of value-destroying projects or acquisitions by the firm's managers (Jiang et al., 2016). Strong boards will also design compensation schemes that focus on the long-term benefits to the shareholders rather than the short-term gains of the managers (e.g. higher equity-based portion of total compensation) and will be more effective at replacing underperforming managers. Furthermore, active investors play an important role in disciplining managers through board decisions as well as various market actions (e.g. selling/buying shares, mergers and acquisitions).

With regards to the nature of the relationship between firm-level and country level factors, several studies report that firm-level governance complements country-level factors (Aggarwal et al., 2010; Anderson and Gupta, 2009; Doidge et al., 2007), while another group of studies find that firm-level governance substitutes for country-level mechanisms (Chen et al., 2009; Chou et al., 2011; Klapper and Love, 2004; Renders et al., 2010; Tian and Twite, 2011). One would expect firms operating in countries with strong country-level mechanisms to invest less (more) in firm-level governance than firms in countries with weak country-level mechanisms if the two mechanisms are substitutes (complements).

One should account for the fact that strong country-level governance may also lead to more developed markets and thus, as discussed earlier, more benefits to the firm from adopting good governance practices. On the other hand, weak country-level governance is more likely to create less developed markets and as a result lead to fewer benefits from improving firm-level governance. This would lead to the observance of a complementary relationship between country-level and firm-level mechanisms. However, if some of the more developed markets are associated with lower country-level protections, then one would expect firms to invest more in firm-level governance in order to gain preferential access to capital markets. In this case, country-level and firm-level factors would be substitutes for each other.

The institutional theory framework suggests the presence of a complementary relationship between firm-level and country-level mechanisms based on the assumption that firm-level governance is influenced by the prevailing national institutions and social systems (Aguilera et al., 2015; Schiehl and Martin, 2016). In contrast, the focus of agency theory on the costs and benefits of improving governance at the firm level provides no direct support for either substitution or complementarity. Agency theory suggests that the relationship between firm-level and country-level governance mechanisms may depend on contextual factors and characteristics, such as financial development or firms' external financing needs (Aggarwal et al., 2010, Aguilera et al., 2015).

Schiehl and Martin (2016) classify the different relationship models used in previous studies into four main categories: intervening, moderating, additive and independent. The first two categories assume that country-level factors have no direct influence on firm performance. Models in the intervening category assume that country-level factors influence firm-level mechanisms which then affect firm performance, while moderating models assume that country-level mechanisms act as moderators of the relationship between firm-level governance and firm performance. The last two categories, additive and independent, assume the existence of a direct relationship between both firm-level and country-level variables and firm performance. The difference between these two categories is that the additive models assume that the effects of either mechanism on firm performance does not depend on the other, while the independent models assume the opposite. Therefore, our next closely related research questions are:

**2a.** Which causal relationship model best represents the relationship between country-level factors and firm-level governance mechanisms?

**2b.** Are country-level factors and firm-level governance mechanisms complements or substitutes?

### **3.3.3. The role of financial development and capital dependency**

As discussed earlier, one of the main benefits to a firm from adopting better governance practices is having better access to capital markets along with improved terms of financing (Aggarwal et al., 2010). This comes as a result of the role played by corporate governance mechanisms in controlling agency issues and reducing information asymmetry, which provides better protection for the firm's capital providers (Bhojraj and Sengupta, 2003; Shleifer and Vishny, 1997). However, these benefits differ across countries based on the financing that a firm expects to secure from its domestic market, which in turn depends on the extent of the development of the country's financial system. Furthermore, a firm with higher external financing needs is more likely to obtain higher value from adopting better governance practices in the form of reduced funding costs and better financing conditions, which would result in better financial performance and value (Bhojraj and Sengupta, 2003; Doidge et al., 2007; Shleifer and Vishny, 1997). Additionally, improved access to external finance reduces the likelihood of having to forego value-creating investment opportunities due to the lack of suitable finance. Therefore, it can be argued that a firm's gain from adopting a more stringent governance framework depends on both the financial development status of the country in which the firm operates and the firm's reliance on external sources to fund its operations (Doidge et al., 2007). Consequently, our last two research questions are:

**3.** Does the status of a country's financial development play a major role in determining the relationship between firm-level governance and firm value or return?

**4.** Does the firm's external financing need play a major role in determining the relationship between firm-level governance and firm value or return?

### **3.4. Data**

To conduct our comparative analysis, we extract data for the years 2010 to 2017 (inclusive) from various sources. We source our accounting and market data (i.e. sales, total assets, total debt, book value and market value of equity, net income, short-term assets) from DataStream for all firms with governance data in ASSET4 for the selected period. We extract corporate governance data from ASSET4, which is part of the DataStream package, to construct our own corporate governance index. We also use the corporate governance score calculated by DataStream as an

alternative proxy for a firm's quality of governance. We only include a firm if it has at least half of the attributes covered by our governance index (explained later) to reduce any potential bias in the final governance scores due to the limited number of attributes used. To ensure that our sample reflects corporate governance practices in each country, countries are only included in our sample if the total market capitalisation of firms with adequate data is equal to or above 50% of the country's total market capitalisation.<sup>2</sup> This gives us a final sample of 3301 firms in 43 countries and territories representing different regions around the world. *Table 3.1* provides more information about the countries covered in our study (e.g. legal family, predominant religion, average governance index, financial development index and income group), and the number of firms in each country. Our sample is dominated by countries with high average incomes and civil law systems, and most of the countries in our sample have Christianity as the predominant religion.

We source the data needed to construct our country-level indices (i.e. the rule of law, media freedom, social and cultural development, and market competition) from different public sources such as the World Economic Forum, the World Justice Project and Freedom House. We explain the construction of these variables in Appendix II. We winsorise the different variables at 90% to reduce the effect of extreme or wrong observations on our results.

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<sup>2</sup> Market capitalisation figures are sourced from the World Federation of Exchanges as of the end of 2017.

**Table 3.1: Sample characteristics**

This table shows the main characteristics of the countries covered in this study. The legal family indicator is based on the origin of the legal system in the country, whereas the predominant religion classification reflects the most-followed religion in the country based on the CIA World Factbook. The governance index column shows the average governance score for all the firms in our sample within the particular country (for 2017). The financial development index is based on the 2017 financial development score provided by the Global Competitiveness Index (GCI) report. The number of firms column shows the total number of firms in the country that have been included in our sample. The income group is based on the World Bank's 2017 classification of countries and territories.

Country	Legal family	Predominant religion	Governance index	Financial Development index	No. of firms	Income group
Australia	Common	Christianity	72.96	1.31	346	High income
Austria	Civil	Christianity	59.39	-0.75	16	High income
Belgium	Civil	Christianity	63.36	0.43	25	High income
Brazil	Civil	Christianity	52.84	-1.12	85	Upper-middle income
Canada	Common	Christianity	80.84	2.63	297	High income
Chile	Civil	Christianity	51.36	0.82	22	High income
China	Civil	Buddhism	61.36	-1.19	92	Upper-middle income
Czech Republic	Civil	Christianity	50.40	-0.25	9	High income
Denmark	Civil	Christianity	73.87	-0.34	26	High income
Finland	Civil	Christianity	72.65	3.00	25	High income
France	Civil	Christianity	50.81	0.61	100	High income
Germany	Civil	Christianity	67.70	0.82	90	High income
Greece	Civil	Christianity	55.05	-5.85	18	High income
Hong Kong	Common	Buddhism	59.21	3.55	165	High income
Hungary	Civil	Christianity	51.34	-3.87	9	High income
India	Common	Hinduism	49.41	-1.80	95	Lower-middle income
Indonesia	Civil	Islam	51.32	-0.54	36	Lower-middle income
Ireland	Common	Christianity	83.50	-2.26	15	High income
Israel	Common	Judaism	61.53	-0.07	16	High income
Italy	Civil	Christianity	65.13	-3.97	46	High income
Japan	Civil	Shinto	40.40	1.24	411	High income
Malaysia	Common	Islam	65.02	2.36	52	Upper-middle income
Mexico	Civil	Christianity	49.35	-2.37	33	Upper-middle income
Morocco	Civil	Islam	27.98	-1.65	7	Lower-middle income
Netherlands	Civil	Christianity	75.25	0.79	34	High income
New Zealand	Common	Christianity	70.10	2.66	44	High income
Norway	Civil	Christianity	68.19	3.02	26	High income
Philippines	Civil	Christianity	60.01	-0.41	26	Lower-middle income
Poland	Civil	Christianity	51.28	-1.64	30	High income
Portugal	Civil	Christianity	58.67	-3.00	10	High income
Qatar	Civil	Islam	57.96	3.69	13	High income
Russia	Civil	Christianity	58.27	-3.30	35	High income
Singapore	Common	Buddhism	63.55	3.45	46	High income
South Africa	Common	Christianity	61.78	2.13	121	Upper-middle income
South Korea	Civil	Christianity	44.45	-3.49	111	High income
Spain	Civil	Christianity	62.75	-2.81	48	High income
Sweden	Civil	Christianity	58.30	1.77	61	High income
Switzerland	Civil	Christianity	59.43	2.51	66	High income

Taiwan	Civil	Buddhism	53.24	1.84	134	High income
Thailand	Common	Buddhism	58.88	0.32	33	Upper-middle income
Turkey	Civil	Islam	50.59	-1.46	25	Upper-middle income
United Arab Emirates	Civil	Islam	45.77	2.00	13	High income
United Kingdom	Common	Christianity	78.78	1.20	389	High income
Average			59.40	0.00	77	
Median			59.21	0.32	35	

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### 3.5. Methodology

#### 3.5.1. Governance index

We construct a firm-level additive index of governance (GOVI) using a collection of the most cited individual measures of governance. Many studies in the literature rely on additive governance indices to measure the overall governance quality of a firm (e.g. Aggarwal et al., 2010; Anderson and Gupta, 2009; Brown and Caylor, 2006). The need to construct a governance index arises from the fact that there is no individual variable that can be used to measure the overall governance quality of a firm, and thus some type of scoring system is needed to be able to rank and compare the governance frameworks of each firm. Following Aggarwal et al. (2010) and Brown and Caylor (2006), we use the most recent governance thresholds provided by the Institutional Shareholder Services (ISS) Governance QuickScore 3.0 to construct our index. Basically, a firm gains 1 point if its governance attribute meets the threshold suggested by ISS's guideline or 0 otherwise.<sup>3</sup> We cover a total of 36 governance attributes which represent the different variables covered by both DataStream's ASSET4 database and ISS's QuickScore. Details of these attributes are provided in *Appendix I*. The final value of our index is the percentage of scores achieved versus the potential score that could have been achieved (100%). When an attribute is missing from the database for a particular firm, its score is taken out of the total potential score, which minimises the effect of missing attributes on the final score of such a firm.

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<sup>3</sup> Thresholds for the different governance measures are provided in Appendix I.

### 3.5.2. Main regression models

#### 3.5.2.1. Cross-country differences and firm-level governance

We use four main groups of models to answer the set of questions addressed in our study. First, in order to examine the relationship between firm-level governance and country-level factors (Research Questions 1a to 1d), we run the following regression using industry and year dummies<sup>4</sup>:

$$\begin{aligned} GOVI_{i,t} = & \beta_0 + \beta_1 RLA W_{i,t} + \beta_2 LORG_{i,t} + \beta_3 MEDI_{i,t} + \beta_4 CHRN_{i,t} + \beta_5 ISLM_{i,t} \\ & + \beta_6 SOCL_{i,t} + \beta_7 COMP_{i,t} + \text{Control Variables } (SIZE_{i,t}/LEVG_{i,t}/GROW_{i,t}/LGPC_{i,t}) + \varepsilon_{i,t} \end{aligned} \quad (3.1)$$

where RLAW, MEDI, SOCL and COMP, are indices that measure: the rule of law, media freedom, social and cultural development, and market competition, respectively. LORG is a dummy variable which takes the value 1 if the country's legal system is based on common law or 0 if it is based on civil law, while CHRN and ISLM are dummy variables which take the value 1 if the country's predominant religion is Christianity or Islam, respectively, or 0 otherwise. The sources and the construction of the different independent variables are explained in *Appendix II*.

As highlighted earlier, because the firms are nested within countries, the standard assumption of observation independence is most likely to be violated. This happens because firms within one country are generally more similar than firms from different countries. Therefore, we employ the hierarchical linear modelling (HLM) approach to capture the nested nature of the data and to avoid potential problems with our conclusions due to the violation of the independence assumption (Essen et al., 2013).<sup>5</sup> Our HLM regressions are based on two hierarchical levels (firm and country), each of which has its own regression equation. Level 1 regression includes firm- and country-level variables, whereas Level 2 includes country-level variables only. In contrast to the usual OLS approach, this approach allows us to vary the Level 1 intercept and slopes across countries. Following Aggarwal et al. (2010), Klapper and Love (2004), and others, we include several control

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<sup>4</sup> We analyse individual Variance Inflation Factor (VIF) scores for any signs of multicollinearity in our models. We also report mean VIF scores for all of our regressions.

<sup>5</sup> For the other models we rely on country-clustered standard errors to address our concerns about violation of the independence assumption.

variables in the regression to account for potential variations in the governance characteristics of a firm due to firm-specific attributes.<sup>6,7</sup> These variables are:

- ***Firm size (SIZE)***: is the log of total assets. As highlighted by Klapper and Love (2004), size plays an important role in determining the governance characteristics of the firm. A larger firm may have greater agency problems, indicating the need to impose stricter governance mechanisms. At the same time, a small firm may have greater financing needs and thus may need to improve its governance profile in order to be able to attract external financing.
- ***Leverage (LEVG)***: is the ratio of the total book value of short- and long-term debt to total assets. Leverage levels have been found in many studies to be highly related to the level of agency issues in the firm. Jensen (1986) and Stulz (1990), among others, have documented that higher leverage levels reduce agency issues by reducing the amount of free cash available to managers and by imposing more financial constraints on their daily operations. One can also argue that leverage adds a new layer of monitoring of managers' actions by creditors. Thus, under some conditions leverage can be viewed as an important determinant of the firm's governance profile.
- ***Growth opportunities (GROW)***: is the average growth rate in sales for the last three years. A firm with high growth opportunities will have a higher need for external financing and thus may find it beneficial to improve its governance characteristics and overall protection of shareholder rights in order to improve its access to external sources as well as reduce the cost of doing so (Himmelberg et al., 1999; Klapper and Love, 2004).

We also add a country-level control variable, Log of GNP per capita (LGPC), to control for differences in the state of economic development across countries (Aggarwal et al., 2010; Klapper

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<sup>6</sup> We omit some of the control variables used in earlier studies (e.g. Aggarwal et al., 2010; Klapper and Love, 2004) such as: PPE/Sales, because they were found to be insignificant in these studies. We also believe that the industry dummies will capture many of the differences that those omitted control variables were designed to capture.

<sup>7</sup> The sensitivity of the results of the analysis to the choice and definition of these different control variables will be tested for robustness in a later section.

and Love, 2004). For all countries in our sample we source this data from the World Bank WDI Database.

### 3.5.2.2. The relationship between firm-level and country-level governance

Next, since the focus of this study is on outcome-based (i.e. RLAW, MEDI, SOCL, and COMP) rather than rule-based (LORG, CHRN, and ISLM) country-level indicators, we only include the former indicators in our next three models.<sup>8</sup> This focus stems from the argument that outcome-based variables provide a better gauge of the effectiveness of the protections and governance mechanisms in place than the rule-based variables which only measure the presence of such protections (Kaufmann et al., 2011; Schiehl and Martin, 2016). The second set of research questions is addressed using a second set of regressions which examines the nature of the relationship between firm value/return and firm-level governance when considering the effect of country-level factors. We run the following regressions using industry and year dummies:

$$\begin{aligned}
 \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 \text{RLAW}_{i,t} + \beta_3 \text{MEDI}_{i,t} + \beta_4 \text{SOCL}_{i,t} \\
 & + \beta_5 \text{COMP}_{i,t} + \beta_6 (\text{GOVI}_{i,t} \times \text{RLAW}_{i,t}) + \beta_7 (\text{GOVI}_{i,t} \times \text{MEDI}_{i,t}) \\
 & + \beta_8 (\text{GOVI}_{i,t} \times \text{SOCL}_{i,t}) + \beta_9 (\text{GOVI}_{i,t} \times \text{COMP}_{i,t}) \\
 & + \text{Control Variables } (\text{SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t}
 \end{aligned} \tag{3.2a}$$

$$\begin{aligned}
 \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 \text{RLAW}_{i,t} + \beta_3 \text{MEDI}_{i,t} + \beta_4 \text{SOCL}_{i,t} \\
 & + \beta_5 \text{COMP}_{i,t} + \text{Control Variables } (\text{SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t}
 \end{aligned} \tag{3.2b}$$

$$\begin{aligned}
 \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 (\text{GOVI}_{i,t} \times \text{RLAW}_{i,t}) \\
 & + \beta_3 (\text{GOVI}_{i,t} \times \text{MEDI}_{i,t}) + \beta_4 (\text{GOVI}_{i,t} \times \text{SOCL}_{i,t}) + \beta_5 (\text{GOVI}_{i,t} \times \text{COMP}_{i,t}) \\
 & + \text{Control Variables } (\text{SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t}
 \end{aligned} \tag{3.2c}$$

The different models represent the different causal relationship models used in past studies as outlined by Schiehl and Martin (2016). *Model 3.2a* represents the independent models where all the factors, as well as the interactions between these factors, have been included in the model. *Model 3.2b* represents the second group of models (i.e. the additive models), where the effects of

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<sup>8</sup> As explained earlier, the rules-based indicators measure whether there are adequate rules to protect investors, while outcome-based indicators reflect the actual outcomes of these rules (see Kaufmann et al., 2011; Schiehl and Martin, 2016)

both factors, firm and country, on firm return/value are assumed to be independent of each other, which explains dropping the interaction variables. Lastly, *Model 3.2c* represents the moderating models, where country-level factors moderate the relationship between firm-level mechanisms and firm value/return. We use a battery of model selection tests (explained later) to find the most suitable form to explain the relationship between country-level factors and firm-level governance mechanisms and their joint effect on firm value/return. We also use the Granger causality test and structural equation modelling to investigate the validity of the intervening models for explaining the relationship under consideration.

Moreover, we construct a country-level governance score (COGI) based on the first principal component scores (explains 87% of the variation) from a principal component analysis that includes the individual country-level factors (i.e. RLAW, MEDI, SOCL, or COMP). This allows us to significantly reduce the number of variables needed in our next regressions. Our new set of regressions is:

$$\begin{aligned} \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 \text{COGI}_{i,t} + \beta_3 (\text{GOVI}_{i,t} \times \text{COGI}_{i,t}) \\ & + \text{Control Variables (SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t} \end{aligned} \quad (3.3a)$$

$$\begin{aligned} \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \text{COGI}_{i,t} \\ & + \text{Control Variables (SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t} \end{aligned} \quad (3.3b)$$

$$\begin{aligned} \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 (\text{GOVI}_{i,t} \times \text{COGI}_{i,t}) \\ & + \text{Control Variables (SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t} \end{aligned} \quad (3.3c)$$

Both the sign and significance of the interaction between the governance index and the country variables (e.g.  $\text{GOVI}_{i,t} \times \text{RLAW}_{i,t}$ ) in the above models indicate whether a particular country-level factor or index and firm-level governance are complements (positive sign) or substitutes (negative sign). A positive (negative) sign indicates that improving firm-level governance in a country with strong country-level mechanism is beneficial (detrimental) to firm value/performance.

### 3.5.2.3. The role of financial development and capital dependency

Our next set of regressions is used to answer our third and fourth research questions through examining the relationship between firm return or value measures and firm-level governance when

considering both the country's state of financial development and the firm's external financing needs. We run the following regression using industry and year dummies assuming a moderating causal relationship:

$$\begin{aligned}
 \text{Return or Value Measure}_{i,t} = & \beta_0 + \beta_1 \text{GOVI}_{i,t} + \beta_2 (\text{GOVI}_{i,t} \times D_{\text{COGI}}) \\
 & + \beta_3 (\text{GOVI}_{i,t} \times D_{\text{FIND}}) + \beta_4 (\text{GOVI}_{i,t} \times D_{\text{EXCD}}) \\
 & + \text{Control Variables } (\text{SIZE}_{i,t}/\text{LEVG}_{i,t}/\text{GROW}_{i,t}/\text{LGPC}_{i,t}) + \varepsilon_{i,t}
 \end{aligned} \tag{3.4}$$

where the dummy variables ( $D_{\text{COGI}}$  and  $D_{\text{FIND}}$ ) take the value 1 if the score of the country on the index is above the median value for all countries in the sample or 0 otherwise. The financial development score (FIND) is calculated using PCA based on the scores of the 8<sup>th</sup> pillar (financial market development) of the GCI report (discussed earlier).<sup>9</sup>  $D_{\text{EXCD}}$  is a dummy variable for the firm's External Capital Dependence (EXCD) and takes the value 1 (high dependence on external financing) if the external capital dependence ratio (capital expenditure minus cash-flow from operations divided by capital expenditure) for a particular firm is above the median value for all firms in the sample or 0 otherwise.

Compared to Model 3.3c, the additional independent variable ( $\text{GOVI}_{i,t} \times D_{\text{FIND}}$ ) is added to investigate the effect on firm value/performance of improving firm-level governance in a country with high financial development. The independent variable ( $\text{GOVI}_{i,t} \times D_{\text{EXCD}}$ ) is added to examine the effect on firm value/performance of improving firm-level governance in a firm with high financing needs.

## 3.6. Results and discussion

### 3.6.1. Descriptive statistics

*Panel A* in *Table 3.2* provides descriptive statistics for the country-level factors included in our analysis after splitting the sample into two groups based on the average governance score of the firms operating in each country. It is clear from an analysis of the statistics reported in the table that countries with high average governance scores have significantly higher scores in the different country-level factors. This indicates the presence of a positive link between each of these factors and firm-level governance. Although with a lesser degree of significance, the analysis also

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<sup>9</sup> This pillar scores financial development around the world based on factors such as: affordability and availability of financial services; financing through local equity market; ease of access to loans; venture capital availability; soundness of banks; regulation of securities exchanges.

indicates that high-governance countries tend to have more developed financial markets. This is in line with our earlier discussion of the effect that the financial markets development level has on the firm's governance framework. This is also confirmed by examining the different results from *Panel B of Table 3.2* which show that countries with higher financial development scores also have a higher score on each of the country-level factors as well as the average governance scores. With regards to the firm-level control variables, we can see that firms with better governance profiles are on average larger with lower leverage and growth opportunities.

**Table 3.2: Descriptive statistics**

Panels A and B present the mean and median differences in the different country-level variables after splitting the sample into two groups based on average governance score and financial development score, respectively. The test for the equality of means uses Welch's t-test, while the test for the equality of medians uses Wilcoxon's rank-sum test. The p-values are reported in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

<b>Panel A: Mean and Median comparisons based on the Governance index scores (2017)</b>						
	Upper 50%		Lower 50%		Difference	
	Mean	Median	Mean	Median	Mean	Median
Rule of Law (RLAW)	1.164	2.147	-1.111	-0.446	2.275*** (0.003)	2.593*** (0.002)
Freedom of Media (MEDI)	0.617	1.064	-0.579	-0.234	1.185** (0.019)	1.298*** (0.007)
Social and Cultural index (SOCL)	0.754	1.327	-0.720	-0.394	1.473*** (0.003)	1.720*** (0.002)
Market Competitiveness (COMP)	0.811	1.381	-0.774	-1.299	1.584*** (0.004)	2.679** (0.012)
Financial Development Score (FIND)	0.691	0.819	-0.660	-0.832	1.350* (0.059)	1.651* (0.065)
Firm size (SIZE)	15.804	15.624	15.281	14.963	0.523*** (0.000)	0.661*** (0.000)
Leverage (LEVG)	0.239	0.218	0.250	0.227	-0.110** (0.046)	-0.009** (0.041)
Growth opportunities (GROW)	-2.865	-2.060	2.971	2.053	5.836 (0.243)	4.113 (0.175)

<b>Panel B: Mean and Median comparisons based on the Financial Development score (2017)</b>						
	Upper 50%		Lower 50%		Difference	
	Mean	Median	Mean	Median	Mean	Median
Rule of Law (RLAW)	1.468	2.131	-1.401	-2.011	2.869*** (0.000)	4.142*** (0.000)
Freedom of Media (MEDI)	0.490	0.904	-0.468	-0.234	0.958* (0.060)	1.138** (0.022)
Social and Cultural index (SOCL)	1.018	1.397	-0.971	-0.808	1.989*** (0.000)	2.205*** (0.000)
Market competitiveness (COMP)	1.340	1.657	-1.279	-1.767	2.619*** (0.000)	3.424*** (0.000)
Governance index (GOVI)	62.697	63.356	56.243	56.659	6.454* (0.053)	6.697** (0.035)

### 3.6.2. Explaining the cross-country differences in firm-level governance

*Table 3.3* shows the results of regressing the firm-level governance index on the different country-level variables and firm-level control variables. The  $R^2$  reported in each of the first four columns when we regress the governance index on each of the country variables is much greater than the (unreported)  $R^2$  of 0.037 for the basic regression that only includes the control variables. This indicates the significant role played by the country variables in explaining the governance framework at the firm level. For example, when we include the rule of law index and the legal origin as independent variables, the  $R^2$  (within countries) value improves by five times compared to the basic regression. We observe similar results when we include our media freedom index as well as our social and cultural index and predominant religion dummies. This is largely in line with the findings of La Porta et al. (2000) and Stulz and Williamson (2003), who find that the legal and cultural factors, respectively, are more powerful than economic and financial factors in explaining cross-country differences in governance practices.  $R^2$  scores are also higher for the regression when it includes our market competition index, although the magnitude of the increase is smaller.

In column five we report a regression which includes all of the country-level measures as explanatory variables. The  $R^2$  (within and between countries) is now significantly higher than that of the regressions reported in the first four columns. All of the country variables are positive and all but ISLM are significant. The lower AIC scores also suggest that the regression containing all of the country-level measures provides a better fit to the data after accounting for the higher complexity of this regression (i.e. more independent variables) compared to the regressions reported in the first four columns.

The positive sign of the rule of law index suggests that more effective law enforcement and judicial systems are likely to be associated with better firm-level governance (Doidge et al. 2007). Furthermore, our results show that countries with common law origins tend to be associated with better firm-level governance when compared to those with civil law origins. This finding is in agreement with the findings of La Porta et al. (1997, 1998, 2000) and others, who argue that countries with common law origins tend to have the strongest investor protection frameworks, which in turn influence firm-level protections by imposing higher governance requirements. This influence also manifests through the fact that common law countries tend to have more developed

markets, which incentivises the firm to adopt a more stringent governance framework in order to secure a more favourable access to these markets.<sup>10</sup>

With regards to the role of media in influencing governance quality, the results of our regression show the presence of a positive link between the strength and effectiveness of media and the strength of firm-level governance. It can be argued that an active and free media sector not only helps monitor and rectify governance shortfalls, but also acts as an independent watchdog that forces firms to adopt a more stringent governance framework. The media influences the governance quality of a firm by reporting governance violations and shortfalls to the public (e.g. Bednar et al., 2013; Joe et al., 2009). The publicity generated by negative media coverage threatens the reputations of the firm and its managers and directors, causing them to react quickly to ensure that proper controls are put in place in order to avoid future adverse publicity (Bednar, 2012; Core et al., 2008; Dyck et al. 2008).

The results of the regression also show a positive relationship between our social and cultural index and governance at the firm level. This is consistent with a better educated individual being more involved and astute when investing in the capital markets, and as a result putting more pressure on firms to improve their governance frameworks (Bebchuk and Neeman, 2010). Additionally, technological advances help create a pool of more informed investors by improving the availability of information to the different stakeholders, which in turn increases the pressure on firms to improve their image by adopting a more stringent governance framework.

Contrary to the findings of Stulz and Williamson (2003), the results of our regression suggest the presence of a positive association between firm-level governance and Christianity and Islam as predominant religions when compared to other religions and beliefs, although the dummy variable representing Islam is insignificant in this case. One possible explanation for this relationship is that the prescriptive nature of these two religions compared to other beliefs might contribute to the establishment of a minimum benchmark of accepted business and governance practices, which in turn influences firm-level governance practices. Another possible explanation for this result is related to the fact that our sample is dominated by Christian and Islamic high-to-middle income

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<sup>10</sup> We intend to revisit this claim in our next set of regressions.

countries with more developed financial markets, which could lead to a higher association between firm-level governance and the religion dummy (see La Porta et al., 1999).

With regards to market competitiveness, the results confirm the existence of a positive association between our market competitiveness index and firm-level governance. The market competitiveness index measures the efficiency of the goods and labour markets as well as innovation and business sophistication. In other words, countries with more efficient and competitive domestic markets tend to have higher governance quality at the firm level. This observation is expected, given that highly competitive environments force firms to continuously improve their governance and internal controls to be able to survive (see Claessens and Yurtoglu, 2015). This is also in agreement with prior studies that report higher CEO turnover and more focus on efficiency and performance in competitive environments (Baggs and De Bettignies, 2007; DeFond and Park, 1999; Fee and Hadlock, 2000).

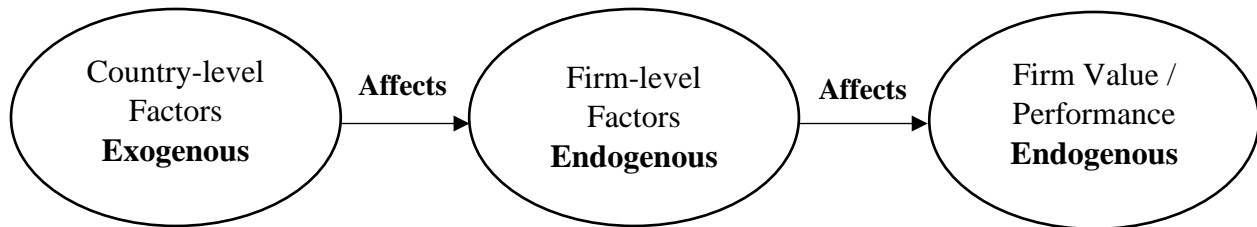
**Table 3.3: HLM analysis of firm-level governance and country-level factors**

This table presents the results of five hierarchical linear modelling (HLM) regressions using industry and year dummies with the Governance index (GOVI) measure as the dependent variable. GOVI is a firm-level additive index of governance constructed using a collection of individual measures of governance (see text for details). The Rule of Law Index (RLAW) is a score of the country's legal system and its law enforcement power. The Legal System Origin (LORG) is a dummy variable which takes the value 1 if the country's legal system is based on common law or 0 if it is based on civil law. Media (MEDI) is a score that assesses the degree of media freedom in a particular country. The Social and Cultural index (SOCL) assesses the characteristics of the education and health systems as well as training and technological readiness in a country. Christianity (CHRN) and Islam (ISLM) are dummy variables which take the value 1 if the country's predominant religion is Christianity or Islam, respectively, or 0 otherwise. The Market Competitiveness index (COMP) measures the efficiency of the goods and labour markets as well as innovation and business sophistication in a particular country. Countries with better or more positive conditions will score higher in the relevant index. The control variables (SIZE/LEVG/GROW/LGPC) are explained in the text. The z-Statistics reported in parentheses are based on country-clustered standard errors. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Mean Variance Inflation Factor (VIF) is a measure of the severity of multicollinearity in a regression. "L1" and "L2" denote level 1 and level 2 predictors in the HLM analysis, respectively. The Akaike information criterion (AIC) measures the relative quality of a model compared to other models, through considering the trade-off between the model's complexity and its goodness of fit.

