Corporate Boards as Monitors: An Empirical Test of the Quad Model of Director Effectiveness

by

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Abstract

The extant board governance literature has generally examined the relationship between specific director attributes and their influence on the board's monitoring performance in isolation of other director attributes. To overcome the limitations of this one-dimensional approach in the pursuit of finding the 'ideal' director, Hambrick, Misangyi, and Park (2015, AMR) proposed the board quad model, which combines the four individual directors' attributes of independence, expertise, bandwidth, and motivation. The quad model essentially summarises the advances of prior literature, particularly concerning director task performance, the confluence of agency theory and resource dependence theory, and the social dynamics of groups. This thesis empirically investigates the validity of the model in the context of three monitoring tasks: CEO turnover, CEO compensation, and director appointment.

The findings generally support the relevance of the quad model. Most prominently, they show that boards with quad-qualified directors make objective assessments of CEO performance and act accordingly. In particular, the results suggest that such boards are less reliant on public information, and assess CEO ability also based on private information and external contingencies. Concerning CEO turnover decisions, quad-qualified boards seem to rely as much on firm-specific stock market performance as on peer stock market performance. A CEO's job is particularly at risk when the board consists of three quad-qualified directors and firm performance deteriorates.

As to CEO compensation, quad-qualified boards tend to overpay CEOs. On the one hand, this reflects the greater scrutinising ability and motivation of such boards, leading to the CEO facing a higher job risk, which in turn needs to be compensated. On the other hand, the same ability and motivation make quad-qualified less reliant on outcome-based incentives and instead directly monitor CEO actions for making informed pay decisions.

Together, the insights regarding CEO turnover and compensation decisions provide evidence that decisions which are directly related to the CEO's employment, arise from

a bargaining process between the CEO and the board about board composition, CEO compensation, and eventually CEO succession. Director appointments are an integral part of this process. This thesis shows that a quad-qualified board can resist managerial power and is likely to appoint another quad-qualified director.

In sum, this thesis reinforces the quad model approach and provides a better understanding of the microfoundations of effective board monitoring. Most importantly, it offers extensive insights into the CEO-board relationship. Furthermore, it supports calls for an individual-based board assessment to uncover both the individual directors' contribution and the social dynamics within the board. In this regard, the selection of suitable measures for individual director quad attributes as well as the operationalisation of the quad model provide guidance for future studies on the quad model, and thereby add to the main contributions of this thesis.

Keywords: Strategic Leadership, Board Qualification, Monitoring

Declaration

The candidate confirms that the work submitted is his own and that appropriate credit has been given were reference has been made to the work of others.

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Acronyms

AC	audit committee.
AME	average marginal effects.
AUC	area under curve.
CC	compensation committee.
CRSP	Center for Research in Security Prices Database.
FA	factor analysis.
FASB	Financial Accounting Standards Board.
IPO	initial public offering.
M&A	mergers & acquisitions.
Nasdaq	Nasdaq Stock Market.
NC	nomination committee.
NYSE	New York Stock Exchange.
QQ	quad-qualification.
RDT	resource-dependence theory.
ROC	receiver operating characteristic.

RPE	relative performance evaluation.
S&P	Standard & Poor's.
SEC	United States Securities and Exchange Commission.
SIC	Standard Industrial Classification.
SOX	Sarbanes-Oxley Act.
TMT	top management team.
TNIC	Text-based Network Industry Classifications.
US	United States of America.
WRDS	Wharton Research Data Services.

Chapter 1

Introduction

1.1 Introduction

Corporate boards take a vital role in the governance system of US firms. This is especially true for publicly listed corporations, where the board of directors delegates most of the day-to-day business to executive managers, and primarily retains a supervisory and advice-giving role in the agency between management and shareholders (Adams, 2017).

In the board's attempt to maximise shareholder value, directors must provide, on the one hand, on-going monitoring of managers and internal control mechanisms. On the other hand, directors can offer advice and counsel to managers, particularly concerning critical strategic decisions and direct corporate policy.

Correspondingly, a long-standing debate among governance researchers and policy-makers is what constitutes an effective board? This question has spawned a large body of literature about the very nature of effective boards, particularly regarding the selection of directors and the overall composition of boards.

Initially, board governance theory emphasised on the independence of directors, who would, in the presence of adequate incentives, provide effective board monitoring (Fama and Jensen, 1983). By this convention, the Sarbanes-Oxley Act 2002 introduced stringent rules on board structure, which has resulted in boards – aside from the CEO – being almost entirely consisting of independent directors. On the contrary, extant literature has since been at odds whether board independence per se provides better monitoring outcomes. Instead, researchers and practitioners, stress the importance of other director qualities for effective monitoring (Forbes and Milliken, 1999; Sonnenfeld, 2002; Hillman and Dalziel, 2003). Accordingly, directors would also need to have the cognitive ability, sufficient time

to devote to their service, and the motivation to fully commit themselves for the benefit of the firm's shareholders (Boivie et al., 2016a; Hambrick et al., 2015; Payne et al., 2009).

This perspective on board composition culminates in a comprehensive model, proposed by Hambrick et al. (2015), which is pivotal to this thesis. Essentially, this quad model for identifying a director's potential for effective monitoring (henceforth called the quad model) summarises the advances of prior literature, particularly concerning director task performance, the confluence of agency theory and resource dependence theory, and the social dynamics of groups. Chapter 2 introduces the quad model in detail and also reviews its related literature in-depth.

What makes the quad model innovative and promising, is the fact that it represents the first attempt to develop a comprehensive model of the ideal governance monitoring device. While directors should be independent, a director's experience, knowledge, skills as well as availability to pursue her tasks accounts for her overall ability to process information and make effective decisions (Forbes and Milliken, 1999; Khanna et al., 2014). However, a director's ability can only fully come into effect if the director is, at the same time, sufficiently motivated to engage in these tasks. Accordingly, Hambrick and colleagues combine the four board attributes of independence, expertise, bandwidth and motivation into one theoretical model.

Fundamentally, these four critical qualities are all individually important and not many directors will equally possess them; in fact, the opposite might frequently be true. If a director lacks one of the attributes, then a pejorative effect on director task performance is generated, regardless of the level of individual quality in the others (e.g., Lawler, 1966; Campion et al., 2011). Conversely, Hambrick and colleagues argue that a director having all four of the attributes above a certain threshold, subsequently defined as quad-qualified director, is significantly better in providing effective monitoring than other directors.

Finally, Hambrick and colleagues particularly address the individual director, contrasting extant research that primarily studies board-level characteristics. Thereby, the quad model attends a key criticism of extant research that the customary approach of aggregating board-level variables overlooks useful information (Johnson et al., 2013; Dalton and Dalton, 2011). Allowing to examine individual directors, the quad model offers an approach to study the importance of minority voices in board discussion and how group dynamics affect the board's monitoring effectiveness.

This thesis responses to Hambrick and colleagues' call to test the quad model

concerning specific board monitoring tasks. While a board's monitoring function relates to numerous duties and responsibilities, this thesis examines three monitoring tasks: (1) CEO turnover, (2) CEO compensation, and (3) director appointment.

1.2 Contributions of the Thesis

To date, no published work has empirically validated the theoretical predictions of the quad model. The on-going debate on what constitutes an effective board, evidenced by an increasing focus on the board of directors in general (Adams, 2017), underpins the need for new advances.

1.2.1 Quad-qualification and CEO turnover-performance sensitivity

Chapter 4 applies the quad model in the context of CEO turnover decisions. The results indicate that the presence of quad-qualified directors improves the board's effectiveness in monitoring CEO ability relative to firm performance. Moreover, it appears that such boards may better utilise their cognitive abilities and resources in their decision-making. Finally, it is shown that group dynamics play a crucial role such that a board's monitoring effectiveness concerning CEO turnovers is greatly increased if there is a critical mass of at least three quad-qualified directors in place.

1.2.2 Quad-qualification and incentive-aligned CEO pay

Chapter 5 examines how CEO pay decisions are affected by the presence of quad-qualified boards. Traditional agency theory under the optimal contracting paradigm argues that a board must reward or punish its CEO for good or bad firm performance so that CEOs have an incentive to maximise shareholder value.

Contrary to this argument, the findings indicate that quad-qualified boards compensate their CEOs relatively higher. However, this finding mirrors recent board governance theory and empirical research, arguing that monitoring-inclined boards have a greater ability and motivation to scrutinise CEO ability, which raises both the CEO's effort and employment risk. As a consequence, the results of Chapter 4 suggest that the CEO receives greater compensation for bearing the higher risk of dismissal because a quad-qualified board is also more effective in making relevant turnover decisions. Likewise, the presence of quad-qualified directors should make boards less reliant on outcome-based CEO pay, because

they possess the attributes necessary to make their own objective judgement about CEO ability.

In conjunction with Chapter 4, Chapter 5 fundamentally underpins the relevance of quad-qualified boards and their greater ability and motivation to monitor and appropriately reward and punish CEOs.

1.2.3 The appointment of quad-qualified directors

Chapter 6 extends the study of the quad model towards the appointment of outside directors. Since corporate boards primarily pick future directors themselves, the selection of qualified candidates is a prerequisite of an effective governance system that is self-contained and sustainable.

Accordingly, the empirical analysis shows that the probability of appointing another quad-qualified director increases in the number of incumbent quad-qualified directors on the board, which underpins that quad-qualified boards can withstand executive interests in the selection and appointment future directors. Furthermore, the results suggest that this effect particularly materialises when the appointing board already consists of a group of 2 or more quad-qualified directors. This substantiates Hambrick and colleagues' argument that a minority opinion can be more effectively voiced when at least another individual supports it.

1.2.4 The operationalisation of the quad model

Applying the quad model extends related empirical research concerning the level of analysis. The individual-based analysis emphasised by Hambrick and colleagues is an effective way to identify quad-qualified boards and further yields more definite conclusions regarding board diversity and group dynamics. Nevertheless, despite providing a better understanding of the microfoundations of effective board monitoring, the results do not lend support that the director-level approach is more effective than the customary board-averages approach.

Still, this thesis makes two fundamental methodological contributions to the board governance literature; the selection and construction of adequate proxies of the four quad attributes as well as an operationalisation of the quad model that allows identifying quad-qualified directors individually.

1.3 Structure of the Thesis

The thesis is organised as follows:

- Chapter 2 provides an in-depth account of the practical as well as theoretical justifications that support the quad model's relevance. The chapter begins by briefly reviewing the past two decades about US corporate boards, how research and regulations have shaped board composition, and how this development nurtures support for the quad model. The subsequent section introduces the quad model and its propositions, followed by an extensive literature review of the four quad attributes. This establishes the basis for the methodological approach and the selection of proxy variables which are fundamental to the application of the model.

- Chapter 3 presents the sample selection and data management process of the main director-level sample. Further, it gives a detailed account of all director-level attribute variables and their construction. Next, the chapter introduces the approach to identify quad-qualified directors and boards, which sets the methodological basis of each of the subsequent empirical studies. The chapter concludes with an overview of the sample distribution of quad-qualified directors and three examples of companies that are identified as quad-qualified.

- Chapter 4 is the first empirical chapter and examines the quad model in the context of CEO turnovers and their sensitivity to firm performance. The analysis additionally features an event study which studies firm stock market performance around turnover announcements and evaluates the CEO turnover-performance sensitivity based on a relative performance model. Moreover, it attends the Hambrick and colleagues' proposition concerning group dynamics by examining different critical mass levels.

- Chapter 5 examines board quad-qualification in another critical board monitoring aspect: CEO compensation. The empirical analysis includes several proxies for CEO compensation and examines the effect of quad-qualified directors on the board- as well as compensation committee level. The chapter further elaborates on group dynamics and the endogenous relationship between a board's monitoring propensity and CEO compensation.

- Chapter 6 concludes the empirical part of the thesis with an analysis of director appointments. From the appointing firm's perspective, the focus is on the

relationship between the current board's quad-qualification and the likelihood of appointing a quad-qualified director. Moreover, this chapter once again takes on the quad model's proposition about minority influence and investigates whether group dynamics matter.

- Chapter 7 summarises the main contributions to theory and methodology in board governance research and related areas. It concludes the thesis with a discussion of the practical implications of the findings and gives directions for future research.

Chapter 2

The Quad-Model, its Attributes, & Monitoring Effectiveness

2.1 Background

The board of directors is the highest echelon of US companies, and as such, receives a great deal of attention from various stakeholders. Every now and then, a corporate scandal hits the news. It prompts journalists, politicians, shareholder representatives, and other observers to comment on what went wrong and how things could be improved. Irrespective of whether or not regulatory authorities implement new policies in the aftermath, corporate scandals are an opportunity for academics and consultants to reassess their theories of best practice critically, analyse the avenues that led to the failure, and convey theory to practitioners.

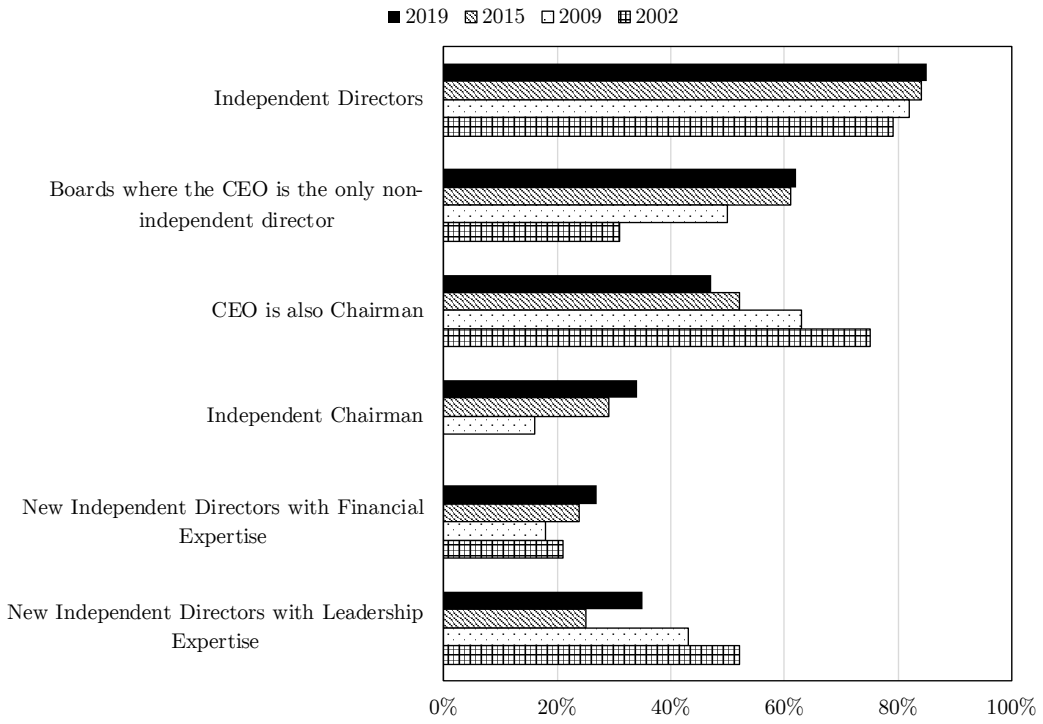
The cardinal point in public debates is often the board of directors. In the early 2000s, fraudulent accounting activities by US firms such as Worldcom and Enron led to massive corporate scandals that shook investor confidence. Both scandals were attributed to substantial oversight failure, and directors were ordered to out-of-pocket payments in the millions of US dollar (Larcker and Tayan, 2015).

As a consequence, the United States passed a new federal corporate law, namely the Sarbanes-Oxley Act 2002, with expanded requirements in various areas, seeking better investor protection. Similarly, the New York Stock Exchange (NYSE) and the Nasdaq Stock Market implemented new listing requirements in 2003.[1] Besides changes regarding audit quality, financial accounting and reporting practices, the new regulations have

[1] Mallin (2013, p. 50, 55)

Figure 2.1: Board Composition of Listed U.S. Companies

This figure shows the changes in board composition among S&P 500 firms. The charts are compiled from reports by Spencer Stuart (2019, 2016, 2015, 2012).