	1	2	3	4	5
Intercept	6.447 (0.100)	5.750 (0.050)	1.389 (0.480)	0.727 (0.240)	0.816 (0.180)
RLAW (L2)	1.199* (1.860)				0.507* (1.920)
LORG (L2)	12.058*** (7.640)				14.647*** (3.880)
MEDI (L2)		4.025*** (3.590)			2.874** (2.020)
SOCL (L2)			0.505*** (2.620)		0.318* (1.650)
CHRN (L2)			11.679*** (5.920)		13.212** (2.30)
ISLM (L2)			1.577 (1.090)		1.759 (1.620)
COMP (L2)				1.326** (2.530)	1.025* (1.920)
SIZE (L1)	0.694*** (4.380)	0.693*** (4.390)	0.693*** (4.390)	0.693*** (4.380)	0.696*** (4.40)
LEVG (L1)	-0.273 (-0.410)	-0.289 (-0.430)	-0.275 (-0.410)	-0.268 (-0.400)	-0.278 (-0.410)
GROW (L1)	-0.000 (-0.800)	-0.000 (-0.750)	-0.000 (-0.800)	-0.000 (-0.800)	-0.000 (-0.760)
LGPC (L2)	4.068* (1.800)	4.446*** (2.880)	4.621*** (3.400)	5.094** (2.440)	3.216** (2.310)
R <sup>2</sup> (within countries)	0.208	0.166	0.164	0.077	0.348
R <sup>2</sup> (between countries)	0.389	0.303	0.299	0.121	0.676
AIC score	96,493	96,491	96,501	96,507	96,473
Mean VIF	2.45	2.53	2.36	2.54	3.72
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43	43	43	43

### 3.6.3. The relationship between firm-level and country-level governance

Table 3.4 shows the results from our sets of regressions (*Models 3.2a-3.2c* and *3.3a-3.3c*) intended to examine the most suitable causal relationship model to represent the relationship between country-level factors and firm-level governance mechanisms. The regressions reported in *Panel A* include the individual country variables, while the regressions reported in *Panel B* include the country-level index only. First of all, the results of the Likelihood-ratio test for nested models suggest that both the additive and the moderating models provide better fit than the independent models. Furthermore, the Davidson-MacKinnon J test for non-nested models confirms that the moderating models provide a better fit than either the independent or the additive models. This is also confirmed by the fact that the moderating models have the lowest AIC scores in each group of regressions, which suggests that these models provide a better fit to the data after accounting for the differences in complexity.<sup>11</sup> With regards to the last group of causal relationship models, the intervening models, we find no evidence to support the hypothesis that country-level factors affect firm-level governance and then firm value/performance. More specifically, we do not find a significant result using the Granger causality test routine to suggest that country-level factors Granger-causes firm-level factors.<sup>12</sup> We also fail to find any support for the intervening models using the structural equation modelling routine specified below.



Overall, the results of our different model selection tests confirm that the moderating models provide a better fit and representation of the relationship between country-level and firm-level governance mechanisms and their joint effect on firm value/performance. Furthermore, we can infer from the positive signs of the interaction between the firm governance index and the country variable (e.g.  $GOVI_{i,t} \times RLAW_{i,t}$ ) in the moderating models that a firm extracts more benefits from adopting a stronger governance framework when operating in a country with stronger country-

<sup>11</sup> The AIC is an approximately unbiased estimate of the Kullback-Liebler Information Criterion (KLIC) used to measure divergence between models.

<sup>12</sup> We test the causality up to the fourth lag of the independent variables and find no significant evidence of granger-causality in our sample.

level mechanisms. This indicates the presence of a complementary relationship between firm-level governance and all the country-level factors included in our regressions. This observation is consistent with the findings of several prior studies (e.g. Aggarwal et al., 2010; Anderson and Gupta, 2009; Doidge et al. 2007), but equally, it is at variance with a number of other studies that found that firm-level governance substitutes, rather than complements, country-level mechanisms (Chen et al., 2009; Klapper and Love, 2004; Renders et al., 2010). Our results remained essentially the same when we used Return on Assets (ROA) as a dependent variable instead of Return on Equity (ROE). This finding supports the argument that better country-level protections empowers firms to adopt stronger governance frameworks which would otherwise be prohibitively expensive (Doidge et al., 2007). The costs associated with adopting such governance frameworks would be justified through better access to capital and enhanced market reputation for the firm, its management, and its board. Such benefits would not exist in markets with less protections and less development.

Our finding of complementarity could also be related to the fact that many of the countries with the highest scores on the country-level indicators are also those with the most advanced financial markets (e.g. United Kingdom, Hong Kong, Australia, Germany, France, Japan). Combined with our previous observation that firms would benefit most from stronger governance in countries with strong financial institutions, this suggests there is an incentive for firms to institute strong internal governance even in countries with strong mechanisms. Our observation of complementarity can also be justified under the institutional theory framework, which views firm-level governance as being a result of the prevailing national institutions and social systems (Aguilera et al., 2015; Schiehl and Martin, 2016). The institutional theory framework assumes that a firm's external environment determines its adoption of the various governance practices. Overall, our observations regarding the moderating effect of country-level factors, as well as the complementarity of firm-level and country-level factors, call for a further examination of the specific factors that entice a firm to alter its investment in firm-level governance under different scenarios. We examine two of these factors in the next section.

**Table 3.4: Multivariate regressions of return and value measures on the firm-level governance index and country-level variables**

This table presents the results of six ordinary least squares regressions using industry and year dummies with two measures of return and value, Return on Equity (ROE) and Tobin's Q, as the dependent variables. *Panel A* presents the regressions with the individual country-level variables, while *Panel B* presents the regressions with the country-level index. ROE is net income divided by equity. Tobin's Q is calculated as the sum of the book value of preferred equity, book value of long-term debt, short-term debt minus short-term marketable securities, and market value of equity divided by the book value of total assets. This method of calculating Tobin's Q was found by Chung and Pruitt (1994) to have a very high correlation with the results of the original Tobin's Q. GOVI is a firm-level additive index of governance constructed using a collection of individual measures of governance (see text for details). COGI is a country-level governance index (explained in the text). The Rule of Law Index (RLAW) is a score of the country's legal system and its law enforcement power. Media (MEDI) is a score that assesses the degree of media freedom in a particular country. The Social and Cultural index (SOCL) assesses the characteristics of the education and health systems as well as training and technological readiness in a country. The Market Competitiveness index (COMP) measures the efficiency of the goods and labour markets as well as innovation and business sophistication in a particular country. The control variables (SIZE/LEV/GROW/LGPC) are explained in the text. The t-Statistics reported in parentheses are based on country-clustered standard errors. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Akaike information criterion (AIC) measures the relative quality of a model compared to other models, through considering the trade-off between the model's complexity and its goodness of fit. The Likelihood-ratio and the Davidson-MacKinnon J tests are model selection tests used for nested and non-nested models, respectively. The Likelihood-ratio test compares the additive/moderating models to the independent model. The Davidson-MacKinnon J test compares each model to the other two alternatives. In both cases, rejecting the null hypothesis (significant results) would result in selecting the alternative model. For both tests, we report the test statistics value and the significance level.

<b>Panel A: Regressions with the Individual Country-level Factors</b>						
<b>Model Category</b>	<b>With ROE as Dependent Variables</b>			<b>With Tobin's Q as Dependent Variables</b>		
	<b>Independent (I)</b>	<b>Additive (A)</b>	<b>Moderating (M)</b>	<b>Independent (I)</b>	<b>Additive (A)</b>	<b>Moderating (M)</b>
Intercept	0.861*** (3.090)	0.821** (2.610)	0.869 (1.620)	0.208** (2.590)	0.167* (1.910)	0.217* (1.700)
GOVI	0.266* (1.880)	0.503*** (2.770)	0.308** (2.460)	0.046** (2.300)	0.093* (1.790)	0.051** (2.210)
RLAW	0.600** (2.250)	0.267 (0.650)		0.431 (1.220)	0.132 (1.120)	
MEDI	0.192 (1.190)	0.372 (0.800)		0.508** (2.100)	0.031 (0.060)	
SOCL	0.421 (1.520)	0.139 (0.270)		0.359 (1.450)	0.830 (0.680)	
COMP	0.343 (0.210)	0.140*** (2.770)		0.374 (1.230)	0.279* (1.860)	
GOVI*RLAW	0.984** (2.120)		0.015*** (3.160)	0.092 (1.260)		0.021** (2.170)

GOVI*MEDI	0.318 (1.090)		0.042* (1.910)	0.104** (2.090)		0.008 (0.900)
GOVI*SOCL	0.705 (1.510)		0.049*** (3.050)	0.063 (1.210)		0.016* (1.820)
GOVI*COMP	0.303 (1.180)		0.241** (2.550)	0.113 (1.550)		0.052* (1.960)
SIZE	0.129 (1.070)	0.130 (1.080)	0.130 (1.080)	-0.351*** (-4.020)	0.350*** (-4.120)	-0.348*** (-4.060)
LEVG	0.736* (1.980)	0.733* (1.980)	0.734* (1.980)	0.935 (0.340)	0.829 (0.300)	0.806 (0.300)
GROW	0.000 (1.500)	0.000 (1.450)	0.000 (1.480)	0.000 (0.780)	0.000 (0.610)	0.000 (0.650)
LGPC	-0.904** (-2.580)	-0.990*** (-2.820)	-0.938*** (-3.310)	-0.914* (-1.780)	-0.946 (-1.530)	-0.987* (-1.890)
Adjusted R-squared	0.150	0.148	0.149	0.124	0.102	0.113
AIC score	172,380	172,377	172,375	121,036	121,049	121,027
Likelihood-ratio test		3.330	1.470		2.280	1.560
Davidson-MacKinnon J test						
<i>H<sub>A</sub>: Independent</i>		1.310	1.210		1.040	1.110
<i>H<sub>A</sub>: Additive</i>	10.470***		-0.190	3.370***		-0.820
<i>H<sub>A</sub>: Moderating</i>	10.470***	3.320***		3.370***	1.820*	
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43	43	43	43	43

**Panel B: Regressions with the Country-level Index**

Model Category	With ROE as Dependent Variables			With Tobin's Q as Dependent Variables		
	Independent	Additive	Moderating	Independent	Additive	Moderating
Intercept	0.699** (2.400)	0.635* (1.830)	0.702* (1.840)	0.172** (2.440)	0.116* (1.880)	0.164 (1.590)
GOVI	0.329* (1.820)	0.458** (2.490)	0.293** (2.360)	0.025** (2.070)	0.087** (2.580)	0.059** (2.170)
COGI	0.258 (0.130)	0.106* (1.880)		0.600** (2.260)	0.105 (0.990)	
GOVI*COGI	0.151* (1.870)		0.194** (2.300)	0.132* (1.740)		0.032** (2.030)

SIZE	0.160 (1.320)	0.159 (1.300)	0.160 (1.310)	-0.292*** (-2.960)	-0.302*** (-3.010)	-0.294*** (-2.970)
LEVG	0.737* (1.990)	0.737* (1.990)	0.737* (1.990)	0.958 (0.340)	0.939 (0.340)	0.908 (0.330)
GROW	0.000 (1.560)	0.000 (1.540)	0.000 (1.570)	0.000 (0.650)	0.000 (0.560)	0.000 (0.570)
LGPC	-0.827** (-2.180)	-0.826** (-2.150)	-0.810** (-2.720)	-0.974 (-1.610)	-0.972 (-1.400)	-0.135* (-1.750)
Adjusted R-squared	0.138	0.138	0.138	0.091	0.083	0.086
AIC score	172,386	172,384	172,384	121,066	121,070	121,061
Likelihood-ratio test		0.300	0.030		1.120	0.980
Davidson-MacKinnon J test						
<i>H<sub>A</sub>: Independent</i>		0.550	0.869		1.210	0.990
<i>H<sub>A</sub>: Additive</i>	10.490***		-0.160	3.400***		-0.930
<i>H<sub>A</sub>: Moderating</i>	10.490***	2.030**		3.400***	3.340***	
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43	43	43	43	43

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### 3.6.4. The role of financial development and capital dependency

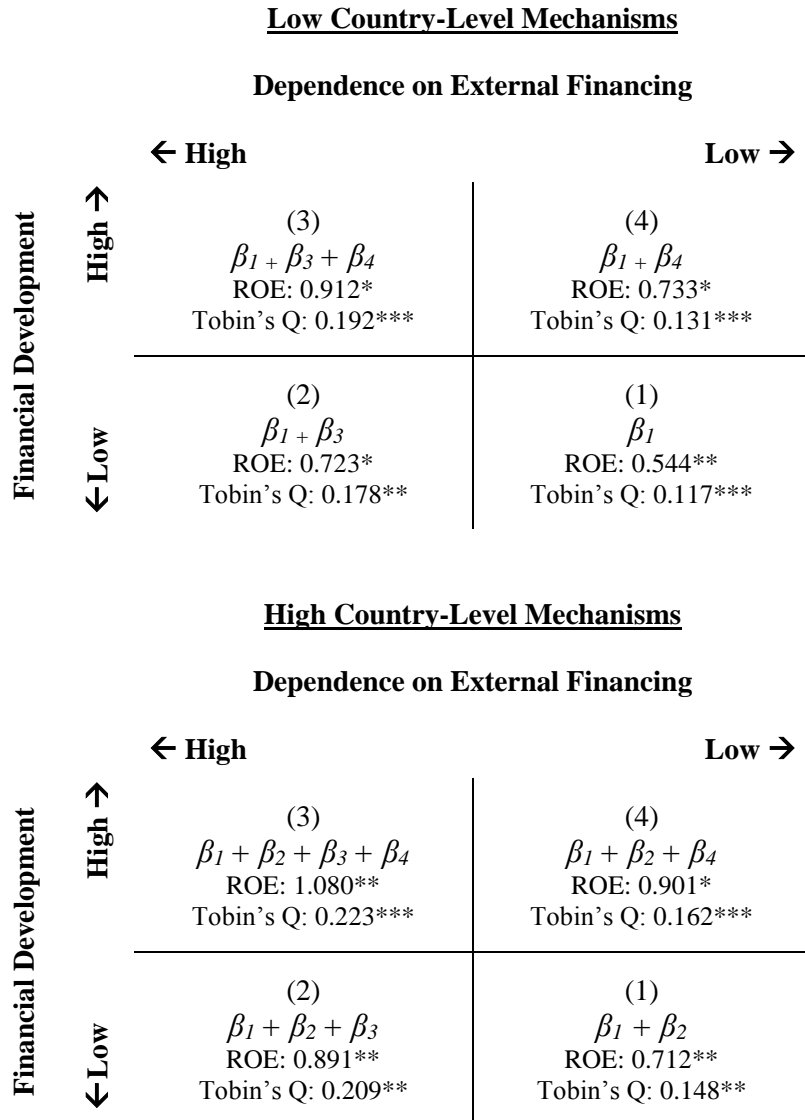
One of main benefits to a firm from adopting better governance practices is having a better access to capital markets along with improved terms of financing. As discussed earlier, this suggests that the benefits will be related to the firm's ability to access capital, which will depend on the extent of the development of the country's capital market. However, it can be also argued that a firm's gain from adopting a more stringent governance framework does not rely exclusively on the financial development status of the country it operates in, but also depends on its external financing requirements. In other words, the higher the firm's need for external financing the more likely it is that it will adopt a stronger governance framework to benefit from the reduced funding costs and the improved access to funding sources, which will result in a better financial performance. Put together, a firm with high external financing needs is most likely to adopt a high governance framework to gain favourable access to the capital markets if it is operating in a country with high financial development. Similarly, a firm with low needs for external financing is more likely to adopt a low governance framework if it is operating in a country with low financial development. An additional dimension can be added to the analysis to capture the difference for firms operating in countries with stronger and weaker country-level governance mechanisms.

To test the validity of our argument, we run *Model 3.4* with dummies for the level of the country governance mechanism ( $D_{COGI}$ ), the level of financial development ( $D_{FIND}$ ), and the extent of demand for external funds ( $D_{EXCD}$ ):

$$\text{Return or Value Measure}_{i,t} = \beta_0 + \beta_1 GOVI_{i,t} + \beta_2 (GOVI_{i,t} \times D_{COGI}) + \beta_3 (GOVI_{i,t} \times D_{FIND}) + \beta_4 (GOVI_{i,t} \times D_{EXCD}) + \text{Control Variables } (SIZE_{i,t}/LEVG_{i,t}/GROW_{i,t}/LGPC_{i,t}) + \varepsilon_{i,t}$$

The coefficient of the governance index ( $\beta_1$ ) represents the effect of governance on firm value or return when the firm operates in a country with a low country score and low financial development while also having low external financing needs. The contribution of governance to firm value or return when the firm operates in an environment with combinations of high and low country governance, financial development, and needs to tap external funding are as set out in Figure 3.1.

**Figure 3.1: The financial development, capital dependency, firm governance nexus**



The results of our regressions reported in *Panel A* of *Table 3.5* show that firms with low external financing needs that are based in a country with low country governance mechanisms and low financial development would still enjoy both higher returns and higher value due to the internal governance mechanisms that they have put in place. However, the positive and significant coefficients associated with each of the cross products terms show that the positive impact that

internal governance has on firm return and value are enhanced by strong country governance, a well-developed capital market and a strong need to raise funds externally. We report the results of the different coefficient combinations in *Figure 3.1* along with the relevant Wald test results (as reported in *Panel B* of *Table 3.5*). The reported results show that the strongest and most significant positive impact on firm performance and value occurs for firms with high external funding needs that are resident in a country with a developed capital market and strong country governance. Finally, our results suggest that it is external financial needs that have the greatest impact on the relationship between internal governance mechanisms and firm performance, whereas it is the extent of the development of the capital market that has the greatest impact on the relationship between internal governance and firm value. Overall, this confirms our earlier arguments and lends support to prior findings in the literature on the collective role of a country's financial development and the firm's external financing needs in influencing its governance framework (see Aggarwal et al. 2010; Doidge et al. 2007).<sup>13</sup>

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<sup>13</sup> Results remain essentially the same when we re-run Model 3.4 excluding the country variables.

**Table 3.5: Multivariate regressions of return and value measures on the firm-level governance index, country-level mechanisms, the financial development index and the external capital dependency measure**

This table presents the results of two ordinary least squares regressions using industry and year dummies with two measures of return and value: Return on Equity (ROE) and Tobin's Q, as the dependent variables. The dummy variables ( $D_{COGI}$ ,  $D_{FIND}$ , and  $D_{EXCD}$ ) take the value 1 if the score of the country/firm on the index is above the median value for all countries/firms in the sample or 0 otherwise. COGI is a country-level governance index (explained in the text). GOVI is a firm-level additive index of governance constructed using a collection of individual measures of governance (see text for details). All other variables are explained in the text. The t-Statistics reported in parentheses are based on country-clustered standard errors. The reported Wald test results in Panel B test the null hypothesis that the coefficients are simultaneously equal to zero. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Mean Variance Inflation Factor (VIF) is a measure of the severity of multicollinearity in a regression.

<b>Panel A: Regression Results</b>		
	<b>ROE</b>	<b>Tobin's Q</b>
Intercept	0.460 (1.290)	0.104* (1.690)
GOVI	0.544** (2.220)	0.117*** (2.980)
GOVI* $D_{COGI}$	0.168* (1.720)	0.031* (1.810)
GOVI* $D_{FIND}$	0.179* (1.830)	0.061** (2.170)
GOVI* $D_{EXCD}$	0.189** (2.250)	0.014 (1.140)
SIZE	0.1110 (0.820)	-0.442*** (-3.860)
LEVG	0.696 (1.510)	0.649 (0.210)
GROW	0.000 (1.650)	0.000 (0.610)
LGPC	-0.525 (-1.450)	-0.660 (-1.160)
Adjusted R-squared	0.156	0.138
Mean VIF	2.73	2.73
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43
<b>Panel B: Wald Tests</b>		
a. $B_{GOVI} = B_{GOVI*DCOGI} = 0$	4.000**	4.830**
b. $B_{GOVI} = B_{GOVI*DFIND} = 0$	2.700*	4.600**
c. $B_{GOVI} = B_{GOVI*DFIND} = B_{GOVI*DCOGI} = 0$	3.610**	3.760**
d. $B_{GOVI} = B_{GOVI*DEXCD} = 0$	2.820*	12.390***
e. $B_{GOVI} = B_{GOVI*DEXCD} = B_{GOVI*DCOGI} = 0$	2.720*	11.000***
f. $B_{GOVI} = B_{GOVI*DFIND} = B_{GOVI*DEXCD} = 0$	2.750*	10.370***
g. $B_{GOVI} = B_{GOVI*DFIND} = B_{GOVI*DEXCD} = B_{GOVI*DCOGI} = 0$	2.770**	8.760***

### 3.6.5. Robustness tests

We realise that the reliability of our conclusions may be called into question due to the way we build our proxy of firm-level governance quality. Therefore, we test the robustness of our results by using the corporate governance score calculated by DataStream (GOVS) as an alternative proxy for a firm's quality of internal governance.<sup>14, 15</sup> While the construction methods of the two governance indices are not dissimilar, the method followed to construct our own index allows us to largely reduce the effect of missing data and over/underrepresentation of firms, by measuring each firm's governance score as a standalone while adjusting for missing variables. Moreover, although no signs of multicollinearity were found using the standard statistical tests, we address any remaining concerns about the possible existence of such a problem by re-running our analysis using the country-level governance (COGI) score introduced earlier. The results from *Table 3.6* confirm that our earlier findings are not affected by our governance index (*Regression 1*). They also confirm (*Regressions 2-4*) that our conclusions remain essentially the same, with an overall measure of country-level factors that accounts for potential multicollinearity issues in our previous models.

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<sup>14</sup> The governance score provided by DataStream is a standardized score (Z-score) that compares the firm's overall governance framework to all other firms in the database.

<sup>15</sup> We re-run all models but report the results for Model 3.1 only, as all results remain essentially the same.

**Table 3.6: Robustness test: Multivariate regressions using alternative firm-level and country-level governance measures**

This table presents the results of four ordinary least squares regressions using industry and year dummies with different dependent variables. GOVI is a firm-level additive index of governance constructed using a collection of individual measures of governance (see text for details). GOVS is a standardised governance score provided by DataStream that compares the firm's overall governance framework to all other firms in the database. COGI is a country-level governance index (explained in the text). The Rule of Law Index (RLAW) is a score of the country's legal system and its law enforcement power. The legal system origin (LORG) is a dummy variable which takes the value 1 if the country's legal system is based on common law or 0 if it is based on civil law. Media (MEDI) is a score that assesses the degree of media freedom in a particular country. The Social and Cultural index (SOCL) assesses the characteristics of the education and health systems as well as training and technological readiness in a country. The Market Competitiveness index (COMP) measures the efficiency of the goods and labour markets as well as innovation and business sophistication in a particular country. All other variables are explained in the text. The t-Statistics reported in parentheses are based on country-clustered standard errors. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Mean Variance Inflation Factor (VIF) is a measure of the severity of multicollinearity in a regression.

	<b>GOVS (1)</b>	<b>GOVI (2)</b>	<b>ROE (3)</b>	<b>Tobin's Q (4)</b>
Intercept	-44.452*** (-3.910)	42.025*** (7.700)	-0.957 (-1.120)	3.340*** (3.360)
GOVS			0.237** (2.170)	0.035* (1.930)
COGI		3.622*** (4.140)		
GOVS*COGI			0.029* (1.790)	0.006* (1.830)
RLAW	3.829* (1.830)			
LORG	28.856*** (8.910)			
MEDI	1.801* (1.740)			
SOCL	3.825* (1.910)			
CHRN	27.388*** (7.470)			
ISLM	9.515 (1.510)			
COMP	2.218 (1.590)			
SIZE	3.379*** (5.090)	-0.055 (-0.170)	0.166 (1.400)	-0.275*** (-2.850)
LEVG	-2.048 (-1.200)	2.338 (1.450)	0.715* (1.970)	0.744 (0.270)
GROW	-0.000** (-2.040)	-0.000 (-0.980)	0.000 (1.420)	0.000 (0.480)
LGPC	7.540 (0.950)	1.121 (0.758)	-0.110 (-1.300)	-0.090 (-0.310)
Adjusted R-squared	0.424	0.217	0.137	0.080
Mean VIF	3.72	2.54	2.63	2.63
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43	43	43

Renders et al. (2010) note several issues such as the observance of insignificant or incorrect results when econometric anomalies such as endogeneity are not properly controlled for in similar studies (see also Aguilera et al., 2015; Schiehl and Martin, 2016). Following Wintoki et al. (2012) and others, we use the dynamic-panel Generalised Methods of Moments (GMM) estimator introduced by Arellano and Bover (1995) and Blundell and Bond (1998) and follow a three-step estimation process. First of all, the regression models (models 3.1 and 3.2a) are modified to include the first lag of the dependent variable as an independent variable. Second, we take the first-difference of the variables to account for any unobserved heterogeneity. Lastly, we use the dynamic panel GMM estimator to estimate the final model while using the lagged values of the explanatory variables as instruments for the current values of the same variables to account for possible simultaneity and reverse causality (Hoechle et al., 2012). This setup allows us to treat all explanatory variables as endogenous variables while adding the years' dummy variables as the only exogenous variables. The results from re-estimating model 3.3c are reported in *Table 3.7*.<sup>16</sup> The results convey similar results to the ones reported earlier with higher significance in the model using Tobin's Q as a dependent variable. Our results remain essentially the same when we use Return on Assets (ROA) or Earnings Per Share (EPS) as dependent variables.

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<sup>16</sup> Unreported results for Models 3.2c and 3.4 confirm similar findings, with regressions using Tobin's Q as the dependent variable showing more significant results.

**Table 3.7: Robustness test: Test for endogeneity using dynamic panel GMM models**

This table presents the results of two different regressions with different dependent variables. COGI is a country-level governance index (explained in the text). GOVI is a firm-level additive index of governance constructed using a collection of individual measures of governance (see text for details). Details of the Dynamic Panel GMM procedure can be found in the text. The Arellano-Bond test is a test for first-order autocorrelation in the first-differenced errors with the null hypothesis of zero autocorrelation (*p-value* is reported). The Hansen test of over-identification tests the null hypothesis that all instruments are valid (*p-value* is reported). The t-Statistics are reported in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	ROE	Tobin's Q
Intercept	0.474 (0.090)	-0.074*** (-2.650)
Dependent variable (One Lag)	0.966*** (22.790)	0.960*** (62.000)
GOVI	0.264* (1.760)	0.009** (2.110)
GOVI*COGI	0.102** (2.222)	0.027** (2.330)
SIZE	0.2341 (0.090)	-0.003** (-2.590)
LEVG	0.8173 (0.540)	0.003** (2.520)
GROW	0.274 (0.540)	0.000*** (2.610)
LGPC	-0.259 (-0.550)	-0.002 (-0.371)
Arellano-Bond first order test	0.229	0.396
Hansen Test	0.593	0.330
No. of Firms (Firm-year)	3301 (25,352)	3301 (25,352)
No. of Countries	43	43

### **3.7. Conclusion**

This study investigates whether differences in some country-level characteristics can explain the differences in the corporate governance practices across countries. The study also analyses the nature of the relationship between the mechanisms of corporate governance and institutions, markets, and socio-political variables across countries. We find that country-level factors such as rule of law, media freedom, social and cultural development, and market competition, explain a significant part of the variation in firm-level governance across countries (Claessens and Yurtoglu, 2015; Core et al., 2008; La Porta et al., 2000; Stulz and Williamson, 2003). Furthermore, we find that the relationship between country-level factors and firm-level mechanisms is best represented using a moderating model where country-level factors act as moderators of the relationship between firm-level mechanisms and firm value/return. Also, consistent with the findings of Aggarwal et al. (2010), Anderson and Gupta (2009) and others, the results from our regressions indicate the presence of a complementary relationship between firm-level governance and all the country-level variables included in our study. Under the framework of the agency theory, this complementary relationship can be explained through the argument that a firm may not find it beneficial to improve its governance framework in an environment with weak institutions and country-level protections because it expects no gains from doing so (Jensen and Meckling, 1976). Support for our observation also comes from the institutional theory framework, which views firm-level governance as being a result of the prevailing national institutions and social systems (Aguilera et al., 2015; Schiehl and Martin, 2016).

When accounting for the effect of financial development, the results suggest that the adoption of a stronger firm-level governance framework is associated with higher value or return when the firm operates in a highly developed financial market. This confirms our argument that a high state of financial development will encourage firms to adopt even more stringent governance frameworks to improve their access to domestic capital markets. We also find evidence of stronger firm-level governance in firms with high financing needs. This supports the argument that a firm's governance framework is highly dependent, not only on the financial development status of the country in which it operates, but also on its needs for external financing (Aggarwal et al., 2010; Doidge et al., 2007). A firm that expects to be able to secure its financing needs from the capital markets is more likely to adopt stronger firm-level governance in order to improve the terms of its financing.

The results of this study contribute to the global debate on the best governance practices and the role of country characteristics in determining the optimal set of mechanisms. Our finding regarding the form of the relationship between the country-level factors and firm-level mechanisms constitutes an important addition to the existing debate on the nature of the relationship between these two governance groups. The results also have the potential to inform future decision-making processes with regards to improving corporate governance practices and increasing investor protection. Future research can focus on examining changes in the relationship between firm-level governance and country-level factors over time. This will also permit a closer examination of the effect that structural changes in country-level factors have on firm-level governance.

**Chapter 4:** Essay II: The role of corporate governance and estimation methods in predicting bankruptcy

# **Chapter 4**

## **Essay II: The role of corporate governance and estimation methods in predicting bankruptcy**

## **4. Essay II: The role of corporate governance and estimation methods in predicting bankruptcy**

### **4.1. Introduction**

In the last few decades, the occurrence of several high-profile corporate bankruptcies (e.g. Enron, WorldCom) have been linked to the failure of corporate governance frameworks and the subsequent introduction of the Sarbanes-Oxley Act in 2002 to reform corporate governance practices. This has increased the interest in studying the role played by corporate governance in influencing the firm's health and determining its fate. One can argue that a firm's probability of bankruptcy may be partially explained by its corporate governance characteristics through their influence on how the firm is operated and the extent to which the interests of the managers are aligned with those of the shareholders (Daily et al., 1994; Jensen, 1986; Jensen and Meckling, 1976). On this basis, enquiries into the role of corporate governance mechanisms in the occurrence of corporate failures, as well as their role in improving our ability to predict such occurrences, have seen growth in recent years (Daily et al., 2003; Darrat et al., 2016; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Liang et al., 2016). However, many of the studies on governance and bankruptcy prediction suffer from several limitations, such as: focusing on a particular family of bankruptcy models (e.g. market-based or accounting-based models); overlooking the impact of the estimation technique on the classification and prediction accuracy; and the lack of a comprehensive analysis of the predictive performance and classificatory power of the different models tested.