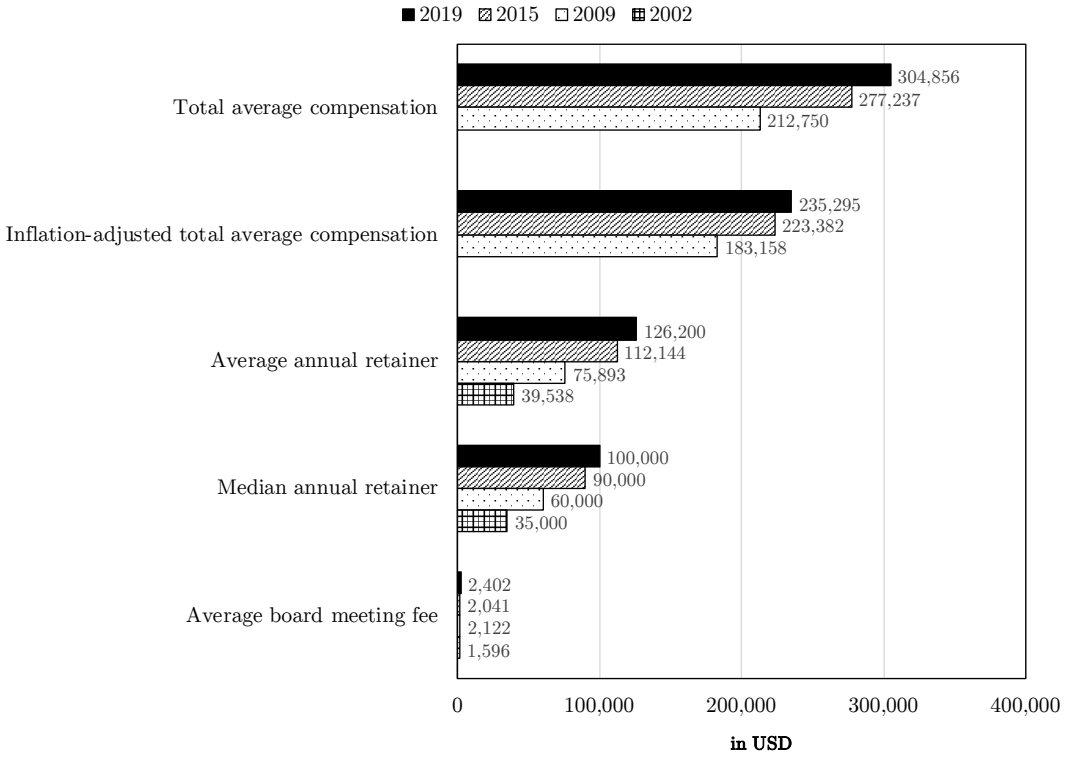
had a substantial impact on US-listed public companies' boards of directors. Boards are now required to have a majority of independent directors and a fully independent audit committee with at least one 'audit committee financial expert'. Indisputable, the heated discussions in the aftermaths of scandals during the past two decades have called researchers to study further why boards fail to adhere to their monitoring responsibilities.

Following the principle-agent relationship, shareholders have a natural interest in the board of directors (Jensen and Meckling, 1976). They expect that its directors act in their best interest and monitor the company's management in ways that maximise the value of the firm. Countless studies have established that the choice of the board's members is a pivotal decision to induce a board's monitoring effectiveness, and thus reduce the probability of governance failures. In efforts to reduce such failures, the regulations implemented in the past two decades have changed the shape of US corporate boards.

Since the introduction of the Sarbanes-Oxley Act in 2002, it is not so much the fraction of independent directors on the board that has changed, but rather the role of the CEO within the board (cf. Figure 2.1). According to the consultancy practice Spencer Stuart, the fraction of independent directors among S&P 500 firms only increased by about six

Figure 2.2: Director Compensation at Listed U.S. Companies

This figure shows the changes in non-executive director compensation. The inflation-adjusted figure of *Total average compensation* is based on the Consumer Price Index (Base year = 2002) published by the Bureau of Labor Statistics, U.S. Department of Labor. The charts are compiled from reports by Spencer Stuart (2019, 2016, 2015, 2012).



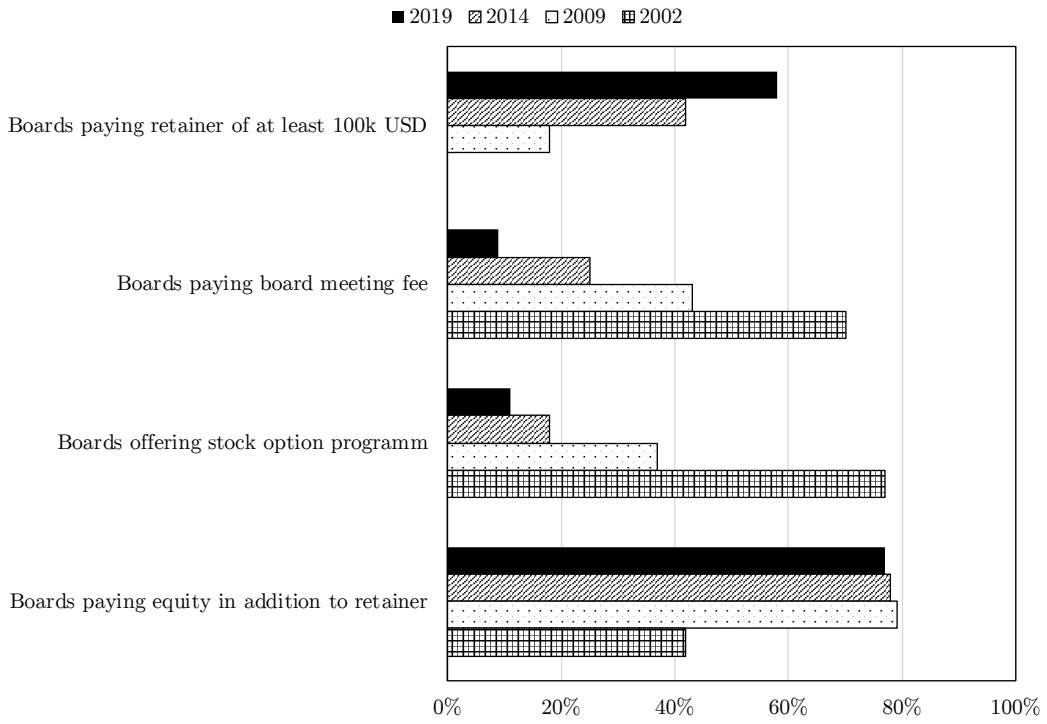
percentage points since 2002. In contrast, nowadays, the CEO is the only non-independent director on nearly two-third of corporate boards, which is about twice as much as in 2002. These developments have been attended by a further diffusion of separating the CEO and board chair positions. Today, less than half of the S&P 500 boards have a combined CEO-chairman position and 34% have an independent director serving as the board's chair. Formally, the regulatory changes did shift the power further to outside directors, to establish counterweight towards the CEO.

In addition to the trend towards outsider-dominated boards and a split of the board chair and chief executive position, the non-executive branch of the board has seen substantial changes regarding its compensation (see Figure 2.2 and Figure 2.3). Companies increasingly pay equity in addition to an annual retainer, which itself is sometimes at least partially paid in equity (Spencer Stuart, 2019). While the retainer has significantly increased since 2002, fewer companies pay a board meeting fee. Overall, average total director compensation substantially increased – even inflation-adjusted.

Nevertheless, despite these changes, governance failures continue to occur. A recent

Figure 2.3: Components of Director Compensation at Listed U.S. Companies

This figure shows the changes in the components of non-executive director compensation. The charts are compiled from reports by Spencer Stuart (2019, 2016, 2015, 2012).



McKinsey & Company (2018) report notes that the number of corporate crises among Forbes Top 100 companies has risen sharply since 2000. They show that the total of news headlines featuring the word 'crisis' went up by 80% for the time period of 2010-2017 relative to 2000-2009. The on-going debate on the monitoring effectiveness of corporate boards is further fuelled by the new opportunities and threats resulting from the digitalisation and globalisation of the economy as well as the increased focus on corporate social responsibility. When firms have to grapple with topics such as cybersecurity, climate change, or gender diversity, the responsibilities of the board change with it (Deloitte, 2018; McKinsey & Company, 2016). At the same time, boards still have to provide the traditional monitoring, such as CEO succession and CEO compensation.

All of the above requires directors to be well-versed and sufficiently motivated to their job. Against the background of a changing environment, board monitoring effectiveness is certainly not induced by a one-dimensional trait such as the board's formal independence. While academics have advocated a focus towards a more comprehensive assessment of directors (Hillman and Dalziel, 2003; Johnson et al., 2013), there are few regulatory requirements as to other characteristics that embody a director's ability and motivation.

Independence alone does not state whether a director has the abilities and capabilities to process the information necessary to make prudent decisions and ultimately deliver effective monitoring (Boivie et al., 2016a).

Moreover, it is questionable whether boards, where only the CEO is an inside director, are preferable all along. Interpersonal relationships can provide an efficient way to obtain valuable information, which substantially adds to an effective board monitoring (e.g., Penrose, 1959; Tian et al., 2011; Sauerwald et al., 2016).