Corporate governance affects the firm's probability of bankruptcy through two main interrelated dimensions. The first dimension is related to agency risk and moral hazard, where the management's pursuit of self-interest and the maximisation of personal wealth may come at the expense of the shareholders' wealth and interests (Jensen and Meckling, 1976). Management actions related to agency issues and the moral hazard problem include: shirking responsibilities, over-compensation, empire building, and focusing on short-term gains rather than long-term value maximising goals. These actions can be detrimental to the firm (Jensen, 1986; Jensen and Meckling, 1976). Ashbaugh-Skaife et al. (2006) found that an increase in agency risk decreases the value of future cash flows while also increasing their volatility, which in turn increases the probability of a default in a firm. Hence, corporate governance mechanisms play an important part in determining the firm's fate through their role in mitigating agency costs as well as monitoring

and controlling the firm's management (Fich and Slezak, 2008; Jensen, 1986; Jensen and Meckling, 1976).

The second dimension is related to information asymmetry or information risk, where struggling firms such as Enron or WorldCom can continue to appear healthy by manipulating their financial results. The manipulation of the firm's results masks its actual situation and allows the firm's management to continue its operations without any discipline or intervention by the different stakeholder groups (e.g. owners, creditors), effectively eliminating any potential for a turnaround. Corporate governance mechanisms reduce information asymmetry by improving the quality and the quantity of information disclosed while also preventing the manipulation of the firm's results, thus indirectly affecting the firm's probability of bankruptcy (Beasley, 1996; Beekes et al., 2016; Elbadry et al., 2015). In the context of bankruptcy prediction, the effect of corporate governance mechanisms on reducing information risk can be seen through their influence on the quality and accuracy of the firm's accounting and financial indicators which are used to gauge the firm's financial health (Bhojraj and Sengupta, 2003).

Estimation methods used in bankruptcy prediction can be generally classified into parametric methods and non-parametric methods (Min and Jeong, 2009). The parametric methods group includes techniques such as: discriminant analysis (e.g. Altman, 1968), logistic regression (e.g. Ohlson, 1980) and hazard analysis (e.g. Shumway, 2001). The non-parametric methods group includes techniques such as: data envelopment analysis (e.g. Premachandra et al., 2009), neural networks (e.g. Desai et al., 1996) and classification and regression trees (e.g. Li et al., 2010). The parametric methods have attracted the attention of researchers and practitioners due to requiring less computing power as well as their superior comprehensibility compared to the non-parametric methods which were seen as 'black box' technologies (Ohlson et al., 2012). The parametric methods are also easier to apply and require much less input and configuration than the non-parametric methods whose use involves dealing with many rules, functions and iterations to arrive at a final output. However, significant improvements in computing power in the last few decades and the improved visualisation offered by some of the non-parametric methods such as the classification and regression trees have contributed to the increased utilisation of non-parametric methods in bankruptcy prediction. Despite the presence of extensive literature on the performance of the various estimation methods in the field of bankruptcy prediction, there appears to be no

consensus on the superiority of one method over the other (Kumar and Ravi, 2007; Min and Jeong, 2009; Ohlson et al., 2012).

This study examines the role of corporate governance variables in improving the predictive power of bankruptcy prediction models, while analysing the classificatory powers offered by the different estimation techniques. The study is among the first to comprehensively examine the nexus between bankruptcy, corporate governance, and estimation techniques. Most prior studies have primarily focused on examining the value of adding governance variables to a bankruptcy prediction model without considering comparability across the different models or estimation techniques (e.g. Daily and Dalton, 1994; Darrat et al., 2016; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Wang and Deng, 2006). Furthermore, recent studies by Chan et al. (2016) and Liang et al., (2016) cover a very limited set of bankruptcy models and estimation techniques. This limits the comparability of the results. We cover a more comprehensive set of models and estimation techniques. Also, we use a larger sample and a longer timeframe to examine different combinations of models and estimation techniques, and this allows for better comparison of the predictive powers of these models, and of the classificatory ability of the different estimation methods. Moreover, our study focuses on examining the role of governance attributes in predicting bankruptcy, which is different to Ashbaugh-Skaife et al. (2006) who examine the role of such attributes in influencing the firm's credit rating. The present study also addresses endogeneity concerns, which is an important issue that has been largely overlooked in similar studies (Schultz et al., 2017).

We find that the addition of governance variables that represent the firm's board attributes significantly improves the classificatory power and predictive accuracy of the different bankruptcy prediction models covered in the study. We also find that the further away in time a firm is from bankruptcy, the greater the additional explanatory power provided by adding the governance measures. This implies that governance variables tend to provide earlier and more accurate warnings of the firm's bankruptcy potential. Lastly, our analysis of six of the most frequently used estimation methods in the literature shows that regardless of the bankruptcy model used, hazard analysis provides the best classification and out-of-sample forecast accuracy among the parametric methods, the other methods being multiple discriminant analysis and regression analysis. Nevertheless, non-parametric methods such as neural networks, data envelopment analysis and classification and regression trees appear to provide better classificatory accuracy regardless of the

model selected (Cielen et al., 2004; Desai et al., 1996; Malhotra and Malhotra, 2003; Premachandra et al., 2009; Wilson and Sharda, 1994; Zhang et al., 1999). Overall, hazard analysis, data envelopment analysis, neural networks and classification and regression trees add the most economic value through reducing the potential costs arising from either lending to firms that will go into bankruptcy soon and thus incurring a loss in principal (classifying bad cases as good), or not lending to healthy firms and thus foregoing the investment opportunity (classifying good cases as bad).

## **4.2. Literature review**

### **4.2.1. Governance and bankruptcy prediction**

The vast majority of corporate governance research focuses on healthy or growing firms with very little attention being directed towards the role of governance in firms facing the imminent threat of bankruptcy (Daily et al., 2003; Fich and Slezak, 2008; Gilson, 1990). Among the first attempts to examine the governance-bankruptcy relationship was completed by Daily and Dalton (1994) who reported the presence of a significant relationship between several corporate governance measures and bankruptcy five years before the actual filing. Specifically, their results showed that bankrupt firms tended to have CEO-chairman duality, less independent boards, lower institutional ownership levels, and lower overall board quality. However, Daily and Dalton point out that the additional explanatory power provided by adding the governance measures disappears in favour of financial measures as we approach the year of bankruptcy, suggesting that as the time of the actual event approaches, financial conditions gain more explanatory power while governance becomes less significant in deciding the firm's fate. Moreover, Elloumi and Gueyie (2001) report that the number of independent board members seems to be inversely related to financial distress, suggesting that board independence improves a firm's financial health (see also Parker et al., 2002). In another related study on a sample of Chinese firms, Wang and Deng (2006) find that the probability of financial distress is inversely related to blockholder ownership (including state ownership) and board independence. However, they find no evidence that managerial ownership, board size, or CEO-chairman duality affect the probability of financial distress. In contrast, using a sample of US firms, Fich and Slezak (2008) report that corporate governance characteristics, such as smaller boards, high managerial ownership, and high board independence, reduce the probability of a distressed firm going into bankruptcy. Fich and Slezak suggest that such

mechanisms provide effective monitoring and advice, and thus help firms in financial distress avoid bankruptcy.

Several recent studies have examined the potential role of corporate governance mechanisms in improving the accuracy of bankruptcy prediction models. The premise behind these studies is that corporate governance practices can affect the probability of bankruptcy of a firm by affecting its operating performance, its valuation, and its ability to attract more financing (Daily et al., 2003; Jensen, 1993; Shleifer and Vishny, 1997; Walsh and Seward, 1990). For instance, Tsai (2013) found that the predictive power of a distress prediction model can be improved significantly by introducing corporate governance measures. Specifically, Tsai's results show that the inclusion of managerial ownership and the pledge-ownership ratio of insiders in the basic Z-score model introduced by Altman (1968) reduces the classification error considerably. In contrast, the findings of Elshahat et al. (2015) find that the addition of a corporate governance index measure to Altman's original model does not improve the predictive power of the model when using a one-year prediction window. However, the results of this study do not rule out the role of governance measures in improving bankruptcy prediction models but may rather confirm the findings of earlier studies (e.g. Daily and Dalton, 1994) that the relationship between governance and financial distress or bankruptcy fades as we get closer to the event.

Schultz et al. (2017) confirm the presence of an association between corporate governance mechanisms and the probability of default which disappears after controlling for endogeneity, suggesting that prior findings in the literature may suffer from inadequate attention to endogeneity issues such as unobserved heterogeneity, possible simultaneity, and reverse causality (see also Wintoki et al., 2012). Darrat et al. (2016), however, show that corporate governance variables retain their explanatory powers even after controlling for endogeneity. Furthermore, Darrat et al. report that board size and the proportion of insiders on the board are inversely related with the risk of bankruptcy in complex firms, suggesting that complex firms require larger boards with more insider expertise to survive. The results further suggest that the relationship between governance and risk of bankruptcy becomes more significant the further we are from the event. Additionally, Chan et al. (2016) provide further evidence that the addition of governance variables to well-known bankruptcy prediction models improves their forecasting powers considerably, and more

so after the enactment of the Sarbanes-Oxley Act (see also Liang et al., 2016; Manzaneque et al., 2016).

#### **4.2.2. Estimation methods and bankruptcy prediction**

With regards to the estimation method, Shumway (2001) argues that hazard models are far better than MDA or regression analysis for predicting bankruptcy because hazard models provide more consistent estimates. Shumway develops a model using hazard modelling techniques and a mixture of accounting- and market-based variables. Shumway reports that the model's performance in out-of-sample prediction is considerably better than earlier market-only or accounting-only models. Furthermore, Cielen et al. (2004) and Premachandra et al. (2009) find that using data envelopment analysis (DEA) to estimate bankruptcy prediction models provides more accurate out-of-sample predictions than models estimated using logistic regression, linear programming or rule induction. DEA is a quick and easy-to-apply non-parametric method that has long been used in the analysis and measurement of operational performance. Premachandra et al. further point out that models estimated using DEA do not require large sample sizes and neither do they need to meet any distributional assumptions. Moreover, Sueyoshi and Goto (2009) compare the results of bankruptcy prediction using the basic DEA method and DEA-discriminant analysis (DEA-DA) and find that DEA-DA is a superior method when the purpose of the analysis is to closely examine rather than just classify firms. Sueyoshi and Goto also point out that DEA-DA has less restrictions on data classification and imbalance, as well as better predictive abilities of new observations compared to basic DEA. Additionally, evidence from the credit scoring literature suggests that neural networks consistently outperform traditional estimation methods such as MDA and regression analysis in identifying bad loans (Desai et al., 1996; Malhotra and Malhotra, 2003; Piramuthu, 1999; West, 2000). Also, several studies have confirmed neural networks' superiority over MDA (e.g. Wilson and Sharda, 1994) and logistic analysis (e.g. Zhang et al., 1999) in predicting bankruptcy.<sup>17</sup>

Several studies in the literature have focused on comparing the predictive powers and performance of the different models and estimation methods. For example, Agarwal and Taffler (2008) compare the performance of market-based and accounting-based models using a sample of UK-listed firms and find no material difference in the performance of the two groups of models. Additionally, their

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<sup>17</sup> A full review is provided in Kumar and Ravi (2007).

results confirm that each group of models carries a unique set of information about firm bankruptcy, suggesting that a model combining variables from both groups would provide better predictive accuracy (see also Hillegeist et al., 2004). These findings are also supported by Mousavi et al. (2015) who also report that hazard models produce better results than either regression analysis or MDA when the same models are estimated using different methods. Furthermore, Wu et al. (2010) finds that Shumway's (2001) market-and-accounting-based model performs far better than accounting-only or market-only models. They also report that of all the major models examined in their study, Altman's original MDA model had the poorest out-of-sample performance, whereas Ohlson (1980), Zmijewski (1984), and Hillegeist et al. (2004) performed adequately.

All in all, the results from past studies suggest that the different governance mechanisms are significantly related to firm health and performance, and that adding them to bankruptcy prediction models can be expected to significantly improve the prediction and classificatory accuracy of such models. However, we are still far from having closure on the extent to which corporate governance impacts the probability of bankruptcy, or on the role played by the different governance mechanisms in the whole prediction process. Furthermore, past attempts have focused primarily on examining the effect of adding governance variables to a bankruptcy prediction model without considering the comparability across the different models or estimation techniques. Also, most of these studies have overlooked concerns about endogeneity in their results, which casts some doubt on earlier findings. Finally, while prior research suggests that estimation methods play an important role in determining the classificatory accuracy of any bankruptcy prediction model, little attention has been given in the literature to the link between the various groups of input variables (market, accounting and governance) and the estimation methods used to classify firms (Kumar and Ravi, 2007; Malhotra and Malhotra, 2003). This study represents one of the first attempts to address these gaps in the literature.

### **4.3. Research questions**

This study has two main interconnected objectives, which are: 1) to test whether governance mechanisms improve the forecasting power of some well-known bankruptcy models, and to highlight the change in this forecasting power as we move away from the event, and 2) to examine the classificatory and predictive accuracy of the different estimation methods. Earlier findings in

the literature suggest the presence of a significant relationship between the quality of corporate governance and the probability of bankruptcy or financial distress (Daily and Dalton, 1994; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Wang and Deng, 2006). Furthermore, a relatively recent group of empirical studies has found that the addition of governance variables to some well-known bankruptcy prediction models improves their predictive powers considerably (Chan et al., 2016; Darrat et al., 2016; Liang et al., 2016; Tsai, 2013). This is based on the belief that corporate governance mechanisms play a vital role in determining a firm's fate through influencing, directly and indirectly, the allocation and management of its resources on a daily basis. A firm's corporate governance framework influences and includes many aspects of how the firm is managed, such as the characteristics of its board and its role in advising and monitoring the firm's executives as well as other internal control mechanisms that help align the interests of the managers with those of the shareholders (Daily et al., 2003; Jensen, 1986; Shleifer and Vishny, 1997). Corporate governance also includes the various incentives given to the firm's board members and executives to align their interests with those of the shareholders. The absence or failure of some or all of these mechanisms can lead to detrimental effects on the firm as its managers may start to pursue activities or make decisions that are not in the shareholders' best interests (Jensen, 1986; Jensen and Meckling, 1976). Based on this discussion and prior findings in the literature, our first research question is:

*1. Does the addition of governance variables significantly improve the classificatory accuracy of bankruptcy prediction models?*

Additionally, the firm's corporate governance framework tends to influence its medium- to long-term decisions, while financial ratios are seen as the consequences of these decisions. The firm's governance framework or mechanisms include its board responsibilities and composition in addition to various types of incentives given to the firm's board members and top management, among other mechanisms. The impact of any change in such mechanisms is likely to take a longer time than normal operational decisions to reflect the company's performance and results. Therefore, one would expect corporate governance attributes to provide an earlier warning of imminent financial distress or bankruptcy, when compared to financial ratios. This is supported by the role of corporate governance mechanisms in influencing the value and volatility of the firm's future cashflows, which in turn affects the firm's ability to meet future obligations (Ashbaugh-

Skaife et al., 2006). Daily and Dalton (1994) point out that the additional explanatory power provided by adding governance measures disappears in favour of financial measures as we approach the year of bankruptcy, suggesting that as time nears the actual event, financial conditions gain more explanatory power while governance becomes less significant in deciding the firm's fate. It is also important to consider that, unlike financial indicators, corporate governance indicators change less often and tend to remain stable for some time, which suggests that such indicators may provide earlier warnings of any upcoming distress. On this basis, our next research question is:

*2. Does the additional explanatory power gained from adding corporate governance measures to the bankruptcy prediction models decline as we approach the year of bankruptcy?*

Moreover, prior studies have found that the predictive accuracy of bankruptcy prediction models depends largely on the estimation method used. For example, Mousavi et al. (2015) and Shumway (2001) find that models estimated using hazard modelling techniques had better predictive accuracy compared to when discriminant analysis or regression analysis were used. Shumway (2001) argues that hazard models are far better for predicting bankruptcy because they account for changes in the firm's performance and characteristics over time.<sup>18</sup> Furthermore, findings in the literature suggest that non-parametric methods like data envelopment analysis provide a better predictive accuracy in small samples, an important feature of bankruptcy research (Cielen et al., 2004; Premachandra et al., 2009; Sueyoshi and Goto, 2009). Data envelopment analysis does not require the use of estimation samples and this helps avoid issues with using deficient or biased samples of the true population. Additionally, evidence from the credit scoring literature suggests that neural networks consistently outperform traditional estimation methods such as discriminant analysis and regression analysis in identifying bad loans (Desai et al., 1996; Malhotra and Malhotra, 2003; Piramuthu, 1999; West, 2000). This superior performance is attributed to the brain-like learning process in neural networks which involves estimating the output and re-adjusting the weights in an iterative process in order to minimise the difference between the outputs and the desired targets. The ability of such techniques to identify bad versus good loans with higher accuracy than other methods, as well as the presence of some evidence from past studies on the

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<sup>18</sup> While discriminant analysis and regressions estimations use the firm's last observation only to estimate the model, hazard models utilise more data points over the life of the firm and are thus likely to provide more accurate and consistent estimates.

superiority of neural networks in bankruptcy prediction (Wilson and Sharda, 1994; Zhang et al., 1999), suggest there are potential benefits from applying these methods in the field of bankruptcy prediction. Lastly, Ohlson et al. (2012) suggest that classification and regression trees provide better accuracy than neural networks when used for classifying bankrupt versus healthy firms. Overall, past evidence on the best estimation method seems to be inconclusive. Thus, our last research question is:

*3. Does any estimation method show consistent superior predictive/classificatory accuracy than other methods?*

#### **4.4. Data**

For the purposes of our study, we define bankruptcy as the event of going into liquidation or reorganisation (Chapters 7 and 11) even if the latter does not lead to bankruptcy. The sample of our study covers all events between January 2000 and December 2015 and consists of all firms that were part of S&P500, S&P MID CAP 400 or S&P SMALL CAP 600, during the period studied.<sup>19</sup> Following prior studies and due to the special nature of such firms, we exclude all finance- and insurance-related firms from our sample.<sup>20</sup> We build our initial list of bankrupt firms manually using publicly available lists of delisted firms as well as several news items. Our final list of bankrupt firms was confirmed by examining form 8-K filings with the Securities and Exchange Commission (SEC). We extracted all governance data (*Table 4.2*) for our study from BoardEx.<sup>21</sup> However, since some of the firms on our list of bankrupt firms did not have governance data in BoardEx, we rely on the firms' proxy statements (SEC filings - DEF 14A) to collect the missing data manually.<sup>22</sup> Finally, we use the CRSP/COMPUSTAT database to source the necessary accounting and market data for all firms in our sample. Our final sample consists of a total of 1,651 firms (out of which 194 firms were bankrupt) with a total of 12,721 firm-year observations.

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<sup>19</sup> We limit our study to this period only because of the unavailability of sufficient governance data for earlier periods.

<sup>20</sup> These firms are excluded because the dynamics of their balance sheets are significantly different from industrial/service firms which makes the usual bankruptcy prediction models and ratios irrelevant for such firms.

<sup>21</sup> For the United States, BoardEx covers all firms that are part of S&P500, S&P MID CAP 400 and S&P SMALL CAP 600, as well as some notable private firms. We only include publicly listed firms in our study.

<sup>22</sup> These firms would normally fall under the scope of coverage of BoardEx, however, no governance data is available in BoardEx for any of these firms, which is why we resort to collecting the data manually to complete our sample. In some years, some non-bankrupt firms do not exist in BoardEx because of the limited coverage by BoardEx during that year. We exclude these firms from our analysis and utilise several matching techniques to avoid sample bias.

#### **4.5. Methodology**

We focused our efforts on examining the bankruptcy models (henceforth referred to as the models) that got most attention in the literature as measured by the number of citations, while also trying to ensure a balanced mix of both estimation methods and accounting- versus market-based models<sup>23</sup> (Mousavi et al., 2015). While there are plenty of bankruptcy prediction models in the literature, only a few have been applied to different firms, markets and time periods with satisfactory results (Agarwal and Taffler, 2008; Grice and Ingram, 2001; Mousavi et al., 2015). In order to ensure the applicability of our conclusions to different situations and conditions, we focused our analysis on these models. The characteristics and structures of the models covered in our study are described in *Table 4.1*.

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<sup>23</sup> A consensus on whether market-based or accounting-based bankruptcy prediction models are more accurate does not seem to arise in the literature. As a matter of fact, the evidence in the literature suggests that a mixture of both measures might provide better prediction accuracy than either alone (see Agarwal and Taffler, 2008; Hillegeist et al., 2004; Mousavi et al., 2015).

**Table 4.1: Description of previous models in the literature**

Study (in chronological order)	Accounting or market based?	Shorthand reference	Estimation technique	Variables
<i>Altman (1968)</i>	Mostly Accounting	ALT	Discriminant analysis	<p><i>WCTA</i> = Working capital / total assets;  <i>RETA</i> = Retained earnings / total assets;  <i>EBITTA</i> = Earnings before interest and taxes / total assets;  <i>METD</i> = Market value of equity / total debt;  <i>STA</i> = Sales / total assets.</p>
<i>Ohlson (1980)</i>	Accounting	OHL	Regression analysis (logit)	<p><i>TLTA</i> = Total liabilities / total assets;  <i>WCTA</i> = Working capital / total assets;  <i>CLCA</i> = Current liabilities / current assets;  <i>OENEG</i> = 1 if total liabilities exceed total assets, 0 otherwise;  <i>NITA</i> = Net income/total assets;  <i>FUTL</i> = Funds from operations (operating income minus depreciation) / total liabilities;  <i>INTWO</i> = 1 if net income has been negative for the last 2 years, 0 otherwise;  <i>CHIN</i> = <math>(NI_t - NI_{t-1}) / ( NI_t  +  NI_{t-1} )</math>, <math>NI_t</math> is the net income for the latest period;  <i>Ohlsonsize</i> = log (Total assets / GNP price-level index)</p>
<i>Zmijewski (1984)</i>	Accounting	ZMJ	Regression analysis (probit)	<p><i>NITA</i> = Net income / total assets;  <i>TLTA</i> = Total liabilities / total assets;  <i>CACL</i> = Current assets / current liabilities</p>
<i>Shumway (2001)</i>	Mix	SHW	Hazard analysis	<p><i>NITA</i> = Net income / total assets;  <i>TLTA</i> = Total liabilities / total assets;  <i>RelativeSize</i> = Log (the number of outstanding shares multiplied by year-end share price divided by total market value);  <i>LagExReturn</i> = Cumulative annual return in year <math>t - 1</math> minus the value-weighted index return in year <math>t - 1</math>;  <i>LagSigma</i> = Standard deviation of residuals derived from regressing monthly stock return on market return in year <math>t - 1</math>.</p>

<i>Bharath and Shumway (2008)</i>	Market	BSH	Hazard analysis	$V_A$ = Market value of assets, estimated as $F + V_E$ ; $V_E$ = Market value of equity; $\mu$ = Continuously compounded expected return on assets Estimated using the 1-year Treasury constant maturity rate; $\delta$ = Continuous dividend rate estimated as total dividends / $V_A$ ; $F$ = Face value of debt maturing at time T, proxied by total liabilities; $\sigma$ = Volatility of stock returns. Annualised percent standard deviation of returns and is estimated from the prior year stock return data for each month; $T$ = Time to debt maturity, considered as 1 year
<i>Campbell et al. (2008)</i>	Mix	CHS	Hazard analysis	$NIMTAAVG$ = Net income / (market value of equity + book value of liabilities), calculated using geometrically declining weights; $TLMTA$ = Total liabilities / (market value of equity + book value of liabilities); $EXRETAVG$ = Monthly log excess return relative to the market index, calculated using geometrically declining weights; $SIGMA$ = the standard deviation of daily stock returns over the past 3 months; $RSIZE$ = log ratio of the firm market capitalisation to that of the market index; $CASHMTA$ = cash and short-term assets / (market value of equity + book value of liabilities); $MB$ = market-to-book ratio; $PRICE$ = log share price, truncated above at \$15
<i>Premachandra et al. (2009)</i>	Mostly Accounting	PRM	Data Envelopment analysis (additive)	<u>Outputs:</u> $TDTA$ = Total debt / total assets; $CLTA$ = Current liabilities / total assets <u>Inputs:</u> $CFTA$ = cash flow / total assets; $NITA$ = net income / total assets; $WCTA$ = working capital / total assets; $CATA$ = current assets / total assets; $EBITTA$ = earnings before interest and taxes / total assets; $EBIE$ = earnings before interest and taxes / interest; $MVCE$ = market value of equity / book value of common equity

We follow the below estimation process to address our research questions:

- **Step 1:** Estimate the original models using our sample and the original estimation methods (one year) and re-estimate all models after adding the governance variables (see *Table 4.2*). This allows us to measure the added value from adding the governance variables to the original models, which is related to our first research question.
- **Step 2:** Re-estimate all models with different horizons to bankruptcy (two, three and five years). This allows us to answer our second research question regarding the potential variation in the explanatory power of governance variables in the time leading up to bankruptcy.
- **Step 3:** Re-estimate all models using Discriminant Analysis (DA), Logistic Regression (LR), Hazard Analysis (HA), the Data Envelopment Analysis (DE)-additive model, the Neural Networks-Backpropagation Network (NN) and Classification and Regression Trees (CT).<sup>24</sup> This allows us to address our last research question regarding the prediction/classificatory accuracy of the different methods.
- **Step 4:** Test the validity of our results after accounting for endogeneity.

As the main goals of this study are to investigate the benefits gained from adding the governance variables and to test the accuracy of the different statistical estimation techniques (henceforth referred to as estimation methods or techniques) at the same time, we used a battery of tests to compare the predictive performance, the classificatory power, and the information content of our models.

#### **4.5.1. Overview of the different statistical techniques**

##### **4.5.1.1. Multiple discriminant analysis (MDA) and regression analysis**

Both MDA and regression analysis have been used extensively in the bankruptcy prediction literature. Put simply, an MDA model is a linear combination of two or more independent variables that are used to differentiate between pre-defined groups. This differentiation is achieved by maximising the between-group variance relative to the within-group variance in order to produce the discriminant score (also called the Z-score) which is then used to classify the different observations into different groups. The average of the Z-scores of the individual observations in

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<sup>24</sup> A full description of these techniques can be obtained from the literature (see Bharath and Shumway, 2008; Kumar and Ravi, 2007; Malhotra and Malhotra, 2003; Mousavi et al., 2015; Premachandra et al., 2009).

each group are used to measure group means which are also called centroids. The statistical significance of the model is determined by measuring the distance between these different centroids. Furthermore, the optimal cut-off scores used to distinguish between the different groups are selected so that the risk of misclassification is minimised. MDA is well-suited for analyses with categorical dependent variables and metric independent variables.

Regression analysis is one of the most widely used statistical techniques across different disciplines and research streams, including bankruptcy prediction. Much like MDA, it is a statistical technique that is used for estimating the relationship between a dependent variable and one or more independent variables. The form of the regression model and its coefficients helps us to understand the relationship between the dependent variable and the independent variables by measuring average changes in the dependent variable due to changes in the independent ones. Logit analysis is the most frequently used method in the bankruptcy prediction field (Mousavi et al., 2015). Many researchers have favoured regression analysis over MDA because regression models tend to work under less restrictive statistical conditions than MDA (*see* Ohlson, 1980). Additionally, the score output from MDA has little explanatory power in terms of closeness to the event as opposed to the more informative output from regression analysis. However, it is worth mentioning that MDA and logit estimations are closely linked under the normality assumption (McFadden, 1976).

#### **4.5.1.2. Hazard analysis**

A number of bankruptcy prediction studies have used hazard analysis to estimate their models rather than MDA or regression analysis. Shumway (2001) argues that hazard models are far better than MDA or regression analysis for predicting bankruptcy because they provide more consistent estimates. Cross-sectional models such as MDA and logit models, fail to take account of changes in the firm's performance or characteristics over time. Specifically, these models consider each firm-year as an independent observation rather than looking at related firm-years as a series of observations of the same firm. Furthermore, while MDA and logit estimations use the firm's last observation only to estimate the model, hazard models utilise more data points over the life of the firm and thus consider the full available history of each firm. Shumway equates hazard models to logit models where no data points are excluded. As a result, the use of more data points is expected

to produce more consistent and efficient estimates which are not time dependent.<sup>25</sup> Hazard models also allow explanatory variables to vary over time, which makes it possible to capture any deterioration in the firm's financial health in the time leading up to bankruptcy.

In hazard analysis, the survival function and the hazard function are the two most relevant functions needed to perform the analysis. While both are functions of time, the hazard function represents the probability of failure at time (t) having survived until or after that point in time, whereas the survival function represents the probability of survival beyond time (t). Shumway's discrete-time hazard model is the most frequently used hazard model in the field of bankruptcy prediction. Shumway's definition of both functions is as follows:

$$S(t, x; \theta) = 1 - \sum_{j < t} f(j, x; \theta) \quad \text{and} \quad H(t, x; \theta) = \frac{f(t, x; \theta)}{S(t, x; \theta)}$$

where  $S(t, x; \theta)$  and  $H(t, x; \theta)$  are the survival and hazard functions, respectively, and  $f(t, x; \theta)$  is the probability mass function of failure. Also,  $t$  represents the time when the firm leaves the sample and  $\theta$  is the vector of the function's parameters, while  $x$  is the vector of bankruptcy prediction variables. Bharath and Shumway (2008) among others, employ Cox proportional hazard models in estimating the probability of default. The Cox proportional model is a semi-parametric hazard regression model that allows testing for differences in survival times between two or more groups. The model assumes a nonlinear relationship between the hazard function and the predictors. In this model, the hazard function is assumed to be:

$$H(t) = \phi(t)[e^{(x(t)'\beta)}]$$

Where  $\phi(t)$  is the common baseline hazard rate and  $e^{(x(t)'\beta)}$  allows variation in the expected time to bankruptcy across firms. In our study, we use the proportional hazard models to estimate our different models. We use the following formula to estimate the discrete-time hazard rate (or probability of default):

$$PD_t = \frac{e^{\phi(t) + \beta_t x_t}}{1 + e^{\phi(t) + \beta_t x_t}}$$

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<sup>25</sup> For a more detailed discussion of the characteristics of such models, see Mousavi et al. (2015) and Shumway (2001).

where  $\beta_t$  and  $X_t$  are the estimated coefficients and estimated variables, respectively.

#### **4.5.1.3. Data envelopment analysis (DEA)**

DEA is a nonparametric method mostly used in the field of operations research for estimating production frontiers and the production efficiency of decision-making units (DMUs).<sup>26</sup> DEA functions focus on determining the most efficient DMU, whereas normal regression analyses focus on the average DMU. DEA offers a nonparametric and distribution-free approach to bankruptcy prediction modelling as opposed to the restrictions imposed by MDA and regression analysis (Premachandra et al., 2009). Furthermore, because no estimation samples are required under the DEA framework, potential issues with using deficient or biased samples of the true population to estimate the model can be avoided.

Following Premachandra et al. (2009) and others, we use the additive DEA model introduced in Charnes et al. (1985) to estimate the probability of bankruptcy of firms in our sample. The additive model allows for negative values in the inputs/outputs which is an important feature in bankruptcy data. Additionally, the additive model circumvents issues observed in prior bankruptcy studies with regards to measuring the efficiency and slack scores for outputs and inputs separately (e.g. Cielen et al., 2004). With regards to defining inputs and outputs, the guideline provided in Premachandra et al. (2009) is to use ratios that increase (decrease) with the probability of bankruptcy as outputs (inputs). The reasoning behind this guideline is simple, because higher (lower) values of outputs (inputs) tend to result in a value of zero for the objective function of the additive model, which makes the firm more likely to appear on the bankruptcy frontier. Following Premachandra et al. (2009), any firm that has zero on all input and output slacks is classified as bankrupt and thus falls on the bankruptcy frontier. Due to limitations with regards to computing power, we used our full bankrupt sample and matched each bankrupt firm with ten non-bankrupt firms based on the total book value and the two-digit Standard Industrial Classification (SIC).

#### **4.5.1.4. Neural networks (NN)**

Neural network models have long been used in the credit scoring literature and have been hailed in many studies for their superiority over many conventional models (Desai et al., 1996; Malhotra and Malhotra, 2003; Wilson and Sharda, 1994; Zhang et al., 1999). The computational framework

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<sup>26</sup> Stochastic Frontier Analysis is the parametric equivalent of DEA.

of neural networks is inspired by the neural networks of the human nervous system. It processes information by linking an enormous number of artificial nerves to simulate the capabilities of biological neural networks. Put simply, neural networks use a combination of concepts and algorithms to learn from examples, simulating the learning experience of a human being. The process of estimation or learning in neural networks involves estimating the output and re-adjusting the weights in a repeated process in order to minimise the difference between the outputs and the desired targets.

As with many statistical techniques, there are different algorithms or estimation techniques for neural networks, of which the backpropagation model is the most popular for classification and prediction problems (Kumar and Ravi, 2007). Malhotra and Malhotra (2003) point out that the ability of the backpropagation model to identify patterns in large pools of data makes it a suitable technique for credit scoring and bankruptcy problems. A standard backpropagation model consists of three layers: the input layer, the hidden layer, and the output layer. The input layer processes the inputs, which usually correspond to the independent variables in a standard regression analysis, and provides the processed values to the hidden layer, which in turn processes the values further before sending them to the output layer. This process continues until the model is able to remember the output of most of the observations in the training sample. The technique takes its name from the process that takes place once the network makes a mistake, because when this happens the algorithm starts at the last layer (the output) and backpropagates the error to the hidden layer. For the purposes of our study, we used the backpropagation model with the independent variables as inputs and the bankruptcy indicator (1 or 0) as an output. As with other studies, we allowed the number of hidden neurons to vary based on a trial and error approach while allowing up to 1,000 training cycles. We find that on average six neurons provide the most efficient results and hence used this setup throughout our study. As with DEA, due to limitations with regard to computing power, every bankrupt firm is matched with ten similar non-bankrupt firms based on total book value and the 2-digit Standard Industrial Classification (SIC).

#### **4.5.1.5. Classification and regression trees (CART)**

Decision Trees, the group of statistical methods to which CART models belong, are commonly used in data mining to create a model that predicts the value of an output (or the dependent variable) based on the values of several inputs (or the independent variables). CART models were

first introduced by Breiman et al. (1984) and encompass two types of decision trees: classification trees and regression trees. While the idea behind both types is the same, regression trees are used when the output is a continuous variable, whereas classification trees are used when the output is a categorical variable (e.g. 1 or 0). The CART algorithm follows a tree-like structure where answers to a sequence of questions form the different nodes or branches of the tree. At each node, CART models apply a greedy algorithm to decide on which input variable to use and the specific cut-off point to apply in order to split the sample into further subsets. Recursive binary splitting, the greedy algorithm used in CART models, is a procedure that lines up and tests the different split points using a cost function (i.e. classification error) in order to select the split point with the lowest cost. The same variable can be used more than once in different parts of the tree. Each new node is expected to partition the output variable better than the node before it. The cost functions used for both types of CART models are:

$$\text{Regression trees} \quad C_i = \sum_j (y_j - \mu_j)^2$$

$$\text{Classification trees} \quad C_i = \sum_j (\rho_j \times (1 - \rho_j))$$

where  $y_j$  and  $\mu_j$  are the actual and predicted values, respectively, while  $\rho_j$  is the proportion of same class inputs present in a particular classification group.

CART models are non-parametric, which makes them suitable to apply to various types of data without any assumptions about the distribution they come from. Furthermore, trees arising from applying CART models can be easily visualised in high dimensions, which facilitates better understanding of the data and helps identify any interdependencies between the various input variables. However, like many machine learning techniques, CART models are highly susceptible to data overfitting issues, which necessitates the employment of some pruning rules while running any CART model. Pre-pruning or early stopping is a process intended to prevent overfitting by stopping the formation of new nodes unless the new node decreases the cross-validation error significantly.<sup>27</sup> Nevertheless, pre-pruning might also lead to underfitting the data by causing the partitioning process to stop too early. A node that achieves significant reduction in the error might not be reached because a former node provided little benefit, causing the process to stop there.

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<sup>27</sup> Cross-validation is the process of growing the tree using most of the data (training set) while using the remaining or withheld data (validation set) to test the predictive accuracy of the tree.

Post-pruning is the process of trimming the decision tree after it has been built back to the point where the cross-validation error was at its minimum. In this paper, we apply both types of pruning, with the pre-pruning applied by creating an early stop for nodes containing less than 2% of the observations. We notice that in two thirds of the cases, post-pruning is needed at the end of the process of building the decision tree.<sup>28</sup>

#### **4.5.2. Governance variables**

We focus our analysis in this study on a number of governance variables related to board composition and structure. Considered as the ‘apex’ of the firm’s governance framework, the board approves and monitors major business decisions and takes responsibility for hiring, dismissing and rewarding the firm’s decision-makers (Daily et al., 2003; Fama and Jensen, 1983; Hillman and Dalziel, 2003). Furthermore, despite well-documented issues with the board’s composition and selection process, its vital role at the top of the firm’s internal governance framework cannot be overlooked or downplayed when analysing the firm’s performance (Hermalin and Weisbach, 1991). While the firm’s governance framework extends well beyond the structure and composition of its board of directors, the board’s monitoring and advisory functions stand out as two of the most important mechanisms by which a firm’s fate is determined (Daily et al., 2003; Darrat et al., 2016). The firm’s board influences its performance through its role, directly and indirectly, in the allocation and management of its resources and decision-making units. There are several ways in which the characteristics of the board affect firm health.

First of all, a large number of studies have documented significant positive effects of board independence on firm value and operating performance due to reasons such as the role of independent directors in offering better and more autonomous advice compared to insider directors (Baysinger and Butler, 1985; Boone et al., 2007; Raheja, 2005; Rosenstein and Wyatt, 1990; Yermack, 2006). Boards with more independent directors are significantly more likely to remove underperforming managers and thus play an important role in determining the firm’s ability to survive. Additionally, independent directors bring valued external resources and experience which can be vital during hard times (Daily and Dalton, 1994; Fitch and Slezak, 2008; Liang et al., 2016; Manzaneque et al., 2016; Weisbach, 1988). Furthermore, several studies have documented a

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<sup>28</sup> We use the probabilities at the terminal nodes for the purpose of building ROC curves and calculating the AUC measure.

negative link between director busyness and firm value and performance based on the fact that boards with more busy members tend to be less effective at monitoring and advising the firm's management (Adams and Ferreira, 2008; Ahn et al., 2010; Fich and Shivdasani, 2006; Jiraporn et al., 2009). For instance, Fich and Shivdasani (2006) show that independent but busy boards display similar monitoring effectiveness to insider-dominated boards, which significantly weakens the board's role in protecting the firm and the interests of the shareholders.

Second, findings in the literature on the CEO-chairman duality seem to be mixed. While some studies find that the separation costs are larger than the benefits gained (Baliga et al., 1996; Brickley et al., 1997), others argue that the duality weakens the board's monitoring powers and reduces the likelihood of firing underperforming managers (Adams et al., 2005; Dey et al., 2011; Goyal and Park, 2002). Moreover, in the case of a firm facing difficulties, the CEO-chairman duality is more likely to result in the CEO-chairman staying the course rather than making changes in order to save the firm's future (Daily and Dalton, 1994). Furthermore, turnarounds are harder to achieve in companies with powerful CEOs as the first action in such situations normally involves removing the current management. Schwartz and Menon (1985) and Bibeault (1998) report that the removal of top management is a typical strategy in turnaround companies, which suggests that a change of CEO can be seen as a sign of distress in a company.

Third, many studies find a negative relationship between board size and firm value or performance (Eisenberg et al., 1998; Mak and Kusnadi, 2005; Yermack, 1996). This is supported by claims in the literature that larger boards tend to have issues to do with poor communication and ineffective decision-making processes (Lipton and Lorsch, 1992; Jensen, 1993). Other studies, however, offer some support for the arguments that larger boards tend to take less extreme decisions, and that they bring more expertise that may be beneficial for complex firms (Boone et al., 2007; Cheng, 2008; Coles et al., 2008). Empirical findings from the governance and bankruptcy literature show that smaller boards are more effective at protecting and sometimes even improving the firm's value during hard times (Fitch and Slezak, 2008; Gilson, 1990).

Fourth, staggered boards have been found to be harmful to firm performance by contributing to managers' entrenchment and by reducing the board's monitoring powers (Bebchuk and Cohen, 2005; Cohen and Wang, 2013; Faleye, 2007; Faleye, 2009). The entrenchment of the firm's management and the insulation of its top executives from market discipline and effective

monitoring by the board destroys the firm's value and significantly reduces the chances of a turnaround in the firm when facing imminent bankruptcy (Faleye, 2007; Faleye, 2009).

Fifth, Yermack (2004) reports that more than half of the overall incentives to external directors come from changes in the value of equity-related holdings (stocks and options), confirming the vital role of equity-related incentives in aligning the interests of board members with those of the shareholders. In a related study, Elloumi and Gueyie (2001) report the presence of a negative relationship between equity ownership of the firm's external directors and the probability of distress, supporting the view that equity ownership incentivises the firm's directors to strengthen their monitoring and advisory roles in order to avoid bankruptcy (see also Fich and Slezak, 2008).

Lastly, the experiences and skills of the different board members determine to a large extent the effectiveness of the board in monitoring and advising the firm's management, especially during hard times (Fama and Jensen, 1983; Platt and Platt, 2012). For instance, Platt and Platt (2012) find that firms with more experienced board members are more likely to avoid bankruptcy. They also report that bankrupt companies tend to have CEOs with less experience, as measured by age, which suggests that experienced CEOs are more successful at avoiding bankruptcy. Furthermore, Adams and Ferreira (2009) document a positive relationship between gender diversity and the board's monitoring activities. Their results show that female directors have less attendance problems and more active participation in the board's committees than their male counterparts, suggesting a stronger overall board performance which can translate to a higher probability of avoiding bankruptcy.

The definitions of the different governance variables covered in our study and their expected effect on the firm's probability of bankruptcy are included in *Table 4.2*.<sup>29</sup> Since the main purpose of our study is to gauge the additional accuracy and informational advantage gained from adding corporate governance measures to the standard bankruptcy prediction models, we use the individual governance variables rather than a composite of all variables. Composite indices that are based on arbitrary cut-offs or governance best practices (e.g. Aggarwal et al., 2010) may not be suitable for measuring the firm's governance quality, as prior research in the literature shows that the principle of 'one-size-fits-all' does not hold for corporate governance mechanisms (Coles

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<sup>29</sup> Throughout this paper, we use interchangeably the terms 'governance variables' and 'board variables/attributes' to refer to the same of group of board-related variables outlined in *Table 2*.

et al., 2008). Furthermore, such indices cause information loss due to, for example, giving equal weights to different indicators that are of varying importance and make different contributions to the firm's governance framework in real life.

**Table 4.2: Description of the corporate governance variables**

<b>Variable</b>	<b>Definition</b>	<b>Type</b>	<b>Expected sign*</b>
<i>Attrition Ratio (ATTR)</i>	The number of directors that have left a role as a proportion of average number of directors	Fraction	+
<i>CEO Change (CEOC)</i>	1 if the CEO was changed during the last three years, 0 otherwise (excluding change due to death or retirement)	Indicator	+
<i>Gender (GEND)</i>	The proportion of male directors on the board	Fraction	+
<i>Board Independence (INDP)</i>	The proportion of total board members who are considered independent	Fraction	-
<i>CEO-Chairman Duality (DUAL)</i>	1 if the chairman is a current or ex-CEO, 0 otherwise	Indicator	+
<i>Board Size (BSIZ)</i>	Natural log of the number of board members in a year	Number	+
<i>CEO Age (CEOA)</i>	The age of the company's CEO	Number	-
<i>Director External Experience (DEEP)</i>	The average number of years that a director sits on the boards of other companies	Number	-
<i>Director Internal Experience (DIEP)</i>	The average number of years that a director sits on the board of the company	Number	-
<i>Director Company Experience (DCEP)</i>	The average number of years that a director works in the company	Number	-
<i>Director busyness (BUSY)</i>	1 if the majority of outside directors hold three directorships or more, 0 otherwise	Indicator	+
<i>Directors compensation (DCOM)</i>	1 if the compensation of directors includes equity-based component, 0 otherwise	Indicator	-

\* A positive (negative) sign means that higher values of this variable are expected to increase (decrease) the probability of bankruptcy.

### 4.5.3. Performance comparison metrics

#### 4.5.3.1. Predictive performance

To examine the predictive performance of the various models, we use a number of interrelated ratios, as explained below.

1. *Accuracy ratio (AR)*: is the proportion of cases correctly classified (bad or good), and is measured as follows:

$$\text{Accuracy ratio (AR)} = \frac{N_{GG} + N_{BB}}{\text{Total sample}}$$

where  $N_{GG}$  ( $N_{BB}$ ) is the number of good (bad) cases classified as good (bad).

2. **Sensitivity:** is the proportion of bad cases correctly classified as bad, and is measured as follows:

$$\text{Sensitivity} = \frac{N_{BB}}{N_{BB} + N_{BG}}$$

where  $N_{BG}$  ( $N_{BB}$ ) is the number of bad (bad) cases classified as good (bad).

3. **Specificity:** is the proportion of good cases correctly classified as good, and is measured as follows:

$$\text{Specificity} = \frac{N_{GG}}{N_{GG} + N_{GB}}$$

Where  $N_{GG}$  ( $N_{GB}$ ) is the number of good (good) cases classified as good (bad).

4. **Type I and Type II errors:** a Type I error is the proportion of bad cases classified as good, while a Type II error is the proportion of good cases classified as bad. These errors are measured as follows:

$$\text{Type I error} = 1 - \text{Sensitivity and Type II error} = 1 - \text{Specificity}$$

5. **Misclassification costs:** this is basically the sum of Type I and Type II errors and reflects the total costs associated with using the model to classify the different cases.

It can be argued that the ratio that conveys the most important piece of information from the perspective of the decision maker is Type I error. This is because the expected costs from classifying a bad case as good far exceed the costs from classifying a good case as bad. In other words, the losses to a bank from lending to a bad firm (Type I error) are expected to be much higher than the losses from refusing to lend to a good firm, which are the foregone interest payments (Type II error). It is worth mentioning, however, that the costs to society and the economy from Type II errors might be significant when good opportunities are systematically disregarded due to such errors.

#### 4.5.3.2. Classificatory power

In line with prior studies in the field, we utilise the receiver operating characteristic (ROC) curve to compare the classificatory ability of each model in our study. ROC is a graphical representation of the levels of true positive rate (TPR) and false positive rate (FPR) as the discrimination threshold

settings are varied. For the purposes of our study we plot FPR and TPR on the x and y axes of the ROC curve, respectively.<sup>30</sup> The larger the area under the curve (AUC) the better the model's classification ability is. Using the AUC measure to compare models allows us to do so while avoiding concerns about the different cut-off points to use across the different models and samples. Furthermore, to compare the significance of the AUCs of the different models, we use the Hanley and McNeil (1983) test which adjusts for the induced correlation due to the usage of the same sample in both models. We also use the McNemar (1947) test to assess the statistical significance of the difference in the classificatory accuracies of the different models involved. The McNemar (1947) test was found to perform better than several other tests including the standard t-test in and the 10-fold cross-validated t-test in comparing the classification performance of models including machine learning algorithms (Demsar, 2006; Dietterich, 1998). While the McNemar test does not confirm whether one model has a better classificatory accuracy than the other, it is widely used to confirm whether the treatment effect (i.e. governance variables in our case) is significantly different from the non-treatment effect.

However, Anderson (2007) recommends avoiding the reliance on one measure to compare the predictive accuracy of different models. Therefore, in addition to the AUC measure we use two other related statistics: the Gini rank correlation coefficient and the Kolmogorov–Smirnov statistic. Both measures are widely used and adopted by credit scoring analysts to compare the predictive powers of rating models (Anderson, 2007). The Gini rank correlation coefficient, or simply Gini coefficient, standardises the AUC measure so that a random classifier earns a score of 0, while a perfect classifier earns a score of 1, with a range between -1 and 1.<sup>31</sup> In other words, the Gini coefficient measures the area between the random classifier and the curve only, while the AUC measures the full area under the curve. The Kolmogorov–Smirnov statistic, or simply K-S statistic, is also related to AUC and measures the maximum difference between FPR and TPR as plotted on the x and y axes of the ROC curve. The K-S statistic measures the predictive power of the model by providing a measure of the maximum deviation between the empirical cumulative distribution functions of good and bad cases. Like AUC, larger values of the Gini coefficient or the K-S statistic indicate greater classificatory power.

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<sup>30</sup> TPR and FPR are also calculated as sensitivity and (1-specificity), respectively (explained earlier).

<sup>31</sup> The coefficient is calculated as  $2 \times \text{AUC} - 1$ .

### **4.5.3.3. Information content**

As highlighted by Hillegeist et al. (2004) and Agarwal and Taffler (2008), a decision-maker does not always face a dichotomous decision, thus he or she may use the output of the model to rate a firm's riskiness in order to decide on the interest to be charged or the collateral to be used, among other things. Therefore, rating models by their predictive performance only may not be the best approach to selecting which model to use. As a result, we use the Akaike information criterion (AIC) to compare the information content of the different models in our study. AIC measures the relative quality of a model compared to other models, through considering the trade-off between the model's complexity and its goodness of fit. The reason behind our selection of the AIC measure instead of the various other measures used in prior studies is our need to compare the quality of each model relative to all other models.<sup>32</sup> It is worth mentioning that the AIC does not test the absolute quality of the model, so no inferences about the absolute fit of the model can be made using this measure. The smaller the value of the AIC measure the better the model in comparison to other models. Furthermore, following Hillegeist et al. (2004) we use the Vuong (1989) test to statistically compare the log likelihood statistics and relative information content of the various models before and after adding the governance variables.

## **4.6. Results and discussion**

### **4.6.1. Descriptive statistics**

*Table 4.3* provides mean and median statistics for the governance variables and some of the financial variables included in our analysis based on the split between non-bankrupt and bankrupt firms. Out of the twelve governance variables included in the study, eleven have significantly different mean and median statistics for the non-bankrupt and bankrupt firms. The statistics suggest that, compared to non-bankrupt firms, bankrupt firms tend to have: higher attrition, CEO change in the last three years, more male-dominated boards, less experienced CEOs, less independent boards, more cases of CEO-chairman duality, bigger boards, less experienced directors (external, internal and company), and a lower presence of equity-based components in directors' compensation. This is in line with the previous findings in the literature and our predictions (see *Table 4.2*) about the expected relationship between governance structure and the

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<sup>32</sup> Similar studies in the literature (e.g. Agarwal and Taffler, 2008; Liang et al., 2016; Mousavi et al., 2015, among others) use the Log-likelihood statistic and the Pseudo-R<sup>2</sup> measure.

probability of bankruptcy (Daily and Dalton; 1994; Elloumi and Gueyie, 2001; Fich and Slezak, 2008; Liang et al., 2016; Manzanque et al., 2016). We can also see significant differences in the financial variables between the two groups (bankrupt vs. non-bankrupt), in line with our expectations and findings in prior studies regarding the financial health of a bankrupt firm one year before bankruptcy. More specifically, we can see from the different ratios that bankrupt firms have significantly lower earnings, working capital and market value as well as significantly higher liabilities.

**Table 4.3: Descriptive statistics of the governance variables and major financial ratios**

This table presents the mean and median values of the governance variables (refer to *Table 4.2* for details) and some of the main financial variables of non-bankrupt and bankrupt firms one year before bankruptcy. The test for the equality of means uses Welch's t-test, while the test for the equality of medians uses Wilcoxon's rank-sum test. The final sample consists of a total of 1,651 firms (out of which 194 firms are bankrupt) with a total of 12,721 firm-year observations. The p-values are reported in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	Non-Bankrupt Firms		Bankrupt Firms		Difference	
	Mean	Median	Mean	Median	Mean	Median
Attrition Ratio (ATTR)	0.026	0.000	0.042	0.000	-0.015** (0.011)	0.000** (0.012)
CEO Change (CEOC)	0.224	0.198	0.327	0.415	-0.103*** (0.000)	-0.217*** (0.000)
Gender (GEND)	0.887	0.889	0.927	1.000	-0.040*** (0.000)	-0.111*** (0.000)
Board Independence (INDP)	0.826	0.857	0.800	0.833	0.027*** (0.010)	0.024*** (0.000)
CEO-Chairman Duality (DUAL)	0.438	0.000	0.527	1.000	-0.089** (0.034)	-1.000** (0.033)
Board Size (BSIZ)	0.915	0.938	0.961	0.954	-0.046* (0.076)	-0.016* (0.082)
CEO Age (CEOA)	58.221	58.500	56.956	57.300	1.265* (0.078)	1.200* (0.092)
Director External Experience (DEEP)	3.746	3.600	2.619	2.279	1.127*** (0.000)	1.321*** (0.000)
Director Internal Experience (DIEP)	8.546	8.169	5.539	4.811	3.007*** (0.000)	3.358*** (0.000)
Director Company Experience (DCEP)	9.587	9.200	6.221	5.114	3.366*** (0.000)	4.086*** (0.000)
Director busyness (BUSY)	0.507	1.000	0.572	1.000	-0.066 (0.117)	0.000 (0.110)
Directors compensation (DCOM)	0.275	0.000	0.178	0.000	0.097*** (0.003)	0.000*** (0.009)
Earnings before interest and taxes / total assets	0.080	0.080	-0.323	-0.054	0.403*** (0.000)	0.134*** (0.000)
Working capital / total assets	0.173	0.124	-0.084	-0.000	0.257*** (0.000)	0.124*** (0.000)
Retained earnings / total assets	0.086	0.189	-0.330	-0.342	0.416*** (0.000)	0.531*** (0.000)
Net income / total assets	0.033	0.043	-0.261	-0.217	0.294*** (0.005)	0.260*** (0.000)
Total liabilities / total assets	0.563	0.558	0.975	0.914	-0.413*** (0.000)	-0.356*** (0.000)
Market value of equity / total debt	1.869	1.766	1.108	0.560	0.760*** (0.000)	1.206*** (0.000)
Current assets / current liabilities	1.983	1.570	1.153	0.866	0.831*** (0.000)	0.703*** (0.000)

#### 4.6.2. Corporate governance structure and bankruptcy prediction

*Panel A* in *Table 4.4* shows the results of re-estimating the original models using our sample and the original estimation methods.<sup>33</sup> The results show that Altman's (1968) original model as well as Zmijewski's (1984) provide the most accurate overall classifications as measured by the accuracy ratio (proportion of correctly classified cases). However, the models of Shumway (2001), Bharath and Shumway (2008), Campbell et al. (2008) and Premachandra et al. (2009) provide better accuracy with regards to classifying bankrupt firms (sensitivity > 75%), which translates into a lower occurrence of the arguably more expensive classification error type, Type I, where bankrupt firms are classified as non-bankrupt. Additionally, the latter models have better classificatory power as shown by the higher AUC, Gini coefficient and Kolmogorov–Smirnov values. The accuracy rates of the out-of-sample forecasts of the different models are very close, with an average accuracy ratio of 70%.

Next, when we add the twelve governance variables covered by our study (*Table 4.2*) to each of these models, we notice a general improvement, sometimes very significant, in the predictive and classificatory accuracy of these models. *Panel B* in *Table 4.4* shows the results of re-estimating the original models from *Panel A* after adding the governance variables, while *Panel C* shows the differences between *Panels A* and *B*. First of all, all models now show better classificatory accuracy and improved classificatory power as measured by the accuracy ratio and the AUC, respectively. Using the Hanley and McNeil (1983) test, we find that the AUC results of all models with the governance variables included (*Panel B*) are significantly better than those without the governance variables (*Panel A*). These results are also confirmed by the improvement seen in both the Gini coefficient and the Kolmogorov–Smirnov statistic for all models (+0.01 to +0.10). Specifically, the models of Shumway (2001), Bharath and Shumway (2008) and Campbell et al. (2008) show the biggest improvement from including the governance variables by classifying 16%, 20% and 11% more cases correctly, respectively. These three models, in addition to Altman et al. (1968) and Zmijewski (1984), also provide more accurate classifications of the bankrupt companies with an increase in classificatory accuracy of 6% to 9% in comparison to the original models without governance variables. Additionally, all models are now able to predict bankruptcy

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<sup>33</sup> The accuracy ratios are close to the specificity ratio due to the high representation of healthy firms in the sample.

in firms outside the sample with better accuracy, with an increase of between 3% and 14% in the accuracy of out-of-sample forecasts after the inclusion of the governance variables. Economically, the largest drops in the arguably more expensive error type (i.e. Type I) are seen in Altman (1968) and Campbell et al. (2008) with a drop of 8-9% in both models after adding governance variables. Furthermore, Campbell et al. (2008) has the lowest Error I rate after adding the governance variables (11%) followed by Bharath and Shumway (2008) and Shumway (2001) with Error I rates of 14% and 19%, respectively. With regards to the information content of the different models, we notice that the models with governance variables have lower AIC values which suggests that these models are more informative and of a better quality than the original ones. This is also confirmed by the results of Vuong's (1989) test which shows that the models with the corporate governance variables have significantly higher information content compared to those without such variables. Additionally, the results of the McNemar (1947) test confirm that for each model, the addition of the governance variables has a significant effect.

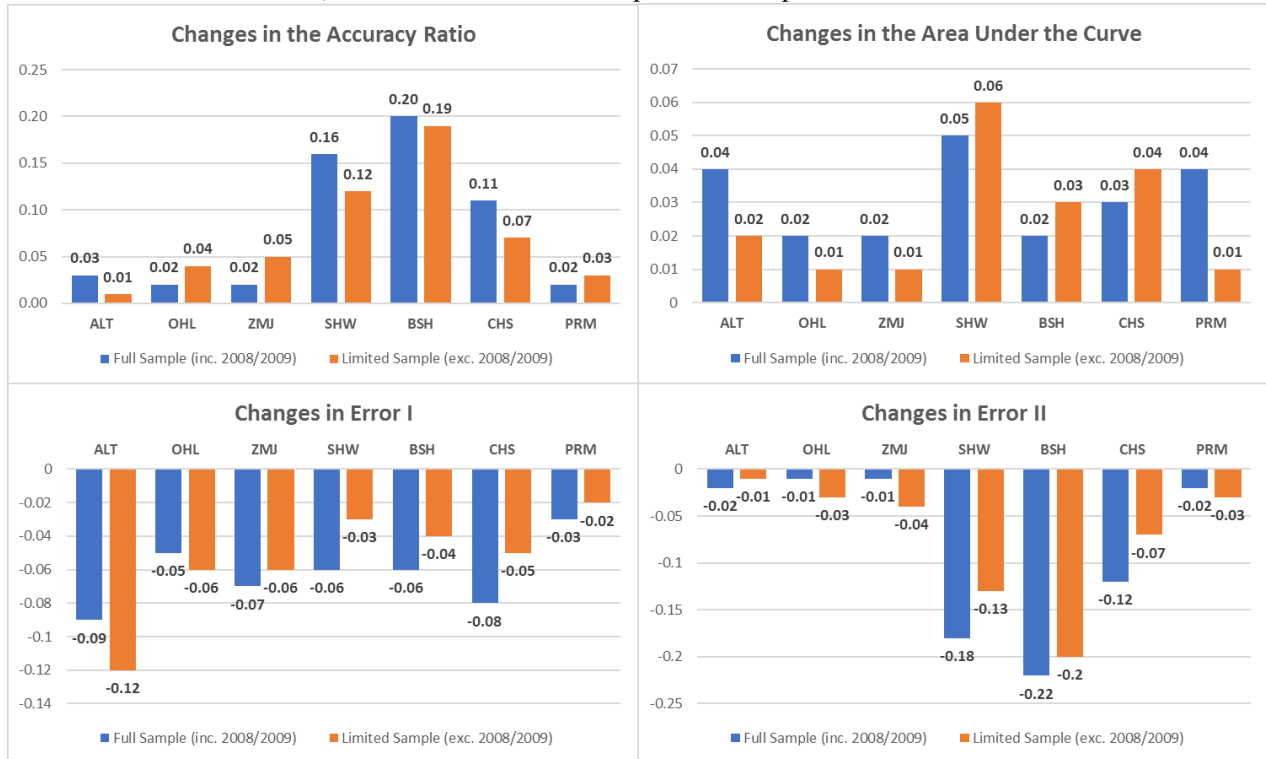
Furthermore, since the 2008 financial crisis falls within the period covered by our study, we re-ran our analysis on a sample which excludes observations from 2008 and 2009 to test if any of our findings so far were affected by observations from this particular period. In *Figure 4.1*, we show the changes in AUC scores, Accuracy Ratio, Type I and Type II Errors, after adding governance variables for the full sample (including 2008 and 2009) and the limited sample (excluding 2008 and 2009) to the various models. Our findings remain essentially the same, with an overall improvement in the performance of the different models being observed after adding the governance variables regardless of the sample selected.<sup>34</sup>

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<sup>34</sup> We have similar conclusions when we re-run similar analyses for the remaining parts of the study.

**Figure 4.1: Changes in the main performance indicators after adding the governance variables for the full and limited samples**

The four graphs show changes in the Accuracy Ratio, Area Under the Curve, Type I and Type II Errors after adding the governance variables for the full sample (including 2008 and 2009) and the limited sample (excluding 2008 and 2009). The results for the full sample are also reported in Table 4.4.



Overall, this suggests that the addition of governance variables to the different bankruptcy prediction models leads to a significant improvement in their classificatory power and predictive accuracy. The most noticeable improvement is found in models utilising hazard analysis, which might be related to the fact that unlike cross-sectional models such as MDA and logit models, hazard analysis takes account of changes in the firm’s performance or characteristics over time. Specifically, hazard analysis looks at related firm-years as a series of observations on the same firm and thus is able to incorporate changes in the firm’s governance structure and as a result produce more consistent and efficient predictions (Shumway, 2001). From an economic point of view, both Error I (classifying a bad case as good) and Error II (classifying a good case as bad) are lower under hazard analysis, confirming the superiority of these models in reducing the potential economic impacts from erroneously classifying a firm that is about to be bankrupt as a healthy one and vice versa.