Interestingly, despite advances in many director characteristics, the vast majority of empirical governance research focuses only on very few director characteristics concurrently, leaving a need for a more comprehensive approach towards director selection and board composition. Correspondingly, Hambrick, Misangyi & Park published "The Quad Model for Identifying a Corporate Director's Potential for Effective Monitoring: Toward a New Theory of Board Sufficiency" in the Academy of Management Review in 2015. This thesis uses their concept to assess whether board monitoring effectiveness can be induced when directors sufficiently possess both ability and motivation.

2.2 Quad Model

Hambrick and colleagues attend to the question of what constitutes effective board monitoring. In that regard, they follow the classic theory of organisational behaviour about individual task effectiveness and propose that a director's effectiveness in pursuing her monitoring task jointly depends upon her ability and motivation.

Accordingly, an independent director might be objective in her judgement, but her ability to perform well in the monitoring task greatly depends on her abilities to obtain, process and share the information. Nonetheless, without being sufficiently motivated to fulfil her duty, she would not utilise her full capabilities, and hence effective monitoring could not be assumed.

$$\text{Director's Task Effectiveness}_{ijt} = f(\text{Ability}_{ijt} \times \text{Motivation}_{ijt}) \tag{2.1}$$

Concerning director task effectiveness about a board's monitoring role, Hambrick and colleagues coalesce prior research into four qualities that capture the above-stated principle on task effectiveness. Firstly, a director should be objective in his judgements, which presumes that the director is independent and also largely corresponds with previous

research and regulatory changes.

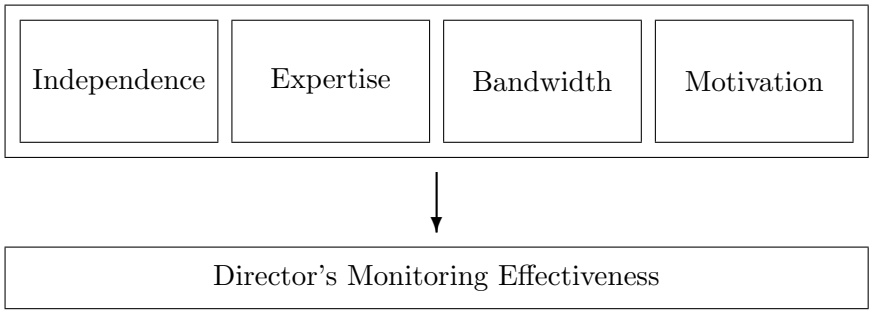
Secondly, to process the information and to make informed decisions, directors should also at least be able to understand the issues at hand in a timelier manner. Hence, this requires that they possess adequate levels of knowledge, skills and experience. In light of the manifold monitoring responsibilities, the authors relate a director's expertise to individual domains of monitoring.

Thirdly, directors only have limited time to spend to certain activities. Since outside directors would usually have other responsibilities, the authors claim that a director's bandwidth is a critical determinant in whether he performs well in his job. While he might have the abilities to make informed and prudent decisions, outside responsibilities limit his capabilities to concern himself with the issues at hand fully.

Lastly, a director should be eager to perform well in his job. Besides being motivated to be a member of the board, a director should dedicate herself to work in the best interest of shareholders. This claim goes back to early corporate governance research (Holmström, 1979; Fama and Jensen, 1983), which stresses the importance of adequate incentives to mitigate the adverse effects within the principal-agent conflict.

Based on the two principles, Hambrick and colleagues make three propositions about effective board monitoring. The first proposition highlights that a director's quad-qualification is not a binary trait. Instead, they propose that when the quad model attributes (subsequently termed as quad attributes) are satisfied above a certain threshold, a director's likelihood of being an effective monitor, in a given monitoring task, will be greatly increased (see Figure 2.4).

Figure 2.4: The Quad Model



Thus, quad-qualified directors may possess different levels in the four attributes as long as each attribute is satisfied above a certain threshold level. However, severely lacking one or more quad attributes can substantially inhibit director task effectiveness, because the attributes are highly interdependent (e.g., a director with firm-specific knowledge is likely

to have at least social ties to the board or firms) and task effectiveness is conditional on having all four attributes. For instance, the non-independent director's assessment of the CEO may result in retaining the CEO for too long, no matter how great the director's abilities are. Similarly, a director who lacks motivation may not be willing to exert himself on behalf of shareholders, irrespective of whether he is objective and expedient with the issue at hand. This holistic approach to a director's monitoring effectiveness is the key innovation of the quad model. Altogether, having all four attributes ensures that a quad-qualified director would not be totally dependent upon the executive management's courtesy in providing her with the information or analysis that she needs to do the job.

This again leads to the authors' second proposition; the presence of one quad-qualified director in a given monitoring domain will reduce the likelihood of governance failure in that domain, as compared to having no such directors on the board. Based on the assumption that one quad-qualified director is less dependent on top management, such a director would be an influential minority on the board who could play a vital role in challenging top management's decision-making. Hambrick and colleagues posit that quad-qualification matters far more than to ensure that directors have the abilities and are sufficiently motivated to pursue their monitoring responsibilities. In fact, quad-qualification reduces the problem with CEOs and other inside directors exerting their influence over ill-informed, affiliated and unmotivated outside directors. However, unless not more than one quad-qualified director is on the board, the probability of such issues would be still high.

Hence, in their third proposition, the authors suggest that the presence of at least two quad-qualified directors could reduce the likelihood of governance failure far more than just one quad-qualified director. Several studies regarding the behavioural dynamics of groups show that minority influence is greatly increased when at least two members represent a minority.

Altogether, the three propositions shift the focus away from the traditional approach to board governance research which examines board characteristics based on averages among all members of the board. The focus on individual directors is not new. However, studying only board-average characteristics omits a board's diversity in personality and skills (Adams et al., 2018), and essentially precludes studies from examining board group dynamics in more detail. Since this has, by comparison to the advances in social psychology research, received little attention in contemporary strategic leadership research,

the director- and group level approach are further key innovations of the quad model.

Altogether, the quad model generally consolidates the advances concerning research about task effectiveness, minority groups, and board governance theories, into a single model for identifying directors capable of providing effective monitoring.

This thesis attempts to test all three propositions in the context of different monitoring domains. Ideally, one methodological approach can be used to test each of the three propositions. Nonetheless, this single approach should warrant slight alterations to each quad attribute to attend different monitoring domains. Therefore, first, the following sections of this chapter discuss the previous literature of each quad attributes at length, providing an in-depth analysis which constitutes the linchpin for the methodological approach to the quad model. The focus is particularly on the quad attributes, which delivers insights into the principle traits and dynamics of each attribute, and further to the interdependencies with other attributes or proxies respectively. Finally, this chapter concludes with a summary of the essential insights given by the literature review.

2.3 Independence

Hambrick et al. (2015, p. 330) argue that "to be capable of dispassionate monitoring, a director must be independent or objective about the company's managers and their policies". Conventional wisdom suggests that one of the main causes of board failure in monitoring is frequently due to a lack of independence among board members. It is assumed that boards will function better if their members can exercise autonomy in decision making and are capable of questioning the dominant view in the boardroom. Along with the other attributes, the quad model predicts that independence allows the director to be objective. This assumption raises the point of effectively understanding what comprises an 'independent' director.

2.3.1 Formal independence

Much of the early literature on board structure and composition, which emphasises the importance of independent directors, stems from agency theory. About corporate governance, the theory postulates that the board of directors is an internal governance mechanism to alleviate the problems arising from the separation of ownership and control, i.e. shareholders and managers (Jensen and Meckling, 1976). By representing shareholder interests, directors are expected to fulfil their fiduciary duty objectively and do not collude

with management (Fama and Jensen, 1983). Their role covers mainly the monitoring and control of management's decision-making and firm performance, which includes activities such as appointing the CEO and setting top management's compensation. Since current employees are more inclined to collude with management, agency theory emphasises that effective boards have a substantial share of non-executive, subsequently termed as outside directors, which in turn leads to superior firm performance (Fama, 1980).

As aforementioned, in the context of the US, the listing requirements of NYSE and Nasdaq have accomplished that in the majority of US companies all directors except the CEO and the chairman are outside directors, i.e. formally independent (see Figure 2.1 in Section 2.1). However, in practice, boards are rather composed of directors whose degree of independence varies depending on the strength of affiliation with the focal firm and individuals within it.