**Table 4.4: The performance of the different prediction models before and after adding the governance variables**

Panels A and B present the performances of the different prediction models (see Table 4.1) before and after adding the governance variables, respectively (one year before bankruptcy). Each model was estimated using the original estimation method. Panel C presents the differences in the performances of the different prediction models before and after adding the governance variables (After minus Before). Out-of-sample forecast accuracy is a ratio that measures the portion of cases correctly classified using the results from running the models on the first eight years (in-sample) to forecast the classification of the firms in the last eight years (out-of-sample). We use a 0.5 cut-off for our classification of the bankrupt/non-bankrupt firms. The Hanley and McNeil (1983) test (Z-value) is used to compare the significance of the difference in the AUC of the different models before and after adding the governance variables. The McNemar (1947) test is used to compare the significance of the difference in the classificatory accuracy of the different models before and after adding the governance variables. The Vuong (1989) test compares relative information content of the various models before and after adding the governance variables. The final sample consists of a total of 12,721 firm-year observations \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

<b>Panel A: Performance of the Different Prediction Models Before Adding the Governance Variables</b>							
	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	0.82	0.73	0.82	0.79	0.73	0.80	0.81
Specificity (Sensitivity)	0.87 (0.44)	0.76 (0.47)	0.87 (0.48)	0.79 (0.75)	0.72 (0.80)	0.79 (0.81)	0.81 (0.79)
Type II Error (Type I Error)	0.13 (0.56)	0.23 (0.53)	0.13 (0.52)	0.21 (0.25)	0.27 (0.20)	0.21 (0.19)	0.19 (0.21)
Misclassification Cost	0.18	0.27	0.18	0.21	0.27	0.20	0.19
Area Under the Curve – AUC (Gini coefficient)	0.71 (0.42)	0.91 (0.82)	0.90 (0.80)	0.89 (0.78)	0.90 (0.80)	0.90 (0.80)	0.86 (0.72)
Kolmogorov–Smirnov statistic	0.52	0.61	0.63	0.65	0.60	0.64	0.63
Out-of-sample Forecast Accuracy	0.75	0.65	0.78	0.69	0.65	0.71	0.72
<b><u>Information Content</u></b>							
Akaike Information Criterion – AIC		1,225.943	1,484.312	1,587.549	1,764.693	1,428.257	
<b>Non-Bankrupt (Bankrupt) firms</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>	<b>1,457 (194)</b>
<b>Panel B: Performance of the Different Prediction Models After Adding the Governance Variables</b>							
	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	0.85	0.75	0.84	0.95	0.93	0.91	0.83
Specificity (Sensitivity)	0.89 (0.53)	0.78 (0.52)	0.88 (0.55)	0.97 (0.81)	0.94 (0.86)	0.91 (0.89)	0.83 (0.82)
Type II Error (Type I Error)	0.11 (0.47)	0.22 (0.48)	0.12 (0.45)	0.03 (0.19)	0.06 (0.14)	0.09 (0.11)	0.19 (0.35)

Misclassification Cost	0.15	0.25	0.16	0.05	0.07	0.09	0.17
Area Under the Curve – AUC (Gini coefficient)	0.75 (0.50)	0.93 (0.86)	0.92 (0.84)	0.94 (0.88)	0.92 (0.84)	0.93 (0.86)	0.90 (0.80)
Kolmogorov–Smirnov statistic	0.53	0.66	0.65	0.68	0.69	0.69	0.67
Out-of-sample Forecast Accuracy	0.79	0.69	0.82	0.86	0.79	0.80	0.75

**Information Content**

Akaike Information Criterion – AIC	1,205.345	1,429.592	1,541.342	1,738.817	1,396.918
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**Panel C: Differences in the Performance of the Different Prediction Models Before and After Adding the Governance Variables (After minus Before)**

	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	+0.03	+0.02	+0.02	+0.16	+0.20	+0.11	+0.02
Specificity (Sensitivity)	+0.02 (+0.09)	+0.02 (+0.05)	+0.01 (+0.07)	+0.18 (+0.06)	+0.22 (+0.06)	+0.12 (+0.08)	+0.02 (+0.03)
Type II Error (Type I Error)	-0.02 (-0.09)	-0.01 (-0.05)	-0.01 (-0.07)	-0.18 (-0.06)	-0.22 (-0.06)	-0.12 (-0.08)	-0.02 (-0.03)
Misclassification Cost	-0.03	-0.02	-0.02	-0.16	-0.20	-0.11	-0.02
Area Under the Curve – AUC (Gini coefficient)	+0.04 (+0.08)	+0.02 (+0.04)	+0.02 (+0.04)	+0.05 (+0.10)	+0.02 (+0.04)	+0.03 (+0.06)	+0.04 (+0.08)
Kolmogorov–Smirnov statistic	+0.01	+0.05	+0.02	+0.03	+0.09	+0.05	+0.04
Out-of-sample Forecast Accuracy	+0.04	+0.04	+0.05	+0.17	+0.14	+0.09	+0.03
<b><u>Information Content</u></b>							
Akaike Information Criterion – AIC		-20.598	-54.720	-46.207	-25.876	-31.339	
<b>Hanley and McNeil (1983) Test</b>	<b>-1.896*</b>	<b>-2.531**</b>	<b>-2.286**</b>	<b>-5.878***</b>	<b>-2.286**</b>	<b>-3.584***</b>	<b>-3.560***</b>
<b>McNemar (1947) Test</b>	<b>14.841***</b>	<b>7.650***</b>	<b>3.694*</b>	<b>55.980***</b>	<b>60.223***</b>	<b>25.500***</b>	<b>9.710***</b>
<b>Vuong (1989) Test</b>		<b>-3.820***</b>	<b>-4.760***</b>	<b>-4.350***</b>	<b>-3.900***</b>	<b>-3.980***</b>	

**Table 4.5: The difference in the performance of the different prediction models (including governance variables) two, three and five years before bankruptcy**

Panels A, B and C present the differences in the performance of the different prediction models before and after adding the governance variables (After minus Before), two, three and five years before bankruptcy, respectively. Each model was estimated using the original estimation method. Out-of-sample forecast accuracy is a ratio that measures the portion of cases correctly classified using the results from running the models on the first eight years (in-sample) to forecast the classification of the firms in the last eight years (out-of-sample). We use a 0.5 cut-off for our classification of the bankrupt/non-bankrupt firms. The Hanley and McNeil (1983) test (Z-value) is used to compare the significance of the difference in the AUC of the different models before and after adding the governance variables. The McNemar (1947) test is used to compare the significance of the difference in the classificatory accuracy of the different models before and after adding the governance variables. The Vuong (1989) test compares relative information content of the various models before and after adding the governance variables. The final sample consists of a total of 12,721 firm-year observations. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

<b>Panel A: Differences in the Performance of the Different Prediction Models Before and After Adding the Governance Variables Two Years Before Bankruptcy</b>							
	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	+0.10	+0.02	+0.01	+0.19	+0.23	+0.22	+0.00
Type II Error (Type I Error)	-0.10 (-0.17)	-0.02 (-0.08)	-0.01 (-0.07)	-0.19 (-0.06)	-0.23 (-0.06)	-0.22 (-0.05)	-0.00 (-0.09)
Area Under the Curve – AUC (Gini coefficient)	+0.07 (+0.14)	+0.03 (+0.06)	+0.03 (+0.06)	+0.06 (+0.12)	+0.02 (+0.04)	+0.04 (+0.08)	+0.05 (+0.10)
Kolmogorov–Smirnov statistic	+0.03	+0.04	+0.05	+0.04	+0.08	+0.06	+0.04
Out-of-sample Forecast Accuracy	+0.05	+0.06	+0.02	+0.21	+0.15	+0.13	+0.11
<b>Hanley and McNeil (1983) Test</b>	<b>-3.022***</b>	<b>-3.553***</b>	<b>-3.186***</b>	<b>-6.501***</b>	<b>-2.031**</b>	<b>-3.357***</b>	<b>-4.055***</b>
<b>McNemar (1947) Test</b>	<b>11.925***</b>	<b>6.771***</b>	<b>2.987*</b>	<b>23.145***</b>	<b>26.026***</b>	<b>12.487***</b>	<b>8.326***</b>
<b>Vuong (1989) Test</b>		<b>-2.980***</b>	<b>-4.580***</b>	<b>-4.980***</b>	<b>-3.690***</b>	<b>-4.120***</b>	

<b>Panel B: Differences in the Performance of the Different Prediction Models Before and After Adding the Governance Variables Three Years Before Bankruptcy</b>							
	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	+0.11	+0.07	+0.03	+0.23	+0.24	+0.25	+0.05
Type II Error (Type I Error)	-0.11 (-0.20)	-0.07 (-0.16)	-0.03 (-0.09)	-0.23 (-0.09)	-0.24 (-0.10)	-0.24 (-0.17)	-0.05 (-0.10)
Area Under the Curve – AUC (Gini coefficient)	+0.10 (+0.20)	+0.04 (+0.08)	+0.04 (+0.08)	+0.08 (+0.16)	+0.07 (+0.14)	+0.06 (+0.12)	+0.06 (+0.12)
Kolmogorov–Smirnov statistic	+0.05	+0.07	+0.05	+0.06	+0.10	+0.08	+0.07

Out-of-sample Forecast Accuracy	+0.09	+0.08	+0.06	+0.24	+0.19	+0.16	+0.15
<b>Hanley and McNeil (1983) Test</b>	<b>-4.506***</b>	<b>-4.973***</b>	<b>-4.439***</b>	<b>-5.434***</b>	<b>-4.506***</b>	<b>-3.892***</b>	<b>-4.958***</b>
<b>McNemar (1947) Test</b>	<b>7.087***</b>	<b>4.405**</b>	<b>2.977*</b>	<b>27.435***</b>	<b>32.533***</b>	<b>15.896***</b>	<b>5.246***</b>
<b>Vuong (1989) Test</b>		<b>-3.550***</b>	<b>-3.620***</b>	<b>-4.170***</b>	<b>-2.780***</b>	<b>-3.880***</b>	

**Panel C: Differences in the Performance of the Different Prediction Models Before and After Adding the Governance Variables Five Years Before Bankruptcy**

	<b>ALT</b>	<b>OHL</b>	<b>ZMJ</b>	<b>SHW</b>	<b>BSH</b>	<b>CHS</b>	<b>PRM</b>
<b><u>Prediction &amp; Classification</u></b>							
Accuracy Ratio	+0.12	+0.12	+0.02	+0.23	+0.26	+0.23	+0.14
Type II Error (Type I Error)	-0.12 (-0.17)	-0.12 (-0.10)	-0.02 (-0.07)	-0.22 (-0.17)	-0.25 (-0.19)	-0.23 (-0.08)	-0.13 (-0.21)
Area Under the Curve – AUC (Gini coefficient)	+0.11 (+0.22)	+0.05 (+0.10)	+0.04 (+0.08)	+0.09 (+0.18)	+0.06 (+0.12)	+0.08 (+0.16)	+0.09 (+0.18)
Kolmogorov–Smirnov statistic	+0.07	+0.10	+0.06	+0.08	+0.09	+0.11	+0.08
Out-of-sample Forecast Accuracy	+0.08	+0.13	+0.09	+0.22	+0.19	+0.18	+0.13
<b>Hanley and McNeil (1983) Test</b>	<b>-2.712***</b>	<b>-3.160***</b>	<b>-4.529***</b>	<b>-3.803***</b>	<b>-4.224***</b>	<b>-4.893***</b>	<b>-5.249***</b>
<b>McNemar (1947) Test</b>	<b>5.654***</b>	<b>4.948**</b>	<b>3.841***</b>	<b>19.720***</b>	<b>28.186***</b>	<b>6.109***</b>	<b>4.862***</b>
<b>Vuong (1989) Test</b>		<b>-3.230***</b>	<b>-2.970***</b>	<b>-3.280***</b>	<b>-2.550***</b>	<b>-4.410***</b>	

**Table 4.6: The performance of the different prediction models (including governance variables) using different estimation methods**

This table presents the performances of the different prediction models (see Table 4.1) including governance (one year before bankruptcy). Models are estimated using: Discriminant Analysis (DA), Logistic Regression (LR), Hazard Analysis (HA), Data Envelopment Analysis (DE)-additive model, Neural Networks-Backpropagation Network (NN), and Classification and Regression Trees (CT). Out-of-sample forecast accuracy is a ratio that measures the portion of cases correctly classified using the results from running the models on the first eight years (in-sample) to forecast the classification of the firms in the last eight years (out-of-sample). We use a 0.5 cut-off for our classification of the bankrupt/non-bankrupt firms. The models are run on a subsample of the main sample to avoid any potential samples bias and due to limitations with computing power for NN and DE methods. Best values (lowest for errors and highest for accuracy, AUC, Gini coefficient and Kolmogorov–Smirnov statistic) are highlighted in bold.

		ALT	OHL	ZMJ	SHW	BSH	CHS	PRM
<b>Prediction &amp; Classification</b>								
Accuracy Ratio	DA	0.86	0.70	0.78	0.82	0.78	0.80	0.77
	LR	0.82	0.67	0.80	0.78	0.74	0.77	0.71
	HA	0.91	0.72	0.80	<b>0.91</b>	0.82	0.93	0.76
	DE	0.92	<b>0.76</b>	0.82	0.88	<b>0.85</b>	0.86	<b>0.83</b>
	NN	<b>0.93</b>	0.72	0.83	0.86	0.82	<b>0.94</b>	0.78
	CT	<b>0.93</b>	0.74	<b>0.84</b>	0.89	0.83	0.92	0.82
Type II Error (Type I Error)	DA	0.09 (0.59)	0.28 (0.55)	0.18 (0.57)	0.16 (0.39)	0.19 (0.48)	0.18 (0.60)	0.21 (0.39)
	LR	0.15 (0.53)	0.31 (0.54)	0.16 (0.59)	0.21 (0.36)	0.25 (0.41)	0.22 (0.67)	0.27 (0.45)
	HA	0.07 (0.28)	0.25 (0.54)	0.18 (0.39)	<b>0.08 (0.17)</b>	0.17 (0.27)	0.05 (0.73)	0.22 (0.48)
	DE	0.06 (0.31)	0.25 (0.57)	0.16 (0.33)	0.10 (0.31)	<b>0.14 (0.26)</b>	0.12 (0.66)	<b>0.17 (0.21)</b>
	NN	<b>0.05 (0.22)</b>	<b>0.22 (0.49)</b>	0.15 (0.39)	0.13 (0.25)	0.17 (0.28)	<b>0.05 (0.84)</b>	0.21 (0.27)
	CT	0.05 (0.25)	0.23 (0.51)	<b>0.15 (0.29)</b>	0.10 (0.25)	0.16 (0.22)	0.06 (0.72)	0.18 (0.21)
Area Under the Curve – AUC (Gini coefficient)	DA	0.89 (0.78)	0.73 (0.46)	0.83 (0.66)	0.93 (0.86)	0.83 (0.66)	0.88 (0.76)	0.82 (0.64)
	LR	0.84 (0.68)	0.71 (0.42)	0.84 (0.68)	0.88 (0.76)	0.79 (0.58)	0.84 (0.68)	0.78 (0.56)
	HA	0.92 (0.84)	0.79 (0.58)	0.86 (0.72)	<b>0.95 (0.90)</b>	0.85 (0.70)	<b>0.93 (0.86)</b>	0.83 (0.66)
	DE	0.92 (0.84)	0.80 (0.60)	0.88 (0.76)	0.89 (0.78)	<b>0.88 (0.76)</b>	0.91 (0.82)	0.90 (0.80)
	NN	0.93 (0.86)	<b>0.83 (0.66)</b>	<b>0.89 (0.78)</b>	0.88 (0.76)	0.86 (0.72)	0.91 (0.82)	0.83 (0.66)
	CT	<b>0.94 (0.88)</b>	0.82 (0.64)	0.88 (0.76)	0.91 (0.82)	0.85 (0.70)	<b>0.93 (0.86)</b>	<b>0.91 (0.82)</b>
Kolmogorov–Smirnov statistic	DA	0.63	0.55	0.59	0.58	0.62	0.67	0.57
	LR	0.57	0.48	0.58	0.65	0.60	0.67	0.53
	HA	0.66	0.59	0.58	0.70	0.63	0.66	0.61
	DE	0.64	<b>0.62</b>	0.63	<b>0.72</b>	<b>0.68</b>	0.64	<b>0.62</b>

	NN	0.63	0.59	<b>0.69</b>	0.68	0.57	<b>0.71</b>	0.61
	CT	<b>0.69</b>	<b>0.62</b>	0.58	0.60	0.59	0.69	0.61
Out-of-sample Forecast Accuracy	DA	0.68	0.59	0.71	0.76	0.68	0.71	0.67
	LR	0.66	0.58	0.68	0.79	0.75	0.67	0.63
	HA	0.69	0.61	0.67	0.81	0.78	0.72	0.66
	DE	0.72	<b>0.69</b>	0.76	<b>0.83</b>	0.79	0.75	0.75
	NN	0.74	0.66	<b>0.80</b>	0.80	0.75	<b>0.76</b>	0.73
	CT	<b>0.78</b>	0.67	0.79	0.82	<b>0.81</b>	0.75	<b>0.76</b>
	<b>Non-Bankrupt (Bankrupt) firms</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>	<b>1,282 (194)</b>

However, as highlighted in the discussion leading to our second research question, previous findings in the literature also suggest that the additional explanatory power provided by adding the governance measures may increase with the time to bankruptcy (Daily and Dalton, 1994; Darrat et al. 2016). Therefore, we re-estimate the models with two, three and five years to bankruptcy. *Panels A-C in Table 4.5* present the differences in the performance of the different prediction models before and after adding the governance variables (After minus Before), two, three and five years before bankruptcy, respectively. Compared to the results shown in *Panel C in Table 4.4*, the current results show improved accuracy in the overall classification and out-of-sample forecast as well as higher classificatory power as reflected by the higher improvement in the accuracy ratios, the AUC, the Gini coefficient and the Kolmogorov–Smirnov statistic. Additionally, the different models are either able to provide the same, or a better, level of classificatory accuracy when it comes to classifying bankrupt companies, with clear dominance for models utilising DEA and hazard analysis. The results of the tests of Hanley and McNeil (1983) and McNemar (1947) confirm the significant improvement in AUC (after versus before) as well as the presence of a significant treatment effect (i.e. corporate governance) in all models. Also, the results of Vuong’s (1989) test suggest that models including corporate governance variables have significantly higher information content compared to those without such variables.

Economically, we can see that Errors I and II drop in all models, with Altman (1968) showing the largest drops in Error I (classifying bad cases as good) and thus providing the best improvement from an economic point of view (i.e. reducing the cost of lending to soon-to-go-bankrupt firms). In a set of unreported results, we compare the performances of the original models without the governance variables and notice a general deterioration in the forecasting and classificatory ability as we increase the time to bankruptcy (two, three and five years). Overall, these findings suggest that while adding governance variables improves the statistical and economic performance of bankruptcy prediction models, the additional explanatory power provided by adding the governance measures improves with the time to bankruptcy. This effect is however not applicable to models without governance variables, which implies that governance variables tend to provide earlier and more accurate warnings of the firm’s bankruptcy potential. This is largely explained by the fact that corporate governance indicators change less frequently compared to market and accounting indicators and thus weaknesses in such indicators are more likely to provide earlier warnings of upcoming distress. This also suggests that strengthening the firm’s corporate

governance framework is an important element of any successful turnaround plan. Lastly, our findings provide additional support for the impact of corporate governance on firm performance and health (Fich and Slezak, 2008; Jensen, 1986; Jensen and Meckling, 1976).

#### **4.6.3. The role of the different estimation techniques in bankruptcy prediction**

*Table 4.6* shows the results of re-estimating the bankruptcy models including the governance variables using different estimation techniques. Due to limitations with regards to computing power as well as potential sample bias from over- or under-representing either group of firms, we use our full bankrupt sample and match each bankrupt firm with 10 non-bankrupt firms based on total book value and the 2-digit Standard Industrial Classification (SIC) code.<sup>35,36,37</sup> With regards to the parametric models, Discriminant Analysis (DA), Logistic Regression (LR), and Hazard Analysis (HA), the results suggest that regardless of the bankruptcy model selected, HA provides the best classificatory performance as well as the highest average out-of-sample forecast accuracy, which confirms prior findings in the literature (Shumway, 2001). Models estimated using HA are also able to more accurately identify bankrupt firms, as shown by the lower incidence of Type I errors (the proportion of bankrupt firms classified as non-bankrupt). The higher AUC/Gini coefficient/Kolmogorov–Smirnov statistic values for HA estimates also indicate higher classificatory powers compared to DA or LR estimates. This is further confirmed by the results of the Hanley and McNeil (1983) test (unreported).

However, the superior results from the non-parametric methods, Data Envelopment Analysis (DE)-additive model, Neural Networks-Backpropagation Network (NN) and Classification and Regression Trees (CT), suggest that such methods tend to provide more accurate classifications, both overall and for bankrupt firms, irrespective of the bankruptcy prediction model used. The unreported results of the Hanley and McNeil (1983) test confirm that DE, NN and CT estimations

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<sup>35</sup> The accuracy ratios will be different due to the higher representation in *Table 4.6* of the bankrupt firms (as a proportion) as opposed to *Table 4.4* which uses the full sample of healthy firms.

<sup>36</sup> The matching is done through selecting ten non-bankrupt firms with the same SIC code (two digits) that are closest in terms of book value of total assets during the year of observation to the bankrupt firm. This is similar to Altman (1968) and others. The match is done through minimising the absolute value of the ratio of the difference between bankrupt and non-bankrupt firms. In our sample 76% of the bankrupt firms are matched with non-bankrupt firms that are within 10-15% of their book value. The matching considers the time dimension as well.

<sup>37</sup> Our overall conclusions remain essentially the same when we match each bankrupt firm to one non-bankrupt firm only, when we match firms based on propensity scores, or when we run a sample with the same proportion of bankrupt to non-bankrupt firms as observed in reality.

provide significantly higher AUC results. Furthermore, those models have higher Gini coefficient and Kolmogorov–Smirnov statistic values. Overall, hazard analysis provides the best classification and out-of-sample forecast accuracy among the most widely used parametric methods in bankruptcy prediction. Nevertheless, non-parametric methods such as neural networks, data envelopment analysis or classification and regression trees appear to provide better classificatory accuracy, regardless of the model selected. Furthermore, those three methods in addition to hazard analysis appear to deliver the most satisfying economic results among the models tested in terms of having lower overall Error I and II rates. For instance, among the seven models tested, the non-parametric methods had the lowest Error I rates in six of them, with hazard analysis having the lowest value in the remaining model.

*The question that this raises is, what estimation method is the best to use to predict bankruptcy?*

The answer to this question is not simple and requires consideration of the strengths and weaknesses of the different estimation methods. While the difference in the performances of the various non-parametric methods is not significant, the challenges faced when applying the different methods are different. For instance, Premachandra et al. (2009) point out that DEA is inferior to the conventional models when it comes to the availability of statistical tests as well as bankruptcy prediction in varying time horizons. The results of DEA models are also found to be sensitive to the selection of inputs and outputs. Similarly, Kumar and Ravi (2007) point out that although neural networks tend to perform well in different classification and forecasting tasks, the selection of the different parameters involved in the neural networks training and estimation process is not a simple task. However, CART models require fewer specifications to run and are considerably less sensitive to the selection of the input variables compared to DEA and neural networks. Furthermore, trees arising from applying CART models can be easily visualised in high dimensions, which facilitates better understanding of the data and helps identify any interdependencies between the various input variables. CART analysis also provides a ranking of the classification performance of the different input variables which improves the insights gained from running the model compared to other non-parametric methods. With regards to parametric methods, hazard models seem to be the best option in this group since their consideration of the full history of the firm in their predictions helps produce more consistent and efficient estimates in comparison to MDA and logit models which use the firm's last observation only to estimate the model.

#### 4.6.4. Corporate governance, bankruptcy and endogeneity concerns

While the findings of some studies suggest that the relationship between corporate governance and the probability of default disappears after accounting for endogeneity (e.g. Schultz et al., 2017), others have documented the persistence of such relationships after addressing the endogeneity concerns (e.g. Darrat et al., 2016). Following Wintoki et al. (2012) and others, we use the dynamic-panel GMM (generalised methods of moments) estimator introduced by Arellano and Bover (1995) and Blundell and Bond (1998) and follow a three-step estimation process. First of all, the regression model is modified to include the first lagged probability of default in addition to the other explanatory variables.<sup>38</sup> Second, we take the first difference of the variables to account for any unobserved heterogeneity. Lastly, we use the dynamic panel GMM estimator to estimate the final model while using the lagged values of the explanatory variables as instruments. Hoechle et al. (2012) point out that using the lagged variables as instruments for the current values of the same variables accounts for possible simultaneity and reverse causality. This setup allows us to treat all explanatory variables as endogenous ones while adding the years' dummy variables as the only exogenous variables. Following Darrat et al. (2016) we also believe that the results from our lagged bankruptcy models (two, three and five years to bankruptcy) provide another test for endogeneity.

*Table 4.7* presents the results of two different regressions with the probability of default estimated using discrete-time hazard rate (SHW model) and logistic regression (OHL model), respectively, as the dependent variable. In addition to including the different governance variables as independent variables we also include the variables from Campbell et al. (2008) as control variables (see *Table 4.1* for a full list of the variables included). The results from both estimations show that even after controlling for unobserved heterogeneity, possible simultaneity, and reverse causality, corporate governance variables have a significant role in predicting bankruptcy. Specifically, nine of the twelve governance variables included in the GMM estimations are significant in at least one regression. Furthermore, using the Hansen test of over-identification, we fail to reject the null hypothesis that the instruments employed in our models are valid, confirming the validity of our results. At large, this confirms the presence of a statistically significant relationship between corporate governance and the probability of default even after controlling for

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<sup>38</sup> Probability of default is estimated using the discrete-time hazard rate and logistic regression analysis as explained earlier.

different forms of endogeneity concerns that have been highlighted in the literature (Wintoki et al., 2012; Schultz et al., 2017).

**Table 4.7: Test for endogeneity using dynamic panel GMM models**

This table presents the results of two different regressions with the probability of default estimated using discrete-time hazard rate and logistic regression, respectively, as the dependent variable. The regression includes first lagged probability of default in addition to the different governance variables and several control variables as independent variables (refer to *Tables 4.1* and *4.2* for definitions). Details of the Dynamic Panel GMM procedure can be found in the text. The Arellano-Bond test is a test for first- and second-order autocorrelation in the first-differenced errors with the null hypothesis of zero autocorrelation (*p-value* is reported). The Hansen test of over-identification tests the null hypothesis that all instruments are valid (*p-value* is reported). We have included the variables from Campbell et al.'s (2008) model (see Table 1 for the full list of variables) as control variables. The t-statistics are reported in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	Probability of Default (SHW: Discrete-time hazard rate)	Probability of Default (OHL: Logistic regression)
Intercept	-2.643*** (-6.730)	-2.144*** (-4.800)
Lagged dependent variable (One Lag)	0.641*** (5.150)	0.418*** (10.780)
Attrition Ratio (ATTR)	0.139** (2.020)	0.175*** (3.600)
CEO Change (CEOC)	0.105** (2.820)	0.134* (1.930)
Gender (GEND)	0.122 (0.660)	0.097 (0.740)
Board Independence (INDP)	-0.595** (-2.130)	-0.843** (-2.200)
CEO-Chairman Duality (DUAL)	0.352 (1.120)	0.729 (1.500)
Board Size (BSIZ)	2.098* (1.690)	3.016** (2.560)
CEO Age (CEOA)	-0.032*** (-2.880)	-0.057** (-2.100)
Director External Experience (DEEP)	-0.138* (-1.910)	-0.041* (-1.710)
Director Internal Experience (DIEP)	-0.179** (-1.980)	-0.154* (-2.340)
Director Company Experience (DCEP)	-0.107 (-1.580)	-0.098 (-1.200)
Director busyness (BUSY)	0.124* (1.910)	0.282** (2.050)
Directors compensation (DCOM)	-0.621* (-1.730)	-0.673** (-2.190)
Control variables from Campbell et al. (2008)	YES	YES
Arellano-Bond first order test	0.280	0.340
Arellano-Bond second order test	0.210	0.360
Hansen Test of over-identification	0.410	0.260
Non-Bankrupt (bankrupt) firms	1,457 (194)	1,457 (194)

#### **4.7. Conclusion**

We examine the role of corporate governance variables in improving the predictive power of bankruptcy prediction models, while analysing the classificatory powers yielded by the different estimation techniques. This study is among the first to comprehensively examine the nexus between bankruptcy, corporate governance and estimation techniques. We find that the addition of board-related governance variables to various bankruptcy prediction models significantly improves their classificatory power and predictive accuracy. The most noticeable improvement is found in models utilising hazard analysis, which might be related to the fact that hazard analysis takes account of changes in the firm's performance or characteristics over time and thus is able to produce more consistent and efficient predictions. We also find that while adding governance variables improves the performance of bankruptcy prediction models, the additional explanatory power provided by adding the governance measures improves the further we are from bankruptcy, which implies that governance variables tend to provide earlier and more accurate warnings of the firm's bankruptcy potential.

Lastly, our analysis of six of the most-used estimation methods in the literature showed that regardless of the bankruptcy model used, hazard analysis provides the best classification and out-of-sample forecast accuracy among the parametric methods. Nevertheless, non-parametric methods such as neural networks, data envelopment analysis or classification and regression trees appear to provide better classificatory accuracy regardless of the model selected. The economic value obtained through reducing the cost of potential bankruptcies (i.e. Error I) and foregone investments (i.e. Error II) was found to be the highest for models utilising hazard analysis, neural networks, data envelopment analysis or classification and regression trees. The study also employed the dynamic panel GMM estimator to address any endogeneity concerns with regards to the relationship between bankruptcy prediction and corporate governance and found no support for such concerns.

While we do not attempt to examine the process through which corporate governance influences the probability of bankruptcy, prior evidence from the literature suggests that corporate governance impacts the firm's operating performance and its risk-taking behaviour and hence its probability of default through mitigating and limiting agency issues (Bhagat and Bolton, 2008; Bhojraj and Sengupta, 2003). The results of this study contribute to the debate on the best estimation methods

and the role of governance characteristics in improving the bankruptcy prediction process. The results also inform future decision-making processes with regards to improving corporate governance practices and increasing investor protection. Regulators and policy makers should take note of the role that corporate governance plays in financial distress and bankruptcy, with a special attention to the fact the corporate governance may provide an earlier indication of the firm's financial health. The results of this study also confirm that it is important for market participants to include the firm's governance profile in their assessment of the firm's financial health. Future research can focus on examining a wider set of governance factors across different geographies which will improve our understanding of the contribution of the different governance factors in each geography.

**Chapter 5:** Essay III: Corporate governance, information uncertainty and market reaction to information signals

# Chapter 5

**Essay III: Corporate governance,  
information uncertainty and market  
reaction to information signals**

## **5. Essay III: Corporate governance, information uncertainty and market reaction to information signals**

### **5.1. Introduction**

Every day, investors process vast amounts of data and information signals in their attempts to find the true value of particular stocks. Whenever a new piece of information is released, investors try to predict the potential implications of such information for the value of the company. However, the process of interpreting information signals is not straightforward but rather susceptible to factors such as the prevailing market sentiment and uncertainty as well as the perceived quality of the information signal itself. Put differently, upon receiving a new piece of information, investors do not always update their beliefs and expectations about the value of a stock in a fully rational or a standard Bayesian fashion but rather get influenced by several market-wide and firm-specific factors that introduce some bias into the process (Brav and Heaton, 2002; Epstein and Schneider, 2008).

Prior evidence in the literature suggests that factors such as: market-wide uncertainty (Williams, 2015), firm-specific uncertainty (Francis et al., 2007), and investors' beliefs and sentiment (Bird and Yeung, 2012; Kumar, 2009; Pevzner et al., 2015), impact investors' responses to new information. For instance, investors tend to under-react initially to imprecise or uncertain information signals, although this under-reaction may be corrected if the uncertainty is subsequently resolved (Brav and Heaton, 2002; Francis et al., 2007; Zhang, 2006). Empirical findings with regards to the effect of market-wide (or macro) uncertainty (Bird and Yeung, 2012; Williams, 2015) and firm-specific (or micro) uncertainty (Francis et al., 2007; Zhang, 2006) on processing information signals support this proposition. Prior findings in the literature have also linked investors' reactions under conditions of uncertainty to their sentiment and beliefs about the market. For instance, Kumar (2009) finds that individual investors display stronger behavioural biases such as overconfidence about stock values when uncertainty at the firm and/or market level is high. Furthermore, Bird and Yeung (2012) and Bird et al. (2014) show that positive market sentiment mitigates the effect of high uncertainty on investors' reactions to earnings announcements.