Accordingly, Finkelstein et al. (2009) define independent directors as members of the board who have little or no business with the focal firm; and inside directors as those who are top managers of the focal firm. Alongside, the board may then consist of affiliated directors as well as family directors. On the whole, definitions vary across the literature, but generally follow the current regulatory and listing requirements for US companies that have been introduced by the Sarbanes-Oxley Act (SOX) in 2002.

Nonetheless, as Rhoades et al. (2000) find in their meta-analysis of 59 empirical studies, it matters how one defines independence. They show that the relationship between board independence and a firm's financial performance is greatly moderated by the measures used to distinguish between inside or outside directors. However, the analysis only considers independence as a dichotomous trait with four general definitions of insiders. Anyhow, the results only indicate a small positive effect of independence, when insiders are defined as current and former employees or current and former employees, including consultants, lawyers and relatives of employees.

Another meta-analysis by Dalton et al. (1998) approaches the issue of independence similarly. In contrast to Rhoades et al. (2000), the results are ambiguous in the sense that both, the proportion of outside and affiliated directors, have no clear effect on financial performance. These findings conflict with the general hypothesis that the proportion of independent directors is associated with greater financial performance.

Despite that these two studies only show very little evidence for a positive effect of independent director representation on corporate boards, both studies do not investigate

its effect on distinct, direct monitoring outcomes, which are essentially targeted by the quad model. Correspondingly, in his statistical analysis of prior literature, Deutsch (2005) investigates how outside director representation can be associated with several critical decisions. His results undermine the traditional perspective of agency theorists. Conflicting initial predictions, the outside director ratio appears to mitigate the usage of CEO incentive pay, promote the adoption of takeover defences, and to result in lower R&D expenditures. Just the positive relationships between outsider representation and the firm's debt intensity as well as CEO turnover are shown as hypothesised.

These discrepancies show the complexity of the quad model and its correlation between director attributes. In certain monitoring domains, managers and outside directors may support each other. Deutsch (2005) attribute the non-matching direction of their results to support stewardship theory. In contrast to agency theory, stewardship theory holds that managers generally strive to be stewards of shareholder interests, unless the issue is not undermining their own position (Donaldson, 1990). In other cases, for instance, CEO compensation, a negative relationship between board independence and monitoring effectiveness may be caused by the CEO's relative power, which hinders the board from protecting shareholders' interests adequately. Finally, the relationship can be moderated by other factors, which indirectly influence the relationship positively or negatively. In reference to Deutsch (2005), the positive effect of outsider representation and debt intensity can be explained by the resource dependence theory, which stresses that outside directors provide external links that can help acquire preferential access to financing resources.

Following the results of Deutsch (2005), it is apparent that agency theory alone cannot describe the complex relationship between an independent board structure and monitoring efficiency. For instance, although agency theory stresses the need for a board of directors as an internal governance mechanism to align the interests between shareholders and managers, several influences from either side affect the positioning of the board in the corporate governance hierarchy. Hence, previous literature has extended the discussion of board independence towards understanding the social ties between CEO, board and management. Altogether, literature and the completed implementation of board independence requirements suggest that more detailed measures may explain the cross-sectional variation in director independence more effectively than formal independence measures.

2.3.2 Board-management ties

Accordingly, Westphal (1999) distinguishes between an independent and a collaborative board model in his attempt to study whether social ties between the CEO and the board of directors eliminate potential detrimental behavioural issues in the board-management relationship. The most notable difference in comparison to the independent board model is the emphasis of the board's advisory role, in addition to its monitoring role. While the explicit function of director's advisory will be discussed in the section regarding directors' expertise, it should be acknowledged that directors, with their knowledge, expertise and social networks, can be a great source for CEOs and other top managers to seek advice and counsel (Ma et al., 2019).

Based on the maxim that personal relationships between colleagues improve collaboration, Westphal (1999) argues that an active board role raises the frequency of advice and counsel interactions, which in turn facilitates corporate performance. His results indeed confirm this relationship, which he attributes to the CEO's higher willingness to seek advice & counsel rather than to impress directors. Most notably and in contrast to agency theory, he cannot confirm that board-management social ties are outright harmful to effective monitoring.

These findings are substantiated by recent post-SOX research. Schmidt (2015) concludes that CEO-board social ties have both costs and benefits, depending on the firm's specific needs. He argues similarly to Westphal (1999), who initially hypothesises that CEO-board social ties are harmful to monitoring effectiveness, but beneficial for advice and counsel interactions. Accordingly, in his study on how board independence relates to merger & acquisition outcomes, he finds that on the one hand when directors possess valuable information about the merger, social ties between the CEO and board members have a positive impact on acquisition returns. On the other hand, when there is a need for stringent monitoring, CEO-board social ties have a negative impact on acquisition returns.

Wintoki and Xi (2019) show that the benefits of board-CEO collaborations have induced firms to appoint CEO-friendly but formally independent directors. Thereby, firms circumvent the regular requirements and preserve board-management collaboration that is needed to benefit from a board's advice & counsel role. Their results indicate that replacing inside directors with independent CEO-friendly directors has been an efficient response in the post-SOX era when measuring its effect on firm profitability.

In distinct monitoring-specific domains, recent research, however, shows that board-management ties are more harmful than beneficial. For instance, about executive compensation, both Hoitash (2011) and Hwang and Kim (2009) find social ties between outside directors and management compromise the arm-length contracting to provide incentive-aligned pay. Hwang and Kim (2009) further show that firm with formally independent but socially linked directors exhibit a weaker turnover-performance sensitivity as firms having socially and formally independent directors.

On the whole, the role of personal relationships between management and board members as well as the impact of social network has recently been given much attention in finance and management research (Hoitash and Mkrtchyan, 2019; Fracassi, 2016; Fracassi and Tate, 2012). The evidence suggests that the formal board independence imposed by post-SOX regulations is, on the one hand, insufficient. On the other hand, it is misguided, when a board's role is interpreted by both its monitoring and advice & counsel function.

2.3.3 Co-option

While CEOs may take advantage of their good social ties with the outside members of the board, the conflicting findings concerning director independence may also be related to a CEO's power conditioned by firm-specific characteristics. Powerful CEOs are, in general, assumed to pose a significant barrier to effective monitoring (Boivie et al., 2016a). Hence, a primary reason for researchers as well as policymakers to emphasise on independent boards is to confine the power of chief executives over the board.

In this context, the problem of powerful CEOs is often approached by investigating certain conditions that might have led to such an undesirable CEO-board relationship. In this regard, the composition of the board has been singled out as a key reason, which motivated numerous studies to focus on the CEO's role in the director selection process (Withers et al., 2012). Considering that still about half of S&P 500 firms have CEOs serving concurrently as board chair (see Figure 2.1 in Section 2.1), the influence of CEOs on the director selection process cannot be neglected.

Correspondingly, many studies about board independence, consider whether outside directors are co-opted – captured – by the CEO. While the concept of co-option has been applied to various contexts, about boards, it describes the process by which outside directors come to support the objectives of management (Pfeffer and Salancik, 1978; Pfeffer, 1992). According to Shivdasani and Yermack (1999), the influence is particularly

bigger for firms which have either no nominating committee or the CEO is a member of this committee. As a consequence of such appointments, outside directors who feel beholden to the CEO for their appointment, or have external social ties to the CEO, may substantially undermine board monitoring effectiveness.

Measuring a board's co-option as the percentage of all directors, including insiders, who were appointed after the CEO assumed office, Coles et al. (2014) examine the effect of co-opted directors on several monitoring measures such as CEO turnover, compensation as well as firm's level of investment. With their findings largely confirming their hypotheses of a detrimental effect of co-opted boards, they further invert their analysis and specifically investigate whether non-co-opted independent directors contribute to more efficient board monitoring. Their results show that a greater degree of non-co-opted independence on the board is associated with more effective CEO incentive-alignment, CEO turnover and lower firm investments. With regards to the weak and inconsistent findings on the relationship between traditional measures of board independence, monitoring effectiveness, and performance (Dalton et al., 1998; Rhoades et al., 2000; Deutsch, 2005), this study shows that independent directors who are co-opted by the CEO are not as independent as previously assumed, and hence non-co-option appears to be a significant determinant of directors' actual independence. Consequently, the question remains how influential CEOs select new outside director candidates.