A relatively recent stream of research has focused on examining the relationship between the firm's corporate governance characteristics and market participants' reactions to the different events and

news. Findings from past studies suggest that governance mechanisms help reduce information uncertainty through different means, such as: increasing voluntary disclosures (Beekes and Brown, 2006; Beekes et al., 2016), enhancing the quality of information (Bhat et al., 2006; Cai et al., 2006), and reducing information asymmetry (Kanagaretnam et al., 2007).

The important contribution of this study is to extend the previous literature by examining the role of corporate governance mechanisms in influencing investors' initial and subsequent reactions to earnings announcements, with special attention to one of the most persistent market anomalies, namely the post-earnings announcement drift (PEAD). When investigating the relationship between corporate governance and investor responses to earnings announcements, we control for market conditions that have been found to impact on this response, with a particular focus on market uncertainty and investor sentiment. While several explanations for PEAD based on the rational expectations model or some behavioural observations are provided in the literature (see Bartov et al., 2000; Mendenhall, 2004, Sadka, 2006), the prevailing market conditions such as market uncertainty and investor sentiment have received increasing attention in recent years as possible contributing factors to PEAD (Bird et al., 2014; Bird and Yeung, 2012; Francis et al., 2007; Ozoguz, 2009; Williams, 2015). This study is the first to look at the nexus between corporate governance, market uncertainty, investor sentiment, and PEAD, and it adds to a growing stream of research focusing on increasing our understanding of the responses of market participants to different types of news and events. The study also supplements previous attempts to understand the initial and subsequent market responses to earnings releases by providing evidence on the contributing role played by corporate governance through the effect that it has on information uncertainty.

In a sample of quarterly announcements made by US public firms between January 2006 and December 2016, we find that better governance significantly strengthens the magnitude of the initial market reaction to both positive and negative earnings announcements. This contrasts with the impact of either market uncertainty or investor sentiment which will have different effects depending on whether the response is to good news or bad news. For example, higher uncertainty will cause pessimism in the minds of investors which will result in a larger response to bad news but a weaker response to good news. An important finding is that during the post-announcement period the level of governance plays no role in explaining movements in share prices that are

attributable to any reassessment of the initial announcement. This contrasts with the findings for uncertainty and sentiment which are both found to have an ongoing influence on the market response to an earnings announcement during the post-announcement period. Significantly, it is changes in either the level of uncertainty or sentiment, and not the level itself, that explain post-announcement drift. The implication is that corporate governance plays no role in explaining PEAD because it remains relatively stable over the post-announcement period. Our findings suggest that the immediate impact of an earnings announcement on investor expectations is conditioned by the environment existing at the time of the announcements which is determined by a number of factors including the level of corporate governance, market uncertainty and investor sentiment. One of our more important findings is that investors only revisit their initial response to an earnings announcement if there is a change in this environment. This brings into question an interpretation that PEAD is an inevitable correction to an initial under-reaction to earnings news (e.g. Zhang, 2006). Our findings suggest that any such a correction is not inevitable but rather is a response to post-announcement movements in factors such as market uncertainty and sentiment. The wider implication of this is that the process by which securities are driven towards efficient pricing is continually being bombarded by distorting factors that may well result in extended periods of mispricing.

There are at least two additional important insights that stem from our analysis. First, we identify the major channel through which the level of corporate governance impacts on the extent of the market's response to earnings announcements. Consistent with previous findings that (i) better corporate governance reduces information uncertainty, and (ii) a reduction in information uncertainty increases investors' initial responses to earnings announcements, we find that information uncertainty is the major channel through which corporate governance operates to increase the market's initial reaction to earnings announcements. Overall, this result suggests that better corporate governance increases the credibility of the information which translates into a greater acceptance of, and so a response to, the information by investors (Francis et al., 2007; Kanagaretnam et al., 2007; Zhang, 2006).

Second, as a by-product of our research, we are the first study to show that investors exhibit a very different reaction to market uncertainty than they do to firm-level information uncertainty. Consistent with previous studies on macro-level uncertainty, we show that a high level of market

uncertainty can assert an asymmetric effect on investors' reactions to earnings news, reducing reaction to good news but increasing their reaction to bad news. For firm-level information uncertainty, however, our results show that a high level of information uncertainty diminishes investor reaction to both good and bad news. Further, this apparent reluctance to act on information continues in the post-earnings period with high levels of information uncertainty significantly reducing PEAD. The implication here is that a firm that has a high level of information uncertainty can be mispriced for an extended period of time which has obvious implications for the efficiency of the market.

## **5.2. Literature review**

Findings in the literature suggest that market conditions such as the prevailing level of market uncertainty and the overall sentiment of market participants exert a significant influence on how investors interpret and react to the influx of information (e.g. Anderson et al., 2009; Bird and Yeung, 2012; Epstein and Schneider, 2008; Ozoguz, 2009). The separation between the concepts of risk and *uncertainty*, first discussed in the work of Knight (1921) and then Keynes (1937), laid down the foundation for a stream of research that looks at how uncertainty affects asset prices outside the framework of traditional asset pricing models. For example, the theoretical work of Chen and Epstein (2002) shows that excess returns for a security are made of a risk premium and an ambiguity or uncertainty premium. The empirical results of Anderson et al. (2009), Connolly et al. (2005), Epstein and Schneider (2008) and Ozoguz (2009), among others, document the presence of a strong relationship between uncertainty and return, confirming the existence of an uncertainty premium. Several empirical studies found that the asymmetric response to earnings surprise is primarily caused by uncertainty, whether economy-wide or firm-specific (Bird and Yeung, 2012; Choi, 2014; Jiang et al., 2005; Williams, 2015; Zhang, 2006). Further, it has been suggested that uncertainty is a major contributor to the persistence of PEAD (Bird et al., 2014; Caskey, 2009; Francis et al., 2007; Gerard, 2012).

It has been found that the *sentiment* of market participants also plays an important role in determining the direction and extent of their reactions to new information (De Long et al., 1990). For instance, Mian and Sankaraguruswamy (2012) find that markets are more responsive to good news released during periods of high sentiment as well as to bad news released during periods of low sentiment. Moreover, Chung et al. (2012) find that market sentiment helps predict the returns

on all portfolios during an economic expansion state when investors' optimism increases. Likewise, Baker and Wurgler (2006) report that market sentiment at the beginning of a period impacts the expected returns at the end of it for a large subset of US stocks. Additionally, the findings of Baker and Wurgler (2007), Conrad et al. (2002), Lemmon and Portniaguina (2006) and Zouaoui et al. (2011), among others, suggest a significant role for market sentiment in predicting stock returns and explaining some market anomalies such as pricing bubbles. Bird and Yeung (2012) find that investor sentiment interreacts with market uncertainty in influencing how investors respond to earnings announcements to the extent that they can override the signal, with investors often reacting negatively to good news released at a time of high market uncertainty and low market sentiment. Bird et al. (2014) also find that investor sentiment and market uncertainty combine to impact on any market response to information in the post-announcement period.

An important factor that can influence investors' reactions to new information, but which has received limited attention in the literature, is *corporate governance*. The strength of the firm's corporate governance framework influences the firm's information environment through several channels such as improving the quality as well as the quantity and frequency of its disclosures. In a recent study, Beekes et al. (2016) study a sample of more than 5,000 firms from 23 countries in the period between 2003 and 2008 and find that better-governed firms made a larger number of disclosures to the market. Their results also show that better-governed firms tended to release documents to the market in a timelier fashion, especially when these documents are related to bad news. The results of Beekes et al. (2016) are similar to those reported in Beekes and Brown (2006) in the Australian market where they find that better-governed firms make more informative disclosures which in turn improves the accuracy of analysts' forecasts. Beekes and Brown (2006) also report that better governance is associated with timelier price discovery.

With regards to governance's effect on information quality, Byard et al. (2006) report the presence of a strong positive association between the quality of analysts' forecast about a firm's upcoming earnings and the quality of its corporate governance practices. They also report that corporate governance's strength affects the quality of mandatory and voluntary disclosures made by a firm, confirming that better quality disclosures may reduce information uncertainty and improve analysts' ability to predict the firm's future performance. Similarly, Cai et al. (2006) report that governance characteristics such as the number of founding family members on the board and the

number of female directors influence the level of information uncertainty in the market. Specifically, the more founding family members and the less female directors the board has, the greater the information uncertainty. Hass et al. (2014) report similar results using a sample of Chinese listed firms in which better-governed firms were found to have more informative earnings forecasts as measured by the accuracy of analysts' forecasts and price timeliness. Furthermore, in a large sample of European firms, Bonetti et al. (2016) find that firms with strong board-level governance tend to have a significantly higher financial reporting quality and more informative earnings announcements compared to firms with weak board-level governance. Dargenidou et al. (2007) also document that firms with better governance are more likely to accurately incorporate bad news in reported and forecasted earnings, thus improving the reliability of earnings announcements. On the whole, while a number of studies have focused on examining the relationship between corporate governance quality and the initial response to earnings announcements, there appears to have been no prior attempt at studying the relationship between corporate governance and the well-documented drift during the post-announcement period.

Finally, this study also relates to the literature that takes into account the joint impacts of several sources of uncertainty. Much of the research in this area tackles the problem from a firm's production and/or investment perspective, examining how macro-economic uncertainty arising from policy uncertainty (Rodrik, 1991; Kang et al., 2014) or political uncertainty (Dixit and Pindyck, 1994; McDonald and Seigel, 1986) leads to uncertainty in the firm's utilisation of resources or reduces firm investment. Indeed, macro-economic uncertainty can induce firm-level uncertainty. Chen et al. (2018) shows that political uncertainty can diminish a firm's information flow and quality of information. Similar to these studies, this study also examines the impact of several sources of uncertainty, market-wide and firm-specific information uncertainty. However, our interest lies in investors' reactions in the presence of uncertainty and ultimately the asset pricing implications of these uncertainties.

### **5.3. Research questions**

This study first addresses two related questions:

- 1. Is the market's immediate response to a firm's earnings announcements affected by its corporate governance characteristics?*

- 2. Is the market's response during the post-announcement period affected by its corporate governance characteristics?*

In undertaking this analysis, we control for the level and/or movement in both market uncertainty and investor sentiment which the literature suggests are factors that exert a significant influence on how investors interpret and react to the flow of information (e.g. Anderson et al. 2009; Baker and Wurgler, 2007; Conrad et al., 2002; Epstein and Schneider, 2008; Lemmon and Portniaguina, 2006; Ozoguz, 2009; Wurgler, 2007). Furthermore, prior evidence in the literature suggests that stronger governance mechanisms are likely to enhance investors' immediate reactions to information signals through reducing firm-specific uncertainty and improving the perception of the quality of the firm's announcements (Cai et al., 2006; Hass et al., 2014; Kanagaretnam et al., 2007).

We then address a third question that relates to the channel through which a firm's corporate governance environment might influence the market's immediate and subsequent response to earnings announcements:

- 3. Is the influence of corporate governance on the market's response to earnings announcements attributable to a significant extent to the favourable impact that it has on improving a firm's earnings quality?*

Francis et al. (2007) and Zhang (2006), among others, associate any delayed response to an earnings announcement with the perceived quality of a firm's information signal. Francis et al. (2007) find that announcements by firms with higher information uncertainty (IU) tend to experience a more muted initial market reaction. Zhang (2006) finds evidence that greater IU is associated with a larger price drift. Based on this evidence, as well as the earlier discussion regarding the role of good corporate governance in reducing the effect of IU, firms with stronger governance are expected to have a larger initial reaction to earnings surprises and as a result a potentially smaller or an insignificant drift during the post-announcement period.

- 4. What is the impact of corporate governance relative to market uncertainty and investor sentiment in explaining the extent of the initial and subsequent market responses to earnings announcements?*

We examine investors' reactions under different market conditions where we consider the interplay between corporate governance, market uncertainty, and investor sentiment. Bird and Yeung (2012) show that strong market sentiment can mitigate the negative impact of market-level uncertainty in investors' responses to unexpected earnings news. In this study, with the introduction of corporate governance, we can gauge the relative impact of each of these three components of the information environment in terms of their influence on how investors react to information signals.

5. *Do the two types of uncertainty analysed in our study (market uncertainty and firm-specific information uncertainty) impact on the market response to information signals in a similar way?*

In this study we follow in the footsteps of prior studies and include market uncertainty as part of the environment that influences the market response to information. We also include firm-level information uncertainty as one channel through which corporate governance influences the market response. This affords us the opportunity to compare the impact that each of the sources of uncertainty has on the pricing process at the time of, and subsequent to, the release of earnings news.

#### **5.4. Data**

The sample of our study covers the quarterly announcements made by US public firms between January 2006 and December 2016.<sup>39</sup> We source our accounting and market data from the CRSP/COMPUSTAT database for all firms that are part of the S&P 1500 Index.<sup>40</sup> We extract corporate governance for the same sample from the ISS (formerly RiskMetrics) database and we construct our own corporate governance index following the approach outlined in the methodology section. As our measure of unexpected earnings, we use analysts' earnings forecasts obtained from I/B/E/S with the requirement that at least two analyst forecasts are available for a data point to be included in our final sample. Our final sample consists of all quarterly observations with sufficient governance and accounting/market data from the different databases. We winsorise all continuous

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<sup>39</sup> Although similar studies use a longer time period, we use a shorter time period due to the limited availability of governance data, especially for the earlier years.

<sup>40</sup> We limit our study to S&P 1500 firms because our governance database primarily covers members of this index.

variables at 1% and 99%. This results in us having 21,692 observations in our final sample, consisting of 14,672 positive surprises and 7,020 negative surprises.<sup>41</sup>

## **5.5. Methodology**

### **5.5.1. Uncertainty and sentiment measures**

Finding an accurate and a reflective measure of *uncertainty* has been a challenging task for many researchers in the field (Connolly et al., 2005). We follow Connolly et al. (2005), Williams (2015) and others in using the implied volatility from the options market, namely the market volatility index (VIX), to measure market uncertainty. An alternative proxy for uncertainty used in the literature has been disagreement among experts, such as a measure of the dispersion of analysts' economic forecasts (Anderson et al., 2009). We find strong support in the literature for using VIX as a measure of market uncertainty, and it has the advantages of being forward looking and calculated on a continuing basis. Bloom (2009) shows that volatility in the stock market as measured by VIX is highly correlated with periods of high economy-wide uncertainty. Furthermore, David and Veronesi (2002) develop an option pricing model that uses economic state uncertainty and identified a positive association between implied volatility in options and investors' uncertainty about fundamentals. Drechsler (2013) also shows that the large variance premium in options' prices can be explained by an equilibrium model that incorporates time varying Knightian uncertainty. Drechsler claims that the variance premium is the result of using options to hedge uncertainty. His results further demonstrate that changes in the levels of uncertainty cause fluctuations in the variance premium (see also Connolly et al., 2005).

We use the cumulative daily returns of a major market index (S&P 1500) over the five days prior to the announcement to capture market *sentiment* at the time of the announcement (SMI) and thus avoid the day-of-the-week effect (Brown and Cliff, 2004). We also capture the change in market sentiment over the post-announcement period (T+2 to T+60) by summing daily returns over the period. Various studies in the literature employ the sentiment index introduced in Baker and Wurgler (2006) to measure market sentiment, however the index is only available on a monthly basis which reduces its usefulness for our purposes as earnings announcements can be released at

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<sup>41</sup> We drop 3,831 observations from our sample due to lack of either forecast data or governance data or both.

any time during a month. We use the Baker and Wurgler index in a later section to test the sensitivity of our results to the choice of the sentiment measure.

### 5.5.2. Standardised Unexpected Earnings (SUE)

Different measures of unexpected earnings (UE) which are based on either historical earnings or analysts' forecasts have been used in the literature. Since analysts' forecasts are a better reflection of market participants' expectations of a firm's earnings than historical earnings (see Livnat and Mendenhall, 2006), we follow Liu et al. (2003), Livnat and Mendenhall (2006) and others by estimating SUE using analysts' forecasts. We calculate our SUE measure as:

$$SUE_{i,t} = \frac{E_{i,t} - \overline{E}_{i,t}}{P_{i,t}}$$

where  $E_{i,t}$  is actual quarterly earnings per share for firm  $i$  in quarter  $t$ ,  $\overline{E}_{i,t}$  is the most recent consensus analysts' forecast available prior to the announcement of the quarterly earnings per share for firm  $i$  in quarter  $t$  and  $P_{i,t}$  is the price for firm  $i$  at the end of the quarter. Following Mendenhall (2004) we only include observations when there are at least two forecasts available.<sup>42</sup>

### 5.5.3. Corporate governance (GOVI) measure

In line with many previous studies we construct a firm-level additive index of governance (GOVI) using the commonly-used measures of governance listed in *Appendix IV* (e.g. Aggarwal et al., 2010; Anderson and Gupta, 2009; Brown et al., 2011; Brown and Caylor, 2006). These 29 measures represent the various governance indicators available from the ISS database and capture well the different aspects of the firm's governance framework, including its board and ownership characteristics, compensation structure, and control or anti-takeover provisions. Following Aggarwal et al. (2010) and Brown and Caylor (2006), we use the most recent governance

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<sup>42</sup> Livnat and Mendenhall (2006) and Doyle et al. (2006) report that PEAD tends to be significantly larger when analysts' forecasts are used in the measurement of unexpected earnings. Furthermore, Livnat and Mendenhall report that measurement methods using analysts' forecasts and those using time-series models may capture different forms of mispricing. For the sake of comprehensiveness, we follow Livnat and Mendenhall (2006) and calculate another measure of SUE that is based on historical earnings to use in our robustness tests:

$$HSUE_{i,t} = \frac{E_{i,t} - E_{i,t-4}}{P_{i,t}}$$

where  $E_{i,t}$  is actual quarterly earnings per share for firm  $i$  in quarter  $t$  and  $E_{i,t-4}$  is the actual quarterly earnings per share for firm  $i$  in the same quarter of the previous year. In line with Livnat and Mendenhall (2006) and Doyle et al. (2006), we find that repeating the same analysis with the historical measure provides similar but weaker results.

thresholds provided by the Institutional Shareholder Services (ISS) Governance QuickScore 3.0 to construct our index. A firm gains one point for each of its governance attributes that meets the threshold suggested by ISS’s guideline, or 0 otherwise.<sup>43</sup> The final value of our index is the total number of points accumulated by a firm divided by the total number of attributes, expressed as a percentage. When an attribute is missing for a particular firm, the score is based upon the remaining attributes, with firms being deleted from the sample if more than one-third of the attributes are missing.<sup>44</sup>

#### 5.5.4. Information uncertainty (IU) measure

We create proxies for information uncertainty in order to address our third question as to whether it is this channel through which corporate governance works when influencing the market reaction to new information. The three proxies chosen on the basis that they are widely cited in the literature are: return volatility, volume traded, and earnings forecast dispersion (see *Table 5.1* for more information). We create a dummy variable, IFUH, for each of these proxies that takes on a value of 1 if the value of the IU measure for the announcement year is above the median value for all other observations, or 0 otherwise. We construct the different IU measures so that higher values indicate higher IU.

**Table 5.1: Measures of information uncertainty (IU)**<sup>45</sup>

Measure	Definition	Expected relation
<i>Return Volatility</i> (VOLT)	The yearly volatility in daily returns (Van Ness et al., 2001)	High IU (+)
<i>Volume Traded</i> (VOLM)	The total number of shares traded during the year divided by the number of outstanding shares (Draper and Paudyal, 2008)	Low IU (-)
<i>Forecast Dispersion</i> (FCDP)	The standard deviation of the most recent analyst earnings forecasts for the fiscal year divided by the consensus (median) forecast (Krishnaswami and Subramaniam, 1999)	High IU (+)

<sup>43</sup> Thresholds for different governance measures are provided in Appendix III. The variables were selected to best represent and capture the corporate governance framework of the firm.

<sup>44</sup> As a result of this restriction we drop 6,451 observations from our sample.

<sup>45</sup> Bharath et al. (2009) and Krishnaswami and Subramaniam (1999) report that many of the information asymmetry measures used in the literature are highly and significantly correlated.

### 5.5.5. Main models

We begin our analysis by examining the nature and significance of the initial reaction to earnings announcements using *Model 5.1a*. We also run *Model 5.1b* to test whether there is a post-earnings announcement drift in our sample. Following Conrad et al. (2002), Choi (2014), Williams (2015) and others, we specify our models as follows:

$$CAR(0,1)_{i,t} = \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/BTMV_{i,t}/ \\ RLAG_{i,t}/FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i \quad (5.1a)$$

$$CAR(2,60)_{i,t} = \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/BTMV_{i,t}/ \\ RLAG_{i,t}/FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i \quad (5.1b)$$

where  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise.  $CAR_{i,t}$  is the cumulative abnormal return calculated for the day of the announcement (T+0) and the following day (T+1) for *Model 5.1a*, or the cumulative abnormal return calculated for the post-announcement period (T+2 to T+60) for *Model 5.1b*.<sup>46</sup> We calculate the abnormal return by subtracting the expected return from the actual return. The expected return is calculated using the market model approach as discussed in MacKinlay (1997) and Kothari and Warner (2007).<sup>47</sup> The parameters of the market model (stated below) are calculated using the data from the 60 days preceding the announcement date (excluding the event window):

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

where  $R_{i,t}$  and  $R_{m,t}$  are the returns during period t for security i and the market index (i.e. S&P 1500), respectively.

We have chosen to include four control variables that are known to influence our dependent variable, and which were found to be significant in prior studies.<sup>48</sup>  $SIZE_{i,t}/BTMV_{i,t}$  are the log of

<sup>46</sup> We define the post-announcement period as T+2 to T+60 to cover the period between the current and future quarterly announcements (3 months).

<sup>47</sup> The results remain unchanged when using the market-adjusted model which calculates the abnormal return by subtracting the daily market return (i.e. S&P 1500) from the actual daily stock return based on the size decile.

<sup>48</sup> There are a number of other control variables suggested in the literature such as having dummy variables to indicate if the firm has announced negative earnings or if it falls in the largest 20 firms in the country (e.g. DeFond et al., 2007; Pevzner et al., 2015), which we decided to not include as we account for size and negative earnings.

the firm's market value and its book-to-market value ratio at the time of the announcement, respectively. Both variables were found to be significantly related to firm valuation and post-earnings announcement drift and are used to control for differences in risk which are not reflected in the excess returns (Bernard and Thomas, 1989; Bhushan, 1994; Choi, 2014; Foster et al., 1984).  $SIZE_{i,t}$  is also included to reduce the coefficient bias effect (Williams, 2015). Furthermore, following DeFond et al. (2007), Landsman et al., (2012) and Pevzner et al. (2015) we add two additional control variables which were found to impact the measured reaction to earnings announcements: earnings reporting lag ( $RLAG_{i,t}$ ) and number of forecasts ( $FORC_{i,t}$ ). We control for the lag between the end of the reporting period and the announcement date ( $RLAG$ ) because a longer lag increases the probability of market participants obtaining significant earnings information prior to the actual announcement, which reduces the significance of the announcement itself (Chambers and Penman, 1984). Additionally, we use the number of forecasts available ( $FORC$ ) as an indicator of the overall precision of the earnings forecast (Kim and Verrecchia, 1991). All variables are defined in more detail in *Appendix III*.

The coefficients  $\beta_1$ , and  $\beta_2$  in *Model 5.1a* will inform us as to the strength of the market reaction to negative and positive earnings surprise, respectively. The same coefficients  $\beta_1$ , and  $\beta_2$  in *Model 5.1b* will indicate the existence of a PEAD.

#### **5.5.5.1. Governance, uncertainty, sentiment and earnings announcements**

For the announcement period, we define announcements with positive sentiment as those where the cumulative daily return of the market index (S&P 1500) for the preceding five days is positive. Furthermore, we define announcements with high uncertainty as those where the value of VIX one day prior to the announcement is above the median for all the observations. In order to examine the relationship between uncertainty, sentiment, corporate governance and unexpected earnings at the time of the announcement we run the following regression model:

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through our SIZE variables and having separate indicators for bad and good news in our independent variables. Another variable which we include at a later stage as part of measuring information uncertainty is the dispersion in analysts' forecast.

$$\begin{aligned}
CAR(0,1)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 SMIP_{i,t} + \beta_5 VIXH_{i,t} \\
& + \beta_6 GOVH_{i,t} \times NUE_{i,t} + \beta_7 GOVH_{i,t} \times PUE_{i,t} + \beta_8 SMIP_{i,t} \times NUE_{i,t} + \beta_9 SMIP_{i,t} \times PUE_{i,t} \\
& + \beta_{10} VIXH_{i,t} \times NUE_{i,t} + \beta_{11} VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables } (SIZE_{i,t}/ BTMV_{i,t}/ \\
& RLAG_{i,t}/ FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
\end{aligned} \tag{5.2}$$

where  $CAR$ ,  $PUE$ ,  $NUE$  and the control variables were defined earlier.  $GOVH_{i,t}$  is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise, while  $SMIP_{i,t}$  is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five days prior to the announcement is positive or 0 otherwise.  $VIXH_{i,t}$  is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise. The answer to our first research question is to be found in both the sign and the significance of  $\beta_6$  and  $\beta_7$  as they represent the differences in the initial reactions to both  $NUE$  and  $PUE$  for better-governed firms as compared to those for the less well-governed firms.

### 5.5.5.2. Governance and post-earnings announcement drift

With regards to the post-announcement period and PEAD, we estimate the following model for the full sample:

$$\begin{aligned}
CAR(2,60)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 PSMIP_{i,t} + \beta_5 \Delta VIXH_{i,t} \\
& + \beta_6 GOVH_{i,t} \times NUE_{i,t} + \beta_7 GOVH_{i,t} \times PUE_{i,t} + \beta_8 PSMIP_{i,t} \times NUE_{i,t} + \beta_9 PSMIP_{i,t} \times PUE_{i,t} \\
& + \beta_{10} \Delta VIXH_{i,t} \times NUE_{i,t} + \beta_{11} \Delta VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables } (SIZE_{i,t}/ BTMV_{i,t}/ \\
& RLAG_{i,t}/ FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
\end{aligned} \tag{5.3}$$

where  $CAR$ ,  $PUE$ ,  $NUE$ ,  $GOVH$  and the control variables were defined earlier.  $PSMIP_{i,t}$  is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while  $\Delta VIXH_{i,t}$  is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over post-announcement period (T+2 to T+60) or 0 otherwise. The sign and significance of  $\beta_6$  and  $\beta_7$  provide the answer to our second research question as they represent the differing impacts of earnings announcements for better-governed firms as compared to less well-governed firms.

### 5.5.5.3. Governance, the firm's information environment and earnings announcements

In order to answer our third question, we run a regression based on the following equations using a structural equation modelling (SEM) routine to test the relationship illustrated in *Figure 5.1*:

$$\begin{aligned}
 CAR(0,1)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 IFUH_{i,t} + \beta_5 SMIP_{i,t} \\
 & + \beta_6 VIXH_{i,t} + \beta_7 GOVH_{i,t} \times NUE_{i,t} + \beta_8 GOVH_{i,t} \times PUE_{i,t} + \beta_9 IFUH_{i,t} \times NUE_{i,t} \\
 & + \beta_{10} IFUH_{i,t} \times PUE_{i,t} + \beta_{11} SMIP_{i,t} \times NUE_{i,t} + \beta_{12} SMIP_{i,t} \times PUE_{i,t} \\
 & + \beta_{13} VIXH_{i,t} \times NUE_{i,t} + \beta_{14} VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/\text{BTMV}_{i,t}/ \\
 & \text{RLAG}_{i,t}/\text{FORC}_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
 \end{aligned} \tag{5.4a}$$

$$IFUH_{i,t} = \mu_0 + \mu_1 GOVH_{i,t} + \varepsilon_i \tag{5.4b}$$

$$IFUH_{i,t} \times NUE_{i,t} = \alpha_0 + \alpha_1 GOVH_{i,t} + \varepsilon_i \tag{5.4c}$$

$$IFUH_{i,t} \times PUE_{i,t} = \gamma_0 + \gamma_1 GOVH_{i,t} + \varepsilon_i \tag{5.4d}$$

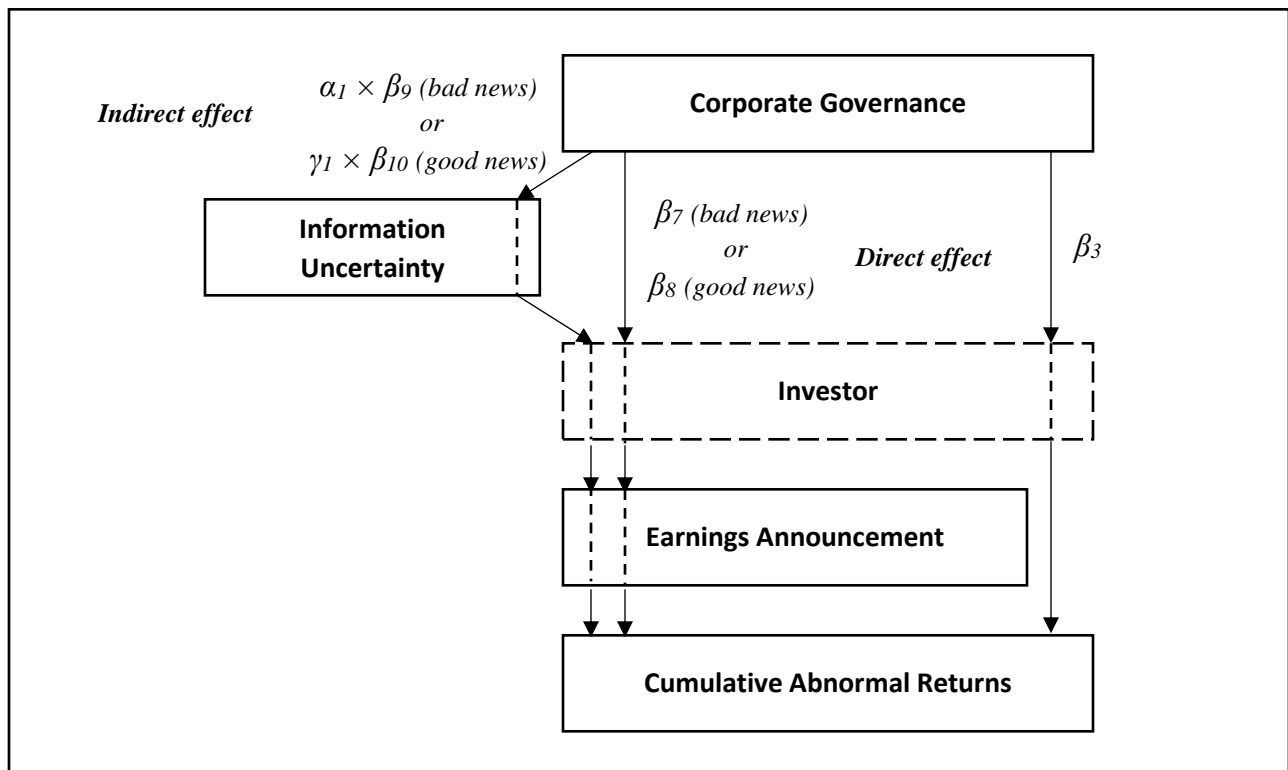
where all variables were explained earlier. We also re-run *Models 5.4a-5.4d* with the cumulative abnormal returns for the post-announcement period (T+2 to T+60) as the dependent variable and the post-announcement measures of sentiment and uncertainty (*PSMIP* and  $\Delta VIXH$ ) instead of *SMIP* and *VIXH* (similar to Model 5.3 but with the addition of the information uncertainty measures). The SEM routine assumes that governance influences the response to earnings announcements (the dependent variable) both directly (what we have seen so far) and indirectly through its impact on information uncertainty. The indirect impact included in the SEM routine represents governance's influence on the market response to earnings announcements through its influence on information uncertainty.<sup>49</sup>  $\beta_3$  represents the direct effect of governance on share price while  $\beta_7$  and  $\beta_8$  represent the direct effect of governance through the reaction to the earnings surprise. The indirect effect of governance as illustrated in *Figure 5.1* is represented by  $\alpha_1 \times \beta_9$  and  $\gamma_1 \times \beta_{10}$  for bad and good earnings surprises, respectively. If our proposition is valid, then we expect  $\beta_9$  and  $\beta_{10}$  to be significant with negative signs, indicating that firms with higher information uncertainty tend to have more muted initial reactions to surprises in the earnings announcement. Based on our earlier observations, we also expect  $\beta_7$  and  $\beta_8$  to be significant with positive signs,

<sup>49</sup> For instance, the term  $GOVH_{i,t} \times NUE_{i,t}$  has a direct impact (reported as part of the main regression) and an indirect impact through  $IFUH_{i,t} \times NUE_{i,t}$  which is reported in the indirect impact section.

indicating a higher initial reaction to announcements in better-governed firms. Additionally, we expect the indirect effect of governance ( $\alpha_1 \times \beta_9$  and  $\gamma_1 \times \beta_{10}$ ) to be significant and to represent a significant portion of the total effect (direct and indirect), thereby confirming the role of governance in improving reactions to earnings announcements through reducing information uncertainty.

**Figure 5.1: An illustration of the structural equation modelling routine performed to analyse the relationship between corporate governance, information uncertainty and reaction to earnings announcements**

- The solid line arrows represent the direction of the relationship
- The focus of this graph is to illustrate the relationship between corporate governance and changes in share price (i.e. CAR). All other variables in Model 5.4a are omitted from the illustration.



## 5.6. Results and discussion

### 5.6.1. Descriptive statistics

Table 5.2 provides descriptive statistics for the final sample based on subsamples using the different governance, sentiment and uncertainty indicators. The results suggest that the magnitude of positive earnings surprises (PUE) is higher than that of negative surprises (NUE), regardless of the subsample used. Further, it suggests that firms with relatively weaker governance (GOVH=0)

have significantly larger negative earnings surprises (NUE) than firms with stronger governance (GOVH=1). Also, we find that larger negative earnings surprise is experienced by firms reporting during periods of high market uncertainty and/or during periods when market uncertainty is increasing. We find that the magnitude of the positive earnings surprise (PUE) is unaffected by corporate governance, market uncertainty and market sentiment.

**Table 5.2: Summary statistics**

Panels A and B present the mean and median differences in our measures of positive (PUE) and negative (NUE) earnings announcements and control variables based on the corporate governance index and the different volatility and sentiments groups, respectively.  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise.  $GOVH_{i,t}$  is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise.  $SMIP_{i,t}$  is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five days prior to the announcement is positive or 0 otherwise.  $VIXH_{i,t}$  is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise.  $PSMIP_{i,t}$  is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while  $\Delta VIXH_{i,t}$  is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over post-announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in *Appendix III*. The test for the equality of means uses Welch's t-test. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

<b>Panel A: NUE and PUE Mean and Standard Deviation based on the Corporate Governance index</b>					
	High Governance Score (GOVH=1)		Low Governance Score (GOVH=0)		Difference (High minus Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.560	1.332	-0.757	1.283	0.197***
PUE	0.827	1.935	0.779	1.726	0.048
<b>Panel B: NUE and PUE Mean and Standard Deviation based on the different uncertainty and sentiment groups</b>					
	High Uncertainty (VIXH=1)		Low Uncertainty (VIXH=0)		Difference (High minus Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.678	1.439	-0.605	1.064	-0.073**
PUE	0.828	1.443	0.785	1.110	0.043
	Increasing Uncertainty ( $\Delta VIXH=1$ )		Decreasing Uncertainty ( $\Delta VIXH=0$ )		Difference (High minus Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.701	0.925	-0.580	1.405	-0.121***
PUE	0.807	1.622	0.808	1.907	-0.001
	Positive Sentiment (SMIP=1)		Negative Sentiment (SMIP=0)		Difference (Pos. minus Neg.)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.656	1.044	-0.624	1.406	-0.032
PUE	0.792	1.184	0.824	1.392	-0.032

	Positive Post Ann. Sent. (PSMIP=1)		Negative Post Ann. Sent. (PSMIP=0)		Difference (Pos. minus Neg.)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.653	1.062	-0.629	1.429	-0.248
PUE	0.814	1.172	0.800	1.392	0.014

### 5.6.2. Earnings surprises and PEAD

Table 5.3 provides the results of applying Models 5.1a and 5.1b to our sample in order to highlight the nature of the response of the market to an earnings surprise, both at the time of the announcement and during the post-announcement period. The coefficients of NUE and PUE are positive and significant in both regressions, indicating an initial reaction to the announcement followed by a further reaction in the post-announcement period (i.e. PEAD). In the first regression, the coefficient of PUE (+0.0045) is slightly larger than that of NUE (+0.0039), suggesting a stronger initial reaction by investors to each unit of positive surprise than to each unit of negative surprise. In the second regression, the sign and significance of the coefficients attached to NUE (+0.0047) and PUE (+0.0034) confirm the existence of a post-announcement drift for both positive and negative surprise. We can also see that the coefficient for negative surprises is now significantly higher than that for positive surprises, which suggests the smaller initial reaction to a to each unit of bad earnings news is followed by a larger PEAD.

Our findings for the control variables are somewhat as expected. The sign on size is negative and significant over each of the two periods, indicating that smaller stocks outperform the rest of the market. In contrast, the sign on book-to-market is negative and significant, indicating that the response for growth stocks is larger than that for value stocks. The positive sign of the variable measuring the number of forecasts (FORC) indicates a positive association with cumulative abnormal returns, which suggests that such stocks are more heavily promoted at the time of the earnings release. Lastly, the variable for the length of time has the expected negative sign but it is insignificant.

**Table 5.3: Multivariate regressions of the cumulative abnormal returns for the announcement and post-announcement periods on the standardised unexpected earnings**

This table presents the results of running ordinary least squares regressions using Models 5.1a and 5.1b. The dependent variable,  $CAR_{i,b}$ , is the cumulative abnormal return calculated for the period specified in the brackets.  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. All variables

are defined in *Appendix III*. The t-Statistics are reported in parentheses. The standard errors are clustered across firm and time. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	(1) CAR (0,1)	(2) CAR (2,60)
Intercept	0.0083** (1.990)	0.0019 (0.220)
NUE	0.0039*** (23.240)	0.0047*** (9.560)
PUE	0.0045*** (30.980)	0.0034*** (15.340)
SIZE	-0.0021*** (-5.160)	-0.0015* (-1.700)
BTMV	0.0048*** (4.790)	0.0075*** (3.520)
RLAG	-0.0000 (-0.120)	-0.0000 (-0.080)
FORC	0.0002*** (2.860)	0.0004*** (2.700)
<b>Test of difference</b>	NUE < PUE**	NUE > PUE***
<b>No. of observations</b>	21,692	21,692
<b>Year/Industry dummies</b>	YES	YES

### 5.6.3. Governance, uncertainty, sentiment and earnings announcements

In *Table 5.4* we report the findings relating to our first two research questions concerning the impact of corporate governance on the market response to earnings announcement both at the time of the announcement and during the post-announcement period.

#### 5.6.3.1. At the time of the announcement

We apply Model 5.2 to our sample to address the initial impact of corporate governance and report our findings in the first column of *Table 5.4*. The critical coefficients on which to focus are  $\beta_6$  and  $\beta_7$  which measure the difference between the impact of a quantum of unexpected earnings news on the valuation of a firm with high corporate governance as compared with one with low corporate governance. For both negative earnings surprises and positive earnings surprises, these coefficients are positive and significant (0.0075\*\*\* for NUE and 0.0082\*\*\* for PUE), indicating that an earnings surprise has a much larger impact on the valuation of a firm if that firm enjoys a high level of corporate governance. From this we can conclude that the level of corporate governance influences how investors react to earnings information flowing from a firm. The fact that stronger corporate governance results in a larger reaction suggests that the investors might give more

credibility to information being released by firms with high levels of corporate governance, which is a proposition that we will consider in more detail in the next section. It is also worth noting that the coefficient measuring the direct relationship between corporate governance and firm valuation ( $\beta_3$ ) is also significant and positive, confirming the findings of previous studies that firms with strong corporate governance are more highly valued by the market.

Our findings for both uncertainty and sentiment are consistent with the findings of other papers, with the market response to good earnings news being greatest when uncertainty is low and sentiment is high, while the response to bad earnings news is greatest when uncertainty is high and sentiment is low (Bird and Yeung, 2012; Bird et al., 2014). We find that greater uncertainty causes investors to take a more pessimistic view when confronted with new information, causing them to react more to bad news and less to good news. Investor sentiment has the opposite effect of causing investors to take a more optimistic stance when analysing new information, resulting in them reacting more to good news and less to bad news. Hence it is obvious that governance works in a different way to both uncertainty and sentiment in its effect on investor response to new information, as a higher level of governance causes investors to respond more to both good and bad earnings news. We would propose this difference reflects that corporate governance works through a different path to both uncertainty and sentiment in terms of influencing how investors respond to information signals. Both uncertainty and sentiment work more on the state of mind of the investors, and impact on the expectations that investors' form based on their analysis of the information. In contrast, governance impacts on the credibility that investors attribute to the information, causing them to be less conservative when adjusting their expectations in response to new information. Another observation that we would make is that corporate governance has a much larger impact on how investors initially react to earnings announcements than either uncertainty or sentiment. We see that for each quantum of good or bad news, the share price of firms with above-median governance increases by about 0.8% more than the share price of firms with below-median governance. In contrast, both uncertainty and sentiment have a much smaller impact on investor response, which is very minimal in the case of sentiment. In summary, corporate governance has been shown to have a greater influence on the initial reaction to earnings

announcements than either uncertainty and sentiment, and it appears to work through a different channel.

#### **5.6.3.2. During the post-announcement period**

We apply Model 5.3 to our sample to address the impact of corporate governance over the post-announcement period and report our findings in the second column of *Table 5.4*. Undoubtedly, our major finding is that the extent of a firm's corporate governance does not play a role in explaining the drift that typically occurs during the post-announcement period (i.e. the PEAD). In contrast, the change in the level of uncertainty plays a major role in explaining PEAD, which is several times the magnitude of the influence that uncertainty contributed to price movement at the time of the announcement. We also find that the prevailing sentiment over the post-announcement period also influences the magnitude of PEAD but only in the instance of a reaction to a negative earnings surprise, as sentiment is not found to influence the magnitude of the PEAD in the case of a positive earnings surprise. It is interesting to observe that this is in line with the influence of sentiment on the initial reaction to the earnings news, which was much greater for bad news than it was for good news.

The question that this raises is: Why does the level of governance play such an important role in explaining the initial market reaction to an earnings announcement, but no role in explaining any drift in the post-announcement period? The answer, we suggest, lies in the proposition that corporate governance influences the share price response through the impact that it has on investors' perceptions of the credibility of the information being provided. Hence, the greater the credibility, the greater the initial response to the earnings announcement. The question then becomes; What would cause investors to reassess their initial response to the earnings announcement? The answer that we would put forward is that any perceived change in the credibility of the information would require investors to go back and reassess their initial response to the announcement, but supposedly this would require a non-trivial change in the firm's governance characteristics. Since corporate governance changes very little over time, there is no reason to believe that it would play a role in explaining PEAD. Our findings would suggest that PEAD is at least partially driven by changes in some of the factors that influenced the initial response to the earnings release. We have seen that changes in uncertainty over the announcement period, and the sentiment prevailing during this period, are both important factors that cause

investors to reassess their initial responses to an earnings announcement, and thus both impact on the magnitude and direction of PEAD.

**Table 5.4: Multivariate regressions of the cumulative abnormal returns for the announcement and post-announcement periods on the standardised unexpected earnings and governance, uncertainty, and sentiment dummies**

This table presents the results of running ordinary least squares regressions using Models 5.2 and 5.3. Refer to the text for a full explanation of the models. The dependent variable,  $CAR_{i,t}$ , is the cumulative abnormal return calculated for the period specified in the brackets.  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise.  $GOVH_{i,t}$  is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise.  $SMIP_{i,t}$  is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five days prior to the announcement is positive or 0 otherwise.  $VIXH_{i,t}$  is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise.  $PSMIP_{i,t}$  is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while  $\Delta VIXH_{i,t}$  is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over the post-announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in *Appendix III*. The t-Statistics are reported in parentheses. The standard errors are clustered across firm and time. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	<b>Model 5.2</b>	<b>Model 5.3</b>
	<b>(1)</b>	<b>(2)</b>
	<b>CAR (0,1)</b>	<b>CAR (2,60)</b>
Intercept	0.0086** (1.970)	-0.0007 (-0.080)
NUE	0.0049*** (12.060)	0.0036*** (4.70)
PUE	0.0035*** (9.230)	0.0056*** (6.370)
GOVH	0.0023** (2.250)	0.0004* (1.910)
SMIP	0.0000 (0.680)	
VIXH	0.0000 (0.700)	
PSMIP		0.0093*** (3.010)
$\Delta VIXH$		-0.0004 (-0.150)
GOVH×NUE	0.0075*** (2.890)	0.0000 (0.710)
GOVH×PUE	0.0082*** (5.850)	0.0000 (0.830)
SMIP×NUE	-0.0024*** (-6.300)	
SMIP×PUE	0.0006** (2.470)	

VIXH×NUE	0.0005*	
	(1.700)	
VIXH×PUE	-0.0003*	
	(-1.910)	
PSMIP×NUE		-0.0026***
		(-3.190)
PSMIP×PUE		0.0000
		(0.030)
ΔVIXH×NUE		0.0039***
		(4.090)
ΔVIXH×PUE		-0.0028***
		(-3.800)
SIZE	-0.0021***	-0.0012*
	(-5.040)	(-1.810)
BTMV	0.0048***	0.0068***
	(4.760)	(3.190)
RLAG	-0.0000	-0.0000
	(-0.050)	(-0.050)
FORC	0.0002***	0.0005***
	(2.620)	(2.970)
<b>No. of observations</b>	21,692	21,692
<b>Year/Industry dummies</b>	YES	YES

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#### 5.6.4. Information uncertainty (IU) as a potential explanation for the role of governance

We suggested that an important reason for corporate governance influencing the market response to information is because of the impact it has on the credibility of the information being provided. The third research question relates to identifying the major channel through which corporate governance works to influence how investors react to earnings announcements. We propose that a major way by which governance works is by reducing information uncertainty and so contributing to the credibility of the information being provided. We investigate this in two steps: first we establish the link between corporate governance and information uncertainty and then we investigate the extent to which the relationship between corporate governance and the market response to earnings announcements is explained by the information uncertainty channel.

##### 5.6.4.1. Corporate governance and information uncertainty

We rank our firms based on their corporate governance score and then divide the sample into quintiles, giving us five sub-samples ranking from those with the lowest corporate governance to those with the highest level of corporate governance. In *Table 5.5* we report the median value for each of our proxies for information uncertainty for each of the five sub-samples. Our findings

clearly indicate a monotonic relationship, with information uncertainty decreasing as we proceed from the lowest governance quintile to the highest governance quintile. We see that for each of the three proxies, there is a very significant difference between the median values for each proxy for the lowest and highest governance quintiles. The conclusion that we draw is that there is a link between the level of corporate governance practised within a firm and the level of uncertainty associated with information flowing from the firm.

**Table 5.5: Median information uncertainty (IU) measures values based on the governance index scores**

This table presents the median values of the different proxies of IU (defined in *Table 5.1*) for each quintile of corporate governance scores. The five quintiles are based on the scores of the governance index, with the highest quintile (Quintile 5) having the observations with the highest governance scores (i.e. strongest governance framework). The different IU proxies were constructed so that higher values indicate higher IU. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

<b>Quintile based on the Governance Index</b>	<b>VOLT</b>	<b>VOLM</b>	<b>FCDP</b>
Quintile 1 ( <i>weakest governance</i> )	0.0215	-0.0006	0.0519
Quintile 2	0.0212	-0.0011	0.0476
Quintile 3	0.0201	-0.0014	0.0458
Quintile 4	0.0196	-0.0024	0.0417
Quintile 5 ( <i>strongest governance</i> )	0.0188	-0.0061	0.0385
<b>Q5 (strongest) versus Q1 (weakest)</b>	Q5 < Q1***	Q5 < Q1***	Q5 < Q1***
<b>No. of observations</b>	21,692	21,692	21,692

#### 5.6.4.2. Information uncertainty and earnings response

The results from applying Models 5.4a-5.4d using structural equation modelling (see *Figure 5.1*) to our sample are to be found in Table 5.6. We only report the coefficient for the variables of interest, corporate governance (GOV) and information uncertainty (IFU) as those for the other variables remain unchanged to those reported in *Table 5.4*. The findings confirm our previous finding that when we use each of the three proxies for information uncertainty, corporate governance increases the impact that both bad and good earnings news have on corporate valuations during the announcement period (i.e. the coefficients attached to both GOVH×NUE and GOVH×PUE in columns 1 to 3 are all positive and significant). Also consistent with our previous finding, the impact of corporate governance on the market's response to earnings news quickly fades away and it is found to play no part in explaining PEAD (i.e. the coefficients attached

to both GOVH×NUE and GOVH×PUE in columns 4 to 6 are insignificant). We previously proposed that the heightened initial response reflected that the credibility of the earnings announcements increased with the level of corporate governance, but that the influence of corporate governance wanes after the announcement, as this variable remains constant over the post-announcement period.

The coefficients reported for information uncertainty are negative and significant for all proxies during both the announcement period and the post-announcement period, reflecting that high information uncertainty dampens the market response to both good and bad earnings news (i.e. the coefficients attached to both IFUH×NUE and IFUH×PUE in columns 1 to 6 are all negative and significant) not only during the announcement period but also during the post-announcement period. This is consistent with our previous interpretation that information uncertainty is always a drag on corporate valuations because it reduces investors' belief in the information and so the extent to which they are willing to build the full impact of the information into their expectations. The findings have strong implications for asset pricing and the efficiency of the market, and they are at variance with those of Zhang (2006) who finds that information uncertainty decreased the investors' initial response to earnings news but increased the contribution made to PEAD. His explanation is that somehow the information uncertainty is resolved in the minds of the investors during the post-announcement period and so the drift reflects their recognition of the mistake that they made when initially responding to the announcement. We would first question the evidence on which he bases his claims, as in measuring the impact that information uncertainty has on investor response, he fails to control for any of the variables that demonstrably impact on that response (e.g. market uncertainty, investor sentiment and others). The other comment that we would make is to question just why information uncertainty would be significantly resolved in the mind of investors in the intervening period before the next quarterly earnings announcement but then again be the cause of an under-reaction to the next earnings announcement.

*Table 5.6* also offers an interesting insight into how investors react to differing sources of uncertainty. Consistent with Williams (2015) and Bird and Yeung (2012), the presence of market uncertainty induces an asymmetric response to the initial earnings announcement that can be regarded as investors following a minmax utility maximisation in their reaction to uncertainty. The findings in *Table 5.6* also confirm that high sentiment also induces an asymmetric response

but in the opposite direction to that of market uncertainty. Yet in the presence of information uncertainty at the firm level, investors appear to systematically under-react to news both at the time of announcement and over the PEAD period. The asymmetric response to market uncertainty is consistent with uncertainty aversion where investors take a more sceptical view of information. In contrast, information uncertainty causes investors to attach less credibility to information and so they under-react to both good and bad news.

The final important result reported in *Table 5.6* relates to the indirect channel through which corporate governance reduces information uncertainty, which in turn impacts on the responses of investors at the time of, and subsequent to, the earnings release. We see that this indirect channel explains the majority of the association between corporate governance and the market reaction to the information signal over the announcement window, which is consistent with the explanation that corporate governance increases the credibility of the information. However, over the post-announcement period, the indirect channel has no impact on the market response, reflecting that it plays no role in explaining PEAD. This finding is totally consistent with our previous finding that the level of corporate governance does not influence PEAD, as during this period there is no variation in corporate governance that would cause investors to reassess their initial reactions to the earnings release. Overall, our findings confirm that information uncertainty is an important indirect channel through which corporate governance influences the market response to information.

Finally, to comment on the other variables reported in *Table 5.6*, the coefficients for NUE and PUE are both positive and significant, reflecting in this case a positive response both at the time of the announcement and over the post-announcement period (i.e. PEAD does exist) in this case for companies with low corporate governance and information uncertainty releasing earnings news at a time of low market uncertainty and investor sentiment. The positive and significant coefficient attached to high corporate governance (GOVH) is consistent with corporate governance having an impact on corporate valuations independent of any reaction to earnings announcement. Similarly, the significant negative coefficient attached to high information uncertainty (IFUH) confirms that information uncertainty has a negative impact on corporate valuation, again independently of any impact that it might have on the market response to the release of earnings announcements. Lastly,

the significant and negative coefficients attached to corporate governance in Models 5.4b, 5.4c and 5.4d are all indicative of the impact that it has on reducing information uncertainty.

**Table 5.6: Multivariate regressions of cumulative abnormal returns for the announcement and post-announcement periods on the standardised unexpected earnings and information uncertainty (IU) measure**

This table presents the results of several multivariate regressions (Models 5.4a-5.4d) using the cumulative abnormal returns (CAR) as the dependent variable and the structural equation modelling routine described in *Figure 5.1*. For the sake of brevity, the table presents the results for the variables related to governance and information uncertainty only, as they are the focus of this analysis. For the announcement period,  $CAR_{i,t}$  is the cumulative abnormal return calculated for the day of the announcement (T+0) and the following day (T+1), while for the post-announcement period the cumulative abnormal return is calculated for the post-announcement period (T+2 to T+60).  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise.  $GOVH_{i,t}$  is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise.  $IFUH_{i,t}$  takes the value 1 if the value of the IU measure (defined in *Table 5.1*) for the announcement year is above the median value for all other observations or 0 otherwise. The IU measures are constructed so that higher values indicate higher IU. All variables are defined in *Appendix III*. The Likelihood Ratio Test (chi-square test value reported) compares the model's fit to the saturated model. The standard errors are clustered across firm and time. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The total effect is the sum of coefficients of the direct effect (e.g.  $\beta_7$  or  $\beta_8$ ) and the indirect effect (e.g.  $\alpha_1 \times \beta_9$  or  $\gamma_1 \times \beta_{10}$ ) for each type of announcement (bad or good).

IU measure (IFUH)	Announcement Period			Post-announcement Period		
	VOLT	VOLM	FCDP	VOLT	VOLM	FCDP
Dependent Variable	(1) CAR (0,1)	(2) CAR (0,1)	(3) CAR (0,1)	(4) CAR (2,60)	(5) CAR (2,60)	(6) CAR (2,60)
<b>Direct Effect</b>						
<b>Model 5.4a</b>						
NUE ( $\beta_1$ )	0.0039*** (21.790)	0.0037*** (23.230)	0.0036*** (20.260)	0.0033*** (9.600)	0.0035*** (10.390)	0.0035*** (9.230)
PUE ( $\beta_2$ )	0.0035*** (19.940)	0.0034*** (21.290)	0.0033*** (18.520)	0.0037*** (10.600)	0.0038*** (11.360)	0.0038*** (10.190)
GOVH ( $\beta_3$ )	0.0022** (2.090)	0.0023** (2.430)	0.0023* (1.770)	0.0009** (2.270)	0.0009*** (2.610)	0.0008** (2.200)
IFUH ( $\beta_4$ )	-0.0006*** (-2.610)	-0.0006* (-1.870)	-0.0019** (-2.050)	-0.0014* (-1.770)	-0.0015*** (-3.520)	-0.0026** (-2.340)
GOVH×NUE ( $\beta_7$ )	0.0017*** (7.470)	0.0018*** (6.570)	0.0019*** (5.240)	0.0000 (1.160)	0.0000 (1.370)	0.0000 (1.140)
GOVH×PUE ( $\beta_8$ )	0.0021*** (6.840)	0.0022*** (6.030)	0.0018*** (4.720)	0.0000 (1.130)	0.0000 (1.530)	0.0000 (1.270)

IFUH×NUE ( $\beta_9$ )	-0.0025*** (-13.940)	-0.0023*** (-11.210)	-0.0014*** (-6.750)	-0.0016*** (-3.810)	-0.0022*** (-5.150)	-0.0016*** (-3.650)
IFUH×PUE ( $\beta_{10}$ )	-0.0022*** (-12.760)	-0.0020*** (-9.790)	-0.0012*** (-5.900)	-0.0018*** (-4.130)	-0.0024*** (-5.590)	-0.0017*** (-3.960)
<b>Model 5.4b</b>						
GOVH ( $\mu_1$ )	-4.0000*** (2.540)	-3.6667*** (2.940)	-1.4211*** (2.880)	-0.8571*** (2.260)	-0.4667*** (2.150)	-0.3462*** (2.770)
<b>Model 5.4c</b>						
GOVH ( $\alpha_1$ )	-1.2800*** (7.810)	-1.1739*** (7.920)	-1.8571*** (6.200)	0.0000 (0.940)	0.0000 (1.100)	0.0000 (1.670)
<b>Model 5.4d</b>						
GOVH ( $\gamma_1$ )	-1.3636*** (6.200)	-1.7000*** (6.150)	-2.4167*** (4.970)	0.0000 (0.480)	0.0000 (0.620)	0.0000 (0.690)
<b><u>Indirect Effect (GOVH through IFUH)</u></b>						
<b>Negative announcements (NUE)</b> ( $\alpha_1 \times \beta_9$ )	0.0032*** (7.360)	0.0027*** (7.720)	0.0026*** (5.890)	0.0000 (0.720)	0.0000 (0.960)	0.0000 (1.660)
<b>Positive announcements (PUE)</b> ( $\gamma_1 \times \beta_{10}$ )	0.0030*** (6.730)	0.0034*** (6.040)	0.0029*** (4.800)	0.0000 (0.410)	0.0000 (0.560)	0.0000 (0.630)
<b><u>Indirect proportion of total effect (%)</u></b>						
<b>Negative announcements (NUE)</b> ( $\alpha_1 \times \beta_9$ ) / [( $\alpha_1 \times \beta_9$ ) + $\beta_7$ ]	65%	60%	58%	3%	4%	3%
<b>Positive announcements (PUE)</b> ( $\gamma_1 \times \beta_{10}$ ) / [( $\gamma_1 \times \beta_{10}$ ) + $\beta_8$ ]	59%	61%	62%	1%	2%	5%
<b>Likelihood Ratio Test (Goodness of Fit)</b>	2.05	1.89	1.66	1.98	1.93	2.03
<b>Control/Sentiment/Uncertainty Variables</b>	YES	YES	YES	YES	YES	YES
<b>Year/Industry dummies</b>	YES	YES	YES	YES	YES	YES
<b>No. of observations</b>	21,692	21,692	21,692	21,692	21,692	21,692

### 5.6.5. Robustness Tests

In order to test the robustness of our results to our choice of the different measures, we repeat our main analysis using alternative measures as follows:

- **Governance quality:** we use the first principal component score (explains 73% of the variation) from a principal component analysis that includes the various governance attributes and related thresholds outlined in *Appendix IV* to provide us with an alternative set of weights to calculate our governance score.<sup>50</sup> This allows us to produce the governance score by allocating different weights to the various governance attributes rather than by using similar weights for all attributes, as done so far. We define our alternative governance measure as the first principal component (and its related loadings) of the correlation matrix of the 29 governance attributes discussed earlier. The coefficients are re-scaled so that the index has unit variance.
- **Uncertainty:** instead of VIX which we have used up to this point in our main regressions, we use the detrended stock turnover level used in Connolly et al. (2005) as an alternative measure of uncertainty. Prior research supports the use of stock turnover to measure uncertainty as it reflects dispersion in beliefs among market participants and/or the changes in the investment opportunity set, both of which are linked to uncertainty (Connolly et al., 2005). We measure turnover as the average daily scaled turnover (shares traded divided by shares outstanding) of the firms with the largest market capitalisation (Top 10%). As highlighted in Connolly et al. (2005), this approach helps approximate the overall market conditions while avoiding any noise from uninformative trading of small stocks. Next, we detrend our turnover measure using a five-day moving average, which allows us to reduce noise and avoid the day-of-the-week effect (Connolly et al., 2005).<sup>51</sup>
- **Sentiment:** we use the six-factor sentiment index introduced in Baker and Wurgler (2006) as an alternative measure to index returns which we have used up to this point to measure market

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<sup>50</sup> We specify the individual measures so that a higher score means better governance.

<sup>51</sup> We use the detrended stock turnover instead of other measures used in the literature such as the quarterly Economic Forecaster Disagreement measure and the monthly Economic Policy Uncertainty measure due to the higher frequency of the first measure. This allows us to better capture intra-month and/or intra-quarter changes in uncertainty conditions.

sentiment.<sup>52</sup> Baker and Wurgler build a monthly sentiment index based on the first principal component of six different sentiment proxies.<sup>53</sup>

*Table 5.7* shows the results derived by applying the same analysis as that used when preparing *Table 5.4* but using these alternative measures for each of governance, uncertainty and sentiment.<sup>54</sup> We find that our main findings generally hold even after using an alternative set of measures for the major variables. Namely, we find that governance significantly increases investors' reactions to earnings announcements and that it plays a more important role than uncertainty or sentiment during the announcement period. We also find that this role becomes insignificant during the post-announcement period in favour of the prevailing uncertainty and sentiment conditions.

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<sup>52</sup> There are a few alternative measures to measure market sentiment such as the put-call ratio or the bull-bear ratio. However, it can be argued that while only available on a monthly-basis, the sentiment index published by Baker and Wurgler provides a more comprehensive reflection of market sentiment.

<sup>53</sup> The six sentiment measures are: trading volume; dividend premium; closed-end fund discount; number of IPOs; average first day IPO returns; equity share in new issues. The authors update their calculations of the index on frequent basis and publish their calculations online (<http://people.stern.nyu.edu/jwurgler/>).

<sup>54</sup> While we only report the results where all alternative variables are used at once, the results where each alternative variable is added separately gives similar conclusions.