Fracassi and Tate (2012) approach this problem by testing whether management ties to potential directors influence the director selection process, and eventually firm performance. They construct a social network index, which aggregates the network ties between outside directors and CEOs regarding four categories: current employment, prior employment, education, and other activities. Using the entrenchment index by Bebchuk et al. (2009) as a proxy for CEO power, they show that greater CEO power is associated with a higher degree of the selected outside director's social network index. Although this finding alone does not depict their subsequent monitoring effectiveness, it appears that CEOs tend to have their friends on the board, which in reference to Coles et al. (2014) makes them easier to capture. However, as to task performance, Fracassi and Tate (2012) provide evidence that boards, which have a greater proportion of directors who have external network connections to the CEO, are less effective monitors, showing that related firms engage more frequently in acquisitions and have a lower firm value.

Overall, the social connectedness of the CEO to outside directors appears to be a

considerable measure for a board's independence. However, CEO-board ties could also be beneficial, depending on the firm's current needs (Schmidt, 2015). Regardless, given the evidence by Coles et al. (2014) and Fracassi and Tate (2012), it is apparent that a CEO's power over the board is a significant moderating determinant in board independence.

2.3.4 CEO power

Finkelstein et al. (2009, p. 245) argue that the board's vigilance in monitoring management is decreasing in the degree of the CEO's power over the board. Powerful CEOs can significantly influence the functioning of the board in numerous ways, which makes the issue being an almost indispensable proxy in board governance research. While CEOs may substantially exercise and nurture their power in the selection of board members, their power and entrenchment respectively is conditioned by several other factors.

CEO duality refers to a leadership structure in which the CEO is also the chairman of the board. As a widely-used board leadership configuration by US public companies, it has received much attention by extant literature in that it is often used as a controlling variable in board governance research. Nonetheless, overall, the evidence of a direct influence of CEO duality on monitoring effectiveness and firm performance is inconsistent, which is possibly related to its ambivalence (for reviews see, Krause et al., 2014; Dalton et al., 1998). On the one hand, a CEO-chairman could utilise his increased power to bypass or influence the board regardless of shareholder interests, and on the other hand, duality could be a signal of more effective leadership, especially during times when effective monitoring less needed (Finkelstein et al., 2009, p. 239).

Following Westphal and Zajac (1995), CEO tenure relative to board tenure is another frequently used measure of CEO power. Closely related to Coles et al. (2014) and their measure of co-opted directors, CEOs with tenures that are relatively longer would have greater chances to capture directors and extend their power over the board. Finally, CEO power is a dynamic process. Retaining a CEO improves his bargaining position in the director selection process, which the CEO influences in his favour by reducing the proportion of outside directors (Hermalin and Weisbach, 1998; Graham et al., 2017).

CEO power may also depend on how equity ownership is concentrated among outside directors relative to the CEO. With regards to agency theory, directors who own stock are assumed to engage in effective monitoring, since their interests are more closely aligned with those of shareholder (Fama and Jensen, 1983). Irrespective of the motivational

characteristics of outside directors' equity ownership, it should be acknowledged that certain mechanisms can substantially inhibit a CEO's extension of power. For instance, apart from aligning directors financially with the interests of shareholders, research argues that board committees are expedient in coping with the most important board tasks, given their high complexity and timely manner (Dalton et al., 1998). In this regard, Faleye et al. (2011) provide evidence that a majority of independent directors serving on at least two of the three principal monitoring committees – audit, compensation and nominating committee – helps to improve monitoring quality. In addition, Brandes et al. (2016) show that overlapping committee memberships can result in better monitoring in terms of CEO total and incentive compensation. These findings underpin that the composition of subgroups – such as committees – can be a significantly moderating determinant in power relations within the board (Johnson et al., 2013).

Aside from board-specific factors, prior literature stresses the fact that CEOs and managers may nurture their power from deficiencies in the greater corporate governance arrangements, such as shareholder provisions regarding voting power and golden parachutes in management compensation contracts. Since numerous provisions exist, and it is sometimes context-dependent which provisions affect the allocation of power between management and shareholders, extant research usually aggregates these corporate governance provisions by using index measures (Gompers et al., 2003; Bebchuk et al., 2009). Although the literature generally documents the effectiveness of such measures, they can only indirectly capture the cross-sectional variation in the allocation of power between the CEO and other board members.

A recent theoretical paper by Levit and Malenko (2016) elaborates on the issues of directors' reputational concerns. They show that weaker corporate governance, accentuated by firms where management, particularly the CEO, is in control, motivates directors to build a reputation of being management-friendly. Consequently, as directors neglect their fiduciary, independent monitoring responsibilities and instead act in the interest of managers, their chances rise to gain additional board seats at management-friendly firms. It appears that this would particularly hold within a firm's peer network since corporate governance standards, i.e. the tendency to a management-friendly governance structure, are often determined by peer firms (Bouwman, 2011).

In summary, this brief discussion illustrates the importance of CEO power as a determinant of a board's functioning and by extension, also firm performance. Nonetheless,

despite the common consensus about the negative relationship between CEO power and board functioning, Haynes et al. (2019) show that board monitoring can alleviate the harmful effect on firm performance. Further, it should be acknowledged that CEO power is a function of a multitude of behavioural issues that may be conducive to strengthen the position of the CEO and ultimately curtail the board's independence. In their review, Westphal and Zajac (2013) discuss these behavioural processes, underpinning the research area's need to advance towards are more socially-informed corporate governance theory.

2.3.5 Summary

Overall, from the discussion on the independence of boards and its directors, two interrelated issues in measuring independence become apparent: how one defines independence and the caveat between formally and socially independent directors. Even though the majority of board members are outside directors with no direct affiliation to the firm, their independence may be compromised by existing relationships to the firm's management before the board appointment. This especially becomes a problem if the CEO has ample power to influence the selection of directors and other functions of the board.

However, so far widely neglected, board-management social ties may also be beneficial to the firm, especially in terms of the board's additional advisory role. Besides Westphal (1999) and Schmidt (2015), other studies confirm the moderating influence of board-management social ties. For instance, Adams and Ferreira (2007) methodologically derive implications of combining both the monitoring and advisory & counsel board functions. Their core assumption is that the CEO faces a trade-off in sharing information, such that on the one hand, the quality of the board's advice is dependent upon the CEO's provision of firm-specific information. Conversely, the board, particularly when independent, would use that information to interfere in his decision-making as part of its monitoring function.

Since the board attends two interrelated functions, the trade-off in sharing information considerably determines the specification of the quad model's independence. Although the quad model aims to test the effectiveness of the board from solely a monitoring perspective, a one-sided emphasis on either independent or collaborative boards might have adverse consequences for the firm since neither effective monitoring nor valuable advisory exchange is possible (Adams and Ferreira, 2007).

Consequently, the conjuncture of the two board functions shapes the director-management relationship and the requirements concerning director independence. Nonethe-

less, in order to offer effective monitoring, a director needs more than full independence. It also needs information from executives and other affiliated parties. Thus, the search for effective board monitors should not ignore the board's advice & counsel function. The following section on expertise discusses this circumstance in more detail.

2.4 Expertise

When selecting directors, independence is only a precondition. Without an adequate level of expertise in the fields related to the firm, independent directors could not sufficiently comprehend the issues at hand, and therefore would not be able to contribute to effective board monitoring (Forbes and Milliken, 1999). But what exactly is expertise regarding board monitoring?

A director's expertise in a specific domain comprises his entire corresponding human and social capital, which includes knowledge, experience and the personal network. Extant research that has dealt with the effects of expertise on monitoring effectiveness has its origin in the resource-dependence theory (RDT) by Pfeffer and Salancik (1978). In contrast to agency theory, the board is generally not only seen as having a monitoring function, but it is also a source for advice and counsel as well as a link to the external environment. Nevertheless, these two board functions are not distinct (Brickley and Zimmerman, 2010). A director's expertise, which is valuable to attend a firm's advisory and counsel provision, can also strengthen the quality of their monitoring (Boivie et al., 2016a; Adams and Ferreira, 2007).

The central tenet of the RDT is that firms attempt to reduce their exposure to uncertainties associated with their environment. A large body of literature argues that the board of directors is a primary method for firms to absorb critical elements of environmental uncertainty (Pfeffer, 1972; Boyd, 1990; Hillman et al., 2000). These uncertainties emerge from various sources, such as competitors, regulators, governments and technological change. It is assumed that by limiting the exposure to such external uncertainties, firms also limit their internal – organisational – uncertainties. Although the focus here is on how firms can increase their resource provision through their board of directors, RDT also applies to other contexts such as why firms engage in mergers and acquisitions, or joint ventures (for a review see, Hillman et al., 2009).