**Table 5.7: Robustness tests: Testing the sensitivity of our results to alternatives measures of governance, uncertainty and sentiment**

This table presents the results of running ordinary least squares regressions using Models 5.2 and 5.3 and the alternative measures. Refer to the text for a full explanation of the models. The dependent variable,  $CAR_{i,t}$ , is the cumulative abnormal return calculated for the period specified in the brackets.  $NUE_{i,t}$  ( $PUE_{i,t}$ ) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise.  $GOVHA_{i,t}$  is a dummy variable which takes the value 1 if the first principal component score for the announcement year is above the median value for all other observations or 0 otherwise.  $SMIPA_{i,t}$  is a dummy variable which takes the value 1 if the value of the six-factor Sentiment Index for the particular month is above the median value for all observations or 0 otherwise.  $VIXHA_{i,t}$  is a dummy variable which takes the value 1 if the detrended stock turnover level (uncertainty measure) value one day prior to the announcement is above the median value for all observations or 0 otherwise.  $PSMIPA_{i,t}$  is a dummy variable which takes the value 1 if the value of the six-factor Sentiment Index increases over the announcement period (Month 1 to Month 3), while  $\Delta VIXHA_{i,t}$  is a dummy variable that measures change in detrended stock turnover level over the studied period and takes the value 1 if the value increases over the post-announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in *Appendix III*. The standard errors are clustered across firm and time. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	<b>Model 5.2</b>	<b>Model 5.3</b>
	<b>(1)</b>	<b>(2)</b>
	<b>CAR (0,1)</b>	<b>CAR (2,60)</b>
Intercept	0.0074* (1.660)	0.0006 (0.070)
NUE	0.0026*** (10.530)	0.0017*** (3.780)
PUE	0.0043*** (16.580)	0.0046*** (8.990)
GOVHA	0.0016 (1.430)	0.0003 (1.480)
SMIPA	0.0012 (0.740)	
VIXHA	0.0009 (0.860)	
PSMIPA		0.0057 (1.640)
$\Delta VIXHA$		-0.0071*** (-2.770)
GOVHA×NUE	0.0066*** (5.520)	0.0001 (0.790)
GOVHA×PUE	0.0057*** (4.160)	0.0001 (1.070)
SMIPA×NUE	-0.0012*** (-3.040)	
SMIPA×PUE	0.0006* (1.910)	
VIXHA×NUE	0.0012*** (3.480)	
VIXHA×PUE	-0.0011*** (-3.800)	
PSMIPA×NUE		-0.0010** (-1.970)

PSMIPA×PUE		0.0012*
		(1.870)
ΔVIXHA×NUE		0.0045***
		(4.540)
ΔVIXHA×PUE		-0.0021***
		(-3.470)
SIZE	-0.0021***	-0.0014*
	(-5.030)	(-1.920)
BTMV	0.0049***	0.0072***
	(4.830)	(3.350)
RLAG	-0.0000	-0.0000
	(-0.160)	(-0.120)
FORC	0.0002***	0.0005***
	(2.630)	(2.990)
<b>No. of observations</b>	21,692	21,692
<b>Year/Industry dummies</b>	YES	YES

### 5.6.6. Endogeneity problem

Renders et al. (2010) note several issues such as the observance of insignificant or incorrect results when econometric issues such as endogeneity are not properly controlled for in similar studies. Following Wintoki et al. (2012) and others, we use the dynamic-panel Generalized Methods of Moments (GMM) estimator introduced by Arellano and Bover (1995) and Blundell and Bond (1998) and follow a three steps estimation process. First of all, the regression models (models 5.2 and 5.3) are modified to include the first lag of the dependent variable as an independent variable. Second, we take the first difference of the variables to account for any unobserved heterogeneity. Lastly, we use the dynamic panel GMM estimator to estimate the final model while using the lagged values of the explanatory variables as instruments for the current values of the same variables to account for possible simultaneity and reverse causality. This setup allows us to treat all explanatory variables as endogenous variables while adding the year and industry dummy variables as the only exogenous variables.

We report the results of our analysis in *Table 5.8*. Albeit less significant, the results from re-estimating both models for the initial and subsequent reactions to earnings announcements suggest similar conclusions as seen earlier, even after controlling for unobserved heterogeneity, possible simultaneity, and reverse causality (Wintoki et al., 2012). During the announcement period (column 1), stronger corporate governance continues to be significantly associated with a higher response to a surprise in announced earnings as confirmed by the significant and positive

coefficients (0.0058\*\* for NUE and 0.0064\*\* for PUE). However, as seen before, this effect disappears during the post-announcement period (column 2) with coefficients being insignificant and close to zero. In both periods, our findings for both uncertainty and sentiment are consistent with our earlier observations with the market response to good earnings news being greatest when uncertainty is low and sentiment is high, while the response to bad earnings news is greatest when uncertainty is high and sentiment is low. Further, using the Hansen test of over-identification, we fail to reject the null hypothesis that the instruments employed in our models are valid confirming the validity of our results.

**Table 5.8: Robustness test: Test for endogeneity using Dynamic Panel GMM models**

This table presents the results of re-estimating models 5.2 and 5.3 using Dynamic Panel GMM. All variables are defined in *Appendix III*. Details of the Dynamic Panel GMM procedure can be found in the text. The results of the control variables have been omitted as they remain similar to those reported earlier. Arellano-Bond test is a test for first and second-order autocorrelation in the first-differenced errors with the null hypothesis of zero autocorrelation (*p-value* is reported). Hansen test of over-identification tests the null hypothesis that all instruments are valid (*p-value* is reported). The t-statistics are reported in the parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level.

	(1) CAR (0,1)	(2) CAR (2,60)
Intercept	0.0005 (0.790)	0.0007 (1.250)
Lagged dependent variable (One Lag)	0.3667*** (7.790)	0.2604*** (8.230)
NUE	0.0032*** (6.060)	0.0028*** (3.470)
PUE	0.0024*** (7.780)	0.0041*** (5.930)
GOVH	0.0023** (2.440)	0.0004** (2.270)
SMIP	0.0000 (0.860)	
VIXH	0.0000 (1.250)	
PSMIP		0.0079** (2.310)
$\Delta$ VIXH		-0.0006 (-0.370)
GOVH×NUE	0.0058** (1.990)	0.0000 (1.310)
GOVH×PUE	0.0064** (2.170)	0.0000 (0.590)
SMIP×NUE	-0.0019*** (-5.820)	
SMIP×PUE	0.0007*** (3.140)	

VIXH×NUE	0.0006** (2.260)	
VIXH×PUE	-0.0004* (-1.780)	
PSMIP×NUE		-0.0013* (-1.900)
PSMIP×PUE		0.0002* (1.750)
ΔVIXH×NUE		0.0044*** (2.200)
ΔVIXH×PUE		-0.0021* (-1.820)
Arellano-Bond first order test	0.049	0.077
Arellano-Bond second order test	0.293	0.340
Hansen Test of over-identification	0.310	0.260
<b>No. of observations</b>	21,692	21,692
<b>Control variables (SIZE/BTMV/RLAG/FORC)</b>	YES	YES
<b>Year/Industry dummies</b>	YES	YES

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## 5.7. Conclusion

This study examines the role of the firm's corporate governance characteristics in influencing market participants' initial reactions to earnings announcements while controlling for both market sentiment and uncertainty. Our findings confirm the role of governance in significantly strengthening the initial reaction to earnings announcement with the response to a quantum of both good and bad earnings news being greater for firms with a high level of corporate governance. Our results are consistent with investors having more confidence in the quality of earnings announcements made by better-governed firms, which leads them to attribute more credibility to any surprise element in these announcements. Our results are consistent with the contention that better governed firms make more informative earnings announcements which reduces firm-specific uncertainty and leads investors to respond quicker to any surprise element in these announcements (Beekes et al., 2016; Beekes and Brown, 2006; Cai et al., 2006; Hass et al., 2014).

The study also investigates the role of governance during the post-earnings announcement period. Interestingly, our analysis highlights that corporate governance does not play a role in explaining PEAD, which is a phenomenon that is largely explained by changes in market uncertainty and prevailing market sentiment. A likely explanation for this finding is that investors only turn to reassessing their initial reaction to an earnings announcement when there is a change in the

environment that prevailed at the time of the announcement. Corporate governance changes very little over the post-announcement period, which contributes to our finding that corporate governance is not a stimulus for investors to reassess their initial reaction to the announcement. In contrast, both market uncertainty and sentiment do change over relatively small periods of time and so it is not surprising to find that they do contribute to PEAD.

Bernard and Thomas (1989, 1990), Francis et al. (2007) and Zhang (2006) all attribute the delayed response to earnings announcements to uncertainty about the quality of the information signals. We undertake further analysis which confirms that the major contributing factor to the observed relationship between better governance and a greater market response to earnings announcements is the role of governance in reducing information uncertainty and improving the firm's information environment (Byard et al., 2006; Hass et al., 2014). This suggests that there are two channels through which governance influences investors' reactions to information signals: One is directly through how investors perceive the firm's governance quality and its link to the firm's performance and valuation, and the other one is indirectly through how governance influences investors' perceptions of the quality of the information signal.

Finally, we find that market uncertainty and information uncertainty influence the decision-making processes of investors in different ways. Market uncertainty causes them to take a more pessimistic stance when evaluating information, which causes them to downplay good news but enhance their response to bad news. In contrast, information uncertainty causes them to attach less credibility to all news, which causes investors to moderate their responses to both good and bad news.

Overall, this study contributes to the stream of research focusing on studying and understanding the responses of market participants to different types of news and events under different market and firm-specific conditions. The study also adds to previous attempts to explain the persistence of PEAD and brings into question whether it is necessarily a process for moving prices back to a more efficient level. The insights from this study may help inform various trading and pricing decisions by investors in the market and contribute to a better understanding of investors' behaviour around earnings announcements. Since the focus of this study is on the overall governance quality of a firm, future research could focus on finding the specific governance attributes that contribute most to the observed relationship. Future research could also examine the

impact of using governance quality as an indicator to guide trading strategies targeted towards extracting value from PEAD.

**Chapter 6: Conclusion**

# **Chapter 6**

## **Conclusion**

## 6. Conclusion

The studies in this work address three distinct and important topics on the impact of corporate governance and provide several contributions to the literature. As noted earlier, corporate governance is the collection of mechanisms and tools by which a corporation is governed and through which the shareholders can attempt to protect their interests. In Chapter 2 we identify two main themes in the governance literature to which the studies in this work belong. The first and second studies belong to the first theme which examines the relationship between corporate governance mechanisms and firm performance and value through their role in alleviating agency costs and ensuring proper alignment between shareholders and managers. The second study also belongs to the second theme, along with the third study. The second theme looks at the role of corporate governance mechanisms in improving the quality and quantity of corporate disclosures and accounting numbers.

In the first study, we evaluate the role of by country-level factors in defining the characteristics of the corporate governance framework in a country. We also investigate whether firm-level corporate governance mechanisms act as substitutes or complements to these country-level factors, and give special attention to the role of financial development and firm-level financing needs in influencing the firm's governance framework. We find that a large part of the variation in firm-level governance across countries is explained by country-level factors. Our analysis also shows that country-level mechanisms act as moderators of the relationship between firm-level governance and firm performance or value. We also find a strong evidence to support the argument that firm-level and country-level governance are complementary (Aggarwal et al., 2010; Anderson and Gupta, 2009; Doidge et al., 2007).

Lastly, we find that stronger firm-level governance is associated with higher firm value for firms with high financing needs which operate in countries with highly developed financial sectors. This supports the argument that a firm's governance framework is highly dependent on the financial development status of the country in which it operates as well as its need for external financing. A high state of financial development and/or high financing needs will encourage firms to adopt more stringent governance frameworks to improve their access to domestic capital markets.

The first study is one of the most comprehensive attempts at explaining the relationship between country-level and firm-level factors with regards to corporate governance. It is also one of the few studies to consider the roles of media and other cultural factors (e.g. education) in influencing corporate governance practices across countries. The results of this study contribute to the global debate about the best governance practices and the role of country characteristics in determining the optimal set of internal mechanisms. The results also can help guide future decision-making processes with regards to improving corporate governance practices and increasing investor protection.

The second study assesses the improvement in the predictive power of bankruptcy prediction models due to the addition of corporate governance variables, while examining the differences in the classificatory powers of the different estimation techniques. We find that the classificatory power and predictive accuracy of the different bankruptcy prediction models improves significantly after adding the governance variables. We also find that the additional explanatory power provided by adding the governance measures increases the further we are from the event of bankruptcy. This implies that governance variables tend to provide earlier and more accurate warnings of the deterioration in the firm's financial health, which can be explained by the higher stickiness of a firm's corporate governance framework in comparison to accounting and market indicators.

Last but not least, our analysis shows that, regardless of the bankruptcy model used, non-parametric methods such as neural networks, data envelopment analysis and classification and regression trees appear to provide the best classification and out-of-sample forecast accuracy. Our analysis also shows that hazard analysis provides the best classification and out-of-sample forecast accuracy among the parametric methods covered in our study, the other methods being multiple discriminant analysis and regression analysis. With regards to the economic value of the various estimation techniques, our analysis shows that hazard analysis and the three non-parametric methods add the most value through reducing costs associated with default and loss of opportunity arising from either lending to soon be bankrupt firms or not lending to healthy firms.

The second study is among the first to provide a comprehensive examination of the relationship between bankruptcy, corporate governance, and estimation techniques. Most prior studies have focused primarily on examining the added value from adding governance variables to a bankruptcy

prediction model without considering the comparability across the different models or estimation techniques (e.g. Chan et al., 2016; Darrat et al., 2016; Fich and Slezak, 2008; Liang et al., 2016). In addition to covering a broader set of models and estimation techniques, the study also uses a larger sample and a longer timeframe in order to improve our ability to compare between both the predictive powers and the classificatory ability of the different bankruptcy models and estimation methods.

The third and last study expands the previous literature by investigating the role played by corporate governance in influencing investors' initial and subsequent reactions to earnings announcements, with special focus given to the post-earnings announcement drift (PEAD). We account in our analysis for market conditions that have been found to impact on this response, with an emphasis on market uncertainty and investor sentiment. We find that better governance significantly strengthens the initial market reaction to both positive and negative earnings announcements. We also find that the strength of corporate governance plays no role in explaining movements in share prices during the post-announcement period that are related to any reassessment of the initial announcement. This is in contrast with the findings for uncertainty and sentiment, which are both found to have an influence on the initial and subsequent market responses to an earnings announcement, although with different signs depending on whether the response is to good news or bad news. This implies that investors' initial responses are influenced by the environment existing at the time of the announcement. It also suggests that investors only reassess their initial responses if there is a change in this environment. This is explained by the fact that unlike market uncertainty and investor sentiment which change frequently, corporate governance changes very little over time and thus it is unlikely to cause any movements in the share price due to a reassessment of the initial reaction. Further, we find that the information uncertainty is the main channel through which corporate governance increases the investors' initial reaction to earnings announcements. This finding suggests that better corporate governance enhances the informativeness and credibility of earnings announcements, which translates into a greater and a quicker reaction by investors to the released information (Francis et al., 2007; Kanagaretnam et al., 2007; Zhang, 2006). Lastly, our findings show that investors respond differently to market uncertainty and firm-level information uncertainty. While a high level of market uncertainty causes investors to underreact to good news and overreact to bad ones, firm-level information uncertainty causes investors to underreact to both types of news.

The third study is the first to examine the nexus between corporate governance, market and firm-level uncertainty, investor sentiment and PEAD, and contributes to the strand of research related to understanding the responses of market participants to different types of news and events. The study also adds to previous efforts to explain the initial and subsequent market responses to earnings releases by providing evidence on the role played by corporate governance through the effect that it has on information uncertainty. The insights from this study are important to all market participants as they contribute to better understanding of investors' behaviour around earnings announcements which can help guide various trading and pricing decisions.

Overall, the findings of the three studies included in this work confirm the crucial role played by the firm's corporate governance framework in influencing its performance and valuation as well as its information environment. As highlighted earlier, the separation between ownership and management in contemporary organisations creates a number of challenges with regards to ensuring the alignment of the interests of the two groups. As a result, agency theory suggests that from the owners' perspective, firms can perform better and operate more efficiently when these agency issues are addressed using the appropriate governance mechanisms. Good and strong corporate governance practices are important for the health and sustainability of capital markets and overall economic activity. In addition to providing better protections for the rights of the capital providers, stronger governance mechanisms may help reduce uncertainty and information asymmetry which not only improves our ability to value the firm and assess the performance of its management, but also reduces the risk of misrepresenting the true conditions of the firm. The role played by corporate governance in improving the firm's informational environment allows the different stakeholders to undertake earlier and more prompt actions to discipline the firm's management and reduces the detrimental effects that the failure of a firm may have on the market and the economy as a whole.

The essays in this thesis bring a number of methodological contributions to the corporate governance literature. The first essay uses several indices published by international organizations some of which are used in the corporate governance research to measure country-level governance for the first time. The work in that essay also adds to the previous literature through providing a comprehensive empirical examination of the various forms of relationship between country-level and firm-level factors. Our contribution in the second essay lies in the multidimensional and wide-

ranging comparison of the performance of the various models and methods as well as the study of a diverse set of ‘classical’ and ‘modern’ parametric and non-parametric methods. Using such a comprehensive set of metrics not only enhances the reliability of our findings, but also provides insight on the degree of improvement in forecasting power and information content brought by the addition of governance variables and/or utilization of different estimation methods. In the last essay, we compare for the first time the role of corporate governance in influencing investors’ reactions to earnings announcements to the prevailing market conditions and investigate the direct and indirect contribution of corporate governance to such reaction.

The findings from the essays in this thesis have several practical implications. For a credit analyst, the conclusions from this thesis suggest that governance quality is a vital input in credit analysis due to its role as an early predictor of firm’s performance and fate. Furthermore, the findings also suggest that the decision on which estimation method to use is as important as the decision on what variables to include. For an equity trader or analyst, the findings confirm that governance not only impacts firm’s performance, but also influences market’s perception of that performance. The increased initial reaction to better governed firms seen in the third essay suggests less subsequent drift and thus less benefits from exploiting PEAD in better governed firms. Further, the results of the first essay suggest that international investors should account for differences in the domestic governance environments when making investment decisions as they are likely to have a great impact on the firm’s governance profile and the value associated with it. Lastly, the results suggest that any effort to improve investor protection policies should consider the interaction between country-level factors and firm-level frameworks which tend to move closely together.

The studies in this thesis suffer from several limitations. For instance, in the first study the absence of sufficient historical governance data has prevented us from examining the relationship between changes in country-level factors over time and firm-level governance. Further, limitations with regards to the availability of both governance and bankruptcy data across countries have prevented us from examining variations in the relationships between governance and bankruptcy prediction across countries, which would have provided vital insights into the role played by country-level factors in such relationships. Lastly, while we provide important insights into the relationship between initial and subsequent reactions to earnings announcements and the firm’s governance

framework, we do not attempt to examine the implications of our findings for trading and portfolio formation strategies.

Based on these limitations, we have few suggestions for future research. First, we suggest a closer examination of the changes in the relationship between firm-level governance and country-level factors over time. This will give us a better understanding of the effect that structural changes in country-level factors have on firm-level governance and will provide valuable insights to regulators and policymakers. Second, to improve our understanding of the relationship between governance and bankruptcy prediction in different environments, future research could attempt to examine such role across different geographies. This will answer the question of whether governance has different explanatory and/or predictive powers across geographies due to country-level governance factors. Lastly, we also suggest that future research attempts to examine the impact of using governance quality as an indicator to guide trading strategies targeted towards extracting value from PEAD.

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Appendices

# Appendices

## Appendix I: Essay I: Corporate governance thresholds provided by the ISS

### Governance QuickScore 3.0

<b>Attributes</b>
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#### *Board Structure and Policies*

<b>1.</b>	Average attendance of board meetings is at least 75%
<b>2.</b>	Board is controlled by more than 50% independent outside directors
<b>3.</b>	Board size is not less than 6 but not greater than 15
<b>4.</b>	Board has a policy on diversity
<b>5.</b>	No former CEO on the board
<b>6.</b>	Chairman and CEO are separated
<b>7.</b>	Compensation committee is composed of independent directors only
<b>8.</b>	Nominating committee is composed of independent directors only
<b>9.</b>	Audit committee is composed of independent directors only
<b>10.</b>	Governance committee or similar committee exists
<b>11.</b>	Average number of other corporate affiliations for the board member not greater than four
<b>12.</b>	Governance guidelines are publicly disclosed
<b>13.</b>	No staggered board (frequently elected board)
<b>14.</b>	Majority vote requirement to amend charter/bylaws (no rights to vote or supermajority required)
<b>15.</b>	No limitations on shareholders' right to remove board members (i.e. only for cause, supermajority vote required, etc.)
<b>16.</b>	Board has the authority to hire its own advisors
<b>17.</b>	Performance of the board is reviewed regularly
<b>18.</b>	Cumulative voting rights for shareholders
<b>19.</b>	A succession plan for executives is in place
<b>20.</b>	Policy on limit of the number of years of board membership

#### *Anti-takeover Provisions*

<b>21.</b>	Single class, common
<b>22.</b>	Majority vote requirement to approve significant company transitions such as mergers and acquisitions (no rights to vote or supermajority required)
<b>23.</b>	The company does not have a golden parachute or other similar clauses (compensation plan for accelerated pay-out)
<b>24.</b>	No limitations on shareholders' rights to call special meetings
<b>25.</b>	Company has no poison pill provisions
<b>26.</b>	The company has less than five anti-takeover devices in place
<b>27.</b>	The company does not have unlimited authorized capital or a blank check
<b>28.</b>	The company is not owned by a reference shareholder who has the majority of the voting rights, veto power or golden share
<b>29.</b>	The company permits actions to be taken without meeting by written consent

#### *Compensation and Ownership*

<b>30.</b>	CEO compensation is linked to total shareholder return
<b>31.</b>	The company's statutes or by-laws require that stock-options are only granted with a vote at a shareholder meeting

<b>32.</b>	The company has a policy for performance-oriented compensation that attracts and retain the senior executives and board members
<b>33.</b>	The most recently granted stocks/options vest in a three-year period at a minimum
<b>34.</b>	The company's shareholders have the right to vote on executive compensation
<b>35.</b>	The remuneration of management and directors is partly linked to objectives or targets which are more than two years forward looking
<b>36.</b>	Percentage of shares held by all insiders and 5% owners is less than 50%

## Appendix II: Essay I:Country-level measures

We include a number of country-level variables in our regression models which are selected based on our research questions as well as prior findings in the literature on the role played by these variables in explaining variations in firm-level governance across countries. We explain the construction of these variables in the next few sub-sections.

### **Legal system and law enforcement<sup>55</sup>**

As a measure of the differences in the degree of law enforcement around the world, we use the Rule of Law Index (RLAW) published by the World Justice Project on an annual basis. RLAW relies on more than 100,000 expert and household surveys to gauge how the rule of law is felt in everyday life in more than 100 countries around the world. The survey covers 44 indicators under eight primary rule-of-law categories, which are: constraints on government powers, absence of corruption, open government, fundamental rights, order and security, regulatory enforcement, civil justice, and criminal justice. We use principal component analysis (PCA) to estimate the overall scores of the different countries in our sample using their scores in each of the eight categories. Using this approach allows us to capture as many as possible of the differences in the various categories while maintaining the brevity of our final model.<sup>56</sup> It also simplifies the interpretation of the results of our regressions. Countries with better or more positive conditions will score higher in this index. We also use the legal system origin (LORG) classification provided in La Porta et al. (1998) to classify the legal systems of the countries included in our sample into two main categories: civil or common. Some of the countries covered in our study are not included in La Porta et al.'s original list, thus we classify these countries ourselves using the same classification logic followed in La Porta et al. (1998).

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<sup>55</sup> We do not include a variable related to the type of financial system in our study. La Porta et al. (2000) argue that the legal approach is more powerful in explaining differences in corporate governance practices than the usual argument between bank-centered and market-centered financial systems. La Porta et al. (1997) also highlight that the differences in the financial systems can be traced back to differences in the legal systems.

<sup>56</sup> For all indices included in this study, the first principal explains more than 80% of the variation observed in the scores.

## **Media**

We use the Freedom of the Press annual report published by Freedom House to measure the strength of medias' monitoring role in everyday life and the degree of independence enjoyed by journalists in a particular country. Freedom of the Press is an annual report published since 1980 to assess the degree of media (print, broadcast, and digital) freedom in 199 countries and territories around the world. A group of external analysts, expert advisers, and regional specialists produces the scores seen in the report using a combination of on-the-ground research and information from a variety of sources. The overall score of any country is the sum of its scores in three primary categories, which are: laws and regulations that influence media content, political pressures and controls on media content (including harassment or violence against journalists or facilities, censorship, self-censorship etc.), and economic influences over media content. We use PCA to estimate the overall scores of the different countries in our sample using their scores in each of the three categories, and we name the estimated variable *MEDI*. Countries with better or more positive conditions will score higher in this index.

## **Social norms and cultural characteristics**

The World Economic Forum publishes the Global Competitiveness Index (GCI) report on an annual basis using its Executive Opinion Survey (EOS) of more than 14,000 business leaders from 140 countries in addition to data collected from reports published by several international organisations such as: the World Bank Group, the International Monetary Fund, the United Nations Educational, Scientific and Cultural Organisation, and the World Health Organisation. The report analyses and rates each country's competitiveness based on 12 main pillars: 1) institutions, 2) infrastructure, 3) macroeconomic environment, 4) health and primary education, 5) higher education and training, 6) goods market efficiency, 7) labour market efficiency, 8) financial market development, 9) technological readiness, 10) market size, 11) business sophistication, and 12) innovation. The overall scores are calculated based on three sub-indices: basic requirements, efficiency enhancers, and innovation and sophistication factors, for which the weights of the overall score are determined based on the economy's stage of development (factor-driven, efficiency-driven, or innovation driven). In order to estimate our overall social and cultural index (*SOCL*), we use PCA and the scores of the different countries in our sample for each of the following relevant pillars: health and primary education, higher education and training, and

technological readiness. Countries with better or more positive conditions will score higher in this index. Furthermore, following Stulz and Williamson (2003) and others, we add dummy variables (1 or 0) to capture differences in the prevailing religions in the countries in our sample. Our religion dummy variables reflect three main categories: Christianity (*CHRN*), Islam (*ISLM*) and Shinto/Buddhism/Hinduism (*SBHD*).<sup>57, 58</sup>

### **Competition and market conditions**

We use data from the GCI report (discussed earlier) to build our market competitiveness index (COMP). Specifically, we use PCA and the scores of the following relevant pillars: goods market efficiency, labour market efficiency, market size, business sophistication and innovation. Countries with better or more positive conditions will score higher in this index. This index is intended to measure the level of overall competitiveness and to capture differences in the market conditions and practices among the countries included in our sample.

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<sup>57</sup> We obtain data on the prevailing religion from the CIA World Factbook.

<sup>58</sup> Shinto is the ethnic religion of the Japanese people.

### Appendix III: Essay III: Definitions of main variables

Variable	Definition
<b>Cumulative Abnormal Returns (CAR)</b>	CAR is calculated for the specific period the by subtracting the expected return calculated using the market model (i.e. the Capital Asset Pricing Model or CAPM) from the actual return.
<b>Standardized Unexpected Earnings (SUE)</b>	SUE is calculated as: $SUE_{i,t} = \frac{E_{i,t} - \overline{E_{i,t}}}{P_{i,t}}$ , Where $E_{i,t}$ is actual quarterly earnings per share for firm $i$ in quarter $t$ , $\overline{E_{i,t}}$ is the most recent consensus analysts' forecast available prior to the announcement of the quarterly earnings per share for firm $i$ in quarter $t$ and $P_{i,t}$ is the price for firm $i$ at the end of the quarter.
<b>Positive SUE (PUE) / Negative SUE (NUE)</b>	PUE/NUE is the positive (negative) SUE measure which takes the value of SUE when it is positive (negative) or 0 otherwise.
<b>Governance (GOVH)</b>	GOVH is a dummy variable which takes the value 1 if the governance index (GOV) value for the announcement year is above the median value for all other observations or 0 otherwise. Higher governance index value indicates better governed firms.
<b>Sentiment (SMIP/PSMIP)</b>	SMIP is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five-days prior to the announcement (SMI) is positive or 0 otherwise. PSMIP is a dummy variable which takes the value 1 if the sum of the daily returns on S&P 1500 (sentiment measure) over the post-announcement period (PSMI) is positive or 0 otherwise.
<b>Uncertainty (VIXH/<math>\Delta</math>VIXH)</b>	VIXH is a dummy variable which takes the value 1 if the volatility index or VIX (uncertainty measure) value one day prior to the announcement (VIX) is above the median value for all VIX observations or 0 otherwise. $\Delta$ VIXH is a dummy variable that measures change in VIX (uncertainty measure) over the studied period ( $\Delta$ VIX) and takes the value 1 if the value of VIX increases over post announcement period (T+2 to T+60) or 0 otherwise.
<b>Information Uncertainty (IFUH)</b>	IFUH takes the value 1 if the value of the IU measure (defined in <i>Table I</i> ) for the announcement year is above the median value for all other observations or 0 otherwise. The IU measures are constructed so that higher values indicate higher IU.
<b>SIZE</b>	SIZE is the log of the firm's market value at the time of the announcement.
<b>BTMV</b>	BTMV is the firm's book-to-market value ratio at the time of the announcement.
<b>FORC</b>	FORC is the number of reported earnings forecasts for the quarter in I/B/E/S database.
<b>RLAG</b>	RLAG is the number of days from the end of the reporting period to the announcement date.

**Appendix IV: Essay III: Corporate governance thresholds provided by the  
ISS Governance QuickScore 3.0**

<b>Attributes</b>	
<i>Board Structure and Policies</i>	
<b>37.</b>	Average attendance of board meetings is at least 75%
<b>38.</b>	Board is controlled by more than 50% independent outside directors
<b>39.</b>	Board size is not less than 6 but not greater than 15
<b>40.</b>	Board is made up of at least 25% females
<b>41.</b>	No former CEO on the board
<b>42.</b>	At least 50% of board members have external financial expertise
<b>43.</b>	Chairman and CEO are separated
<b>44.</b>	Compensation committee is composed of independent directors only
<b>45.</b>	Nominating committee is composed of independent directors only
<b>46.</b>	Audit committee is composed of independent directors only
<b>47.</b>	Governance committee or similar committee exists
<b>48.</b>	Average number of other corporate affiliations for the board member not greater than four
<b>49.</b>	Governance guidelines are publicly disclosed
<b>50.</b>	No staggered board (frequently elected board)
<b>51.</b>	Majority vote requirement to amend charter/bylaws (no rights to vote or supermajority required)
<b>52.</b>	No limitations on shareholders' right to remove board members (i.e. only for cause, supermajority vote required, etc.)
<b>53.</b>	Performance of the board is reviewed regularly
<b>54.</b>	Cumulative voting rights for shareholders
<b>55.</b>	A succession plan for executives is in place
<i>Anti-takeover Provisions</i>	
<b>56.</b>	Single class, common
<b>57.</b>	Majority vote requirement to approve significant company transitions such as mergers and acquisitions (no rights to vote or supermajority required)
<b>58.</b>	The company does not have a golden parachute or other similar clauses (compensation plan for accelerated pay-out)
<b>59.</b>	No limitations on shareholders' rights to call special meetings
<b>60.</b>	Company has no poison pill provisions
<b>61.</b>	The company has less than five anti-takeover devices in place
<b>62.</b>	The company does not have unlimited authorized capital or a blank check
<b>63.</b>	The company is not owned by a reference shareholder who has the majority of the voting rights, veto power or golden share
<b>64.</b>	The company permits actions to be taken without meeting by written consent
<b>65.</b>	Percentage of shares held by all insiders and 5% owners is less than 50%