According to Pfeffer and Salancik (1978) firms can benefits from directors by (1) gaining information in the form of advice and counsel, (2) expanding its access to

channels of information between the firm and environmental contingencies, (3) acquiring preferential access to resources, and (4) improving its legitimacy. To what extent directors are capable of providing these resources to the benefit of their firm is captured by measuring a board's human and social capital (Johnson et al., 2013). Human capital refers to an individual's knowledge, skills and experience, whereas social capital describes an individual's interpersonal linkages.

In the board context, directors' human capital describes their ability to positively contribute to the board's tasks, i.e. advice & counsel and monitoring (Hillman and Dalziel, 2003). Directors' social capital relates to their ability to use social ties – both inside and outside the firm – to contribute to the board's tasks (Burt, 1992; Kim and Cannella, 2008). Although social capital is more often considered in the context of advice & counsel, it should not be neglected that a director does not only receive important information through her linkages, which could directly contribute to monitoring issues. But, also her social ties influence her overall approach to monitoring – e.g. if she has many linkages to other outside directors. Therefore, the following will not only consider expertise in the form of human capital but also social capital.

2.4.1 Human capital

Since directors' human capital differs greatly in specific aspects, prior literature has often categorised those aspects by function or level, e.g. business expertise, industry expertise, or financial expertise. In the following, the literature on human capital is divided into a ternary and hierarchical categorisation as proposed by Castanias and Helfat (1991, 2001): (1) generic, (2) industry-specific, and (3) firm-specific capital. This categorisation builds upon two dimensions: First, to what extent is a director's human capital transferable across all industries, and second to which degree does the director's human capital has the potential to generate rents.

Generic expertise

A director's generic expertise covers knowledge, skills and experience that are transferable across industries (Castanias and Helfat, 1991, p. 160). Sources of this expertise are both education and prior experience. Similar to the quad model, prior literature often intends it in a specific board function domain.

A popular object of study is the directors' financial expertise. Agency theorists claim

that it is a key quality in monitoring management in an effective manner. Regulators have particularly recognised financial expertise as a valuable characteristic of directors, especially those sitting on the audit committee.[2] By SEC definition such knowledge can be acquired through education and experience in various capacities.[3]

Aside from regulatory and listing requirements, the motivation to appoint financial experts resembles the two principal board functions, monitoring and advice & counsel. On the one hand, extant research examines how financial experts provide valuable resources and advice to effect financing decisions. These studies show that firms can expect more efficient financing decisions, in terms of access to pay and lower borrowing costs (Mizruchi and Stearns, 1994). On the other hand, prior literature shows that the addition of a financial expert improves financial reporting quality, which essentially attends the purpose of the SOX act and following regulatory and listing requirement changes (Agrawal and Chadra, 2005). Nevertheless, directors with financial expertise also serve as a signal to other stakeholders, corroborating that the focal firm has adequate board monitoring in place, which can result in lower financial lending expenditures (Mizruchi and Stearns, 1994; Burak Güner et al., 2008).

In terms of director quad-qualification, the focus should be on how financial expert directors improve the board's monitoring effectiveness. Considering market expectations, Davidson et al. (2004) and Defond et al. (2005) show that investors appreciate the presence of financial experts on the audit committee. Supporting the agency perspective on the board's monitoring function, Defond et al. (2005) also find that the stock market reaction to the appointment of financial experts is strongest when boards are more independent.

However, existing research is ambiguous regarding the effectiveness of financial expert directors in monitoring decisions. In support of financial expert directors, Agrawal and Chadra (2005) find that such expertise among board and audit committee members reduces the probability of earnings restatements. The study by Dhaliwal et al. (2010) documents a positive effect on accruals quality, when financial experts sit on the audit committee. However, Burak Güner et al. (2008) fail to find evidence that such directors improve monitoring effectiveness in executive pay contracting. Also, Minton et al. (2014) show that banks with financial expert directors were subject to greater risk-taking during the financial crisis.

[2]Section 407 of the Sarbanes-Oxley Act 2002 requires firms to disclose whether its audit committee includes at least one member who is a financial expert

[3]Section 407 of the Sarbanes-Oxley Act 2002, II. A. 4(c)

Such findings are surprising considering regulators intention to improve investor protection. Correspondingly, Erkens and Bonner (2013) argue that the ambiguity of prior results may originate in the misconception of SOX regulation, which allows directors without direct experience but with supervisory experience (e.g. CEOs) to qualify for regulatory purposes as 'financial experts' – a practice related to the structural elaboration theory (Joseph et al., 2014). Altogether, this shows once again that the formal requirements to board composition fail to induce effective monitoring.

Directors can also bring CEO experience to the board, through current and past CEO positions. This aspect of generic human capital is often referred to as a board member's functional background. The assumption is that CEO-experienced directors are more effective in assessing, advising, appointing, and dismissing a CEO (Fich, 2005; Tian et al., 2011; Khanna et al., 2014). Moreover, CEOs are associated with a great deal of experience and legitimacy (Higgins and Gulati, 2006), which enables them not only to cultivate a cooperative relationship with the CEO of the appointing firm but also to stand up to him in times of discrepancies (Adams and Ferreira, 2007). On the whole, CEO experience appears to be a much sought-after director attribute, which contributes substantially to the director's likelihood to become a career director (Do et al., 2015).

Underpinning these perceptions regarding the comparative advantages of CEOs, several studies show that firms who appoint CEOs as directors enjoy a positive stock market reaction. Emphasising that CEOs are the most commonly appointed executives for outside directorships, Fich (2005) ask under what conditions CEOs are likely to accept outside director appointments and how does their appointment influence firm performance in the long term. Fich (2005) finds that investors generally favour the appointment of CEOs as outside directors, but investors particularly pay attention to the directors home firm's profitability and size.

Fahlenbrach et al. (2010) largely confirm these findings. However, in terms of accounting performance as well as important corporate decisions such as mergers, setting CEO compensation and replacing CEOs, they cannot observe that the appointment of outside CEO-directors has any significant influence. Anyhow, they find that investors prefer outside CEO-directors over other outside directors, but only if not another outside CEO-director is already on the board. They observe, however, that their economic contribution to the firm is questionable, even in pure monitoring tasks such as setting the chief executive's compensation and deciding over his future. The latter is investigated

at length in Tian et al. (2011) who build on the notion to link agency theory and resource dependence theory. Their event study analysis reveals that the board's CEO experience positively affects investor reaction on new CEO announcements. Still, this finding only confirms the previous market-based evidence by Fahlenbrach et al. (2010) and Fich (2005). Further, it only takes into account the effect that CEO experience has on CEO selection, which is just one of several CEO-related tasks of a director.

Although overall, the evidence on the performance as well as monitoring efficiency contribution of CEO-experienced directors is limited, previous studies highlight their importance for the relationship between the board and the CEO. Gulati and Westphal (1999) show that the joint occurrence of outside directors with CEO experience and cooperative CEO-board relationships may increase the likelihood of joint venture creation when boards are not sufficiently independent. According to Westphal and Zajac (1997), cooperative CEO-board relationships are more likely with CEO-experienced outside board members, since CEOs of other firms prefer boards on which they can support their fellow CEO. In the same context, the authors also observe that the contribution of CEO-experienced outside directors to the firm likely depends upon their experience at their home firm. Both studies underpin the multiplicity of the effect of outside CEO-directors on board task performance.

Besides CEO and financial expertise, the literature also covers various other traits of generic human capital. Carpenter et al. (2003) shows that in VC-backed firms, outside directors with international experience positively affect the firm's global sales. Also, venture capitalists and their great deal of experience in accompanying growing businesses provide an excellent source for advice and monitoring for those young firms. Thus, when there is venture capitalist representation on boards of young IPO firms, Kroll et al. (2007) provides evidence that this results in significantly higher market performance. A similar type of support specialists are directors with expertise in mergers and acquisitions. Investigating their contribution in M&A decision-making, Kroll et al. (2008) finds that such directors can be generally supportive in reaching superior acquisition outcomes, especially when they had gained their acquisition expertise as chief executives. McDonald et al. (2008) confirms the positive relationship between board members' acquisition expertise and acquisition outcomes, but show that this relationship is significantly fuelled by specialised M&A experience in the focal firm's product market. In sum, acquisition outcomes – specifically in terms of overpayments – are a good indicator of efficiency in

a discrete monitoring task, which requires director's monitoring as well as advice ability. Regarding that, Kroll et al. (2008) provides evidence for the importance of the interaction between independence or rather vigilance and human capital in M&A decision-making.

Industry-specific expertise

Another characteristic that is regularly examined in conjunction with board capital research is industry-specific expertise, which includes all the knowledge, skills and experience that are only transferable within an industry. Industry experts are explicitly valuable for their tacit knowledge of the firm's competitive, regulatory, technological environment as well as other threats and opportunities to the firm (Kor and Misangyi, 2008).

Kroll et al. (2008) argue that boards without relevant industry experience are unlikely to ensure effective monitoring, irrelevant of how vigilant they pursue their monitoring tasks. In addition to the importance of prior acquisition experience, as mentioned earlier, they also find solid support for the interaction of board vigilance and industry experience on acquisition outcomes, which once again underpins the importance to consolidate agency logic with resource dependence theory. Kor and Sundaramurthy (2009) find that industry experience has also been found to contribute to a firm's sales growth positively. But, with industry-specific experience being a function of current positions held in the industry, Kor and Sundaramurthy (2009) raise the concern that too much industry-specific experience could be detrimental to the firm, given that those directors would be too busy to utilise their human capital. From a methodologically perspective, researchers should generally act with caution when measuring human capital as a function of current positions and roles. How such factors of busyness are affecting a board's task performance will be discussed in Section 2.5.

With the main objective of investigating the interaction of the CEO's and directors' generic and industry-specific expertise, Sundaramurthy et al. (2014) study IPOs of US biotech companies and their tendency to underpricing. They document that the average years of directors' experience appears to be a mitigating factor for the relative size of IPO underpricing. Their paper makes an important contribution; the joint presence of high degrees of industry-specific knowledge among the CEO and directors has positive synergies, but this depends on the age and current performance of the firm. The synergies may become negative when firms mature and are performing well. On the one hand,

the authors refer this to the intensification of behavioural issues between the CEO and directors (cf. Section 2.3). On the other hand, a strong emphasis on industry experience may cause directors to have a narrow perspective on their advice and monitoring function due to the lack of diverse experience and social ties.

Similarly, Kor and Misangyi (2008) find that outside directors with substantial industry experience can offset a lack of industry experience among top executives. By examining entrepreneurial firms in the medical and surgical instruments industry, it is also shown that this negative relationship diminishes in the later stages of a firm's life-cycle.

Overall, the findings indicate the need for diversity of experience on the board. Further, attention should be given to the firm's life-cycle stage as well as its current situation. And lastly, since both Kor and Sundaramurthy (2009), Kor and Misangyi (2008) and Sundaramurthy et al. (2014) only consider individual industries in specific situations, it is questionable whether the findings would still apply in a more general sample.

Firm-specific expertise

In order to exercise oversight and control over top management, the board of directors not only needs generic and industry-specific expertise but largely relies on firm-specific information. At the board-level, this expertise is generally clustered in inside directors. Hence, outside directors rely on inside directors' goodwill to provide such information (Hillman et al., 2000). Due to power relations between inside and outside directors as well as other behavioural issues (Westphal and Zajac, 2013), the flow of objective information towards outside directors may be distorted (Raheja, 2005). Extant literature has hence stressed the need for outsiders with firm-specific expertise. However, thereby problems regarding a director's independence may evolve.

Newly appointed directors can either gather firm-specific expertise as former employees of the focal firm or as representatives of organisations that have a business relationship or other substantial affiliations with the focal firm. However, directors with firm-specific expertise before their first appointment to the board of the focal firm can generally be referred to as affiliated or grey directors. They would under the proposition of Hambrick et al. (2015) most likely not qualify as quad-qualified directors. Consequently, independent directors would usually acquire firm-specific expertise with the start of their tenure.

Assuming that independent directors' firm-specific expertise is a function of their tenure, Kim et al. (2014) find that tenure generally has a positive impact on both a

board's advising and monitoring effectiveness. The fact that with prolonging tenure a director's independence may diminish (cf. Section 2.3) while their firm-specific expertise increases, underpins the notion that the board's primary functions, monitoring and resource provision, are rather complementary than competing. Hence, caution should be given to the selection and weighting of measures of independence as well as firm-specific expertise when measuring director quad-qualification.

In contrast to the linear relationship of Kim et al. (2014), Kor and Sundaramurthy (2009) assume a curvilinear relationship between an outside director's board tenure and firm performance, measured in the firm's rate of sales growth. Directors initially acquire knowledge and skills that help them in their capacity as well as to integrate within the board and firm (Kor and Sundaramurthy, 2009). However, as their tenures prolong, directors may become accustomed to their function, the firm and the board, which results in less effective task performance. Interestingly, Kor and Sundaramurthy (2009) cannot confirm their hypothesis and instead find a negative linear impact of extended outside board tenure, which conflicts with the results of Kim et al. (2014). Moreover, the authors find significant evidence for a mitigating influence of outside directors' board tenure on the aforementioned positive relationship between industry-specific expertise and the rate of sales growth, which further underpins their conflicting finding for firm-specific expertise.

A survey-based study by Rutherford and Buchholtz (2007) finds that outside director's board tenure cannot be associated with the quality of information gathered by the board. Similarly, the authors cannot confirm that longer tenures increase a board's proactive information-seeking behaviour, which indicates that boards become less vigilant as their tenure prolongs. Examining the degree of discontent of shareholders towards the monitoring efficiency of directors measured by the votes withheld during director elections, Hillman et al. (2011) find that shareholders' discontent rises as directors' tenure increases. However, in these two studies that aim to underpin the problems associated with measuring firm-expertise in terms of outside directors' board tenure, subjectivity may play a crucial role.

Lastly, it should be noted that longer tenures may not only be a proxy of increased firm-specific expertise but be simply the result of directors remaining members, because of reputation incentives which will be discussed in more detail in Section 2.6. Overall, the evidence of extant studies is too ambiguous to decide the effect of firm-specific expertise on monitoring efficiency, when measured on directors' tenures. Theoretically, the

importance of firm-specific expertise, especially to overcome distortions in the information flow between inside and outside directors, is beyond question. But, methodologically, the issue remains, and new alternative approaches are necessary.

2.4.2 Social capital

In the context of corporate boards, directors' social ties have received much attention. As mentioned earlier, social ties may decide over the degree of affiliation of a director, but also may have a substantial impact on board functioning regarding board-management relations. Moreover, social ties are an essential contributor to a firm's ability to access resources. Accordingly, research usually distinguishes network ties into internal and external ties, since they have different implications for the board's functioning.

External ties

On the grounds of the resource provision capability of board members, the literature has specifically covered social ties to the external environment, which can be either social ties to other firms or personal relationships and affiliations (Johnson et al., 2013). A director's external social ties may assist firms with timely, valuable information and networks. These may facilitate a firm's access to critical resources, its legitimacy and reputation and its success in new outside director selection to maintain or even improve its board's human and social capital (Hillman and Dalziel, 2003). External ties, which are often proxied by a director's memberships on outside boards, executive teams, clubs, charities and other organisations, supposedly increase not only a director's ability to gather relevant information but also shape his generic and industry-specific expertise. This interdependence and the inability to isolate the effect of one from the other is why most of the previously discussed literature similarly proxies human capital as studies of social capital do.

Sauerwald et al. (2016) show that external ties can compromise board's monitoring performance, arguing that director's extensive levels of external social capital may motivate directors to adhere to the normative pressures of the corporate elite - such as less strict monitoring. This discrepancy with other studies may be a result of their methodology. In contrast to the majority of studies, the authors focus not only on direct ties but also use eigenvector centrality to measure the degree of external social capital. In comparison to the total number of ties, also referred to as degree centrality, eigenvector

centrality measures director's position within the network based on the connectedness of her direct peers (Borgatti et al., 2013). Despite such advantages, the problem with external ties is that directors could be distracted from their monitoring tasks because they are either too busy to cultivate their network ties or too busy with their other professional positions. Hence, high levels of both degree and eigenvector centrality could well be also mitigating factors in terms of a board's monitoring efficiency (Sauerwald et al., 2016). Notably, this overlap with a director's bandwidth underpins the relevance of the quad model (cf. Section 2.5).

As external social capital in the corporate board context is primarily related to the resource provision theory, it is worth examining how firms' characteristics decide over the need for socially well-connected directors. For example, firms with greater business complexity (i.e., size, number of segments, degree of internationalisation) would be keener to employ directors with ample numbers of external ties. In this aspect, Johnson et al. (2011) find that at large, more complex firms, those having a high number of related businesses, instead utilise the potential of directorships' social ties to channel information to the firm in order to reduce information asymmetry and ultimately ensure effective board monitoring. However, there is also evidence that complex firms also need more attention than other board memberships, and hence an outside director who also sits on other boards may not be able to effectively monitor (Khanna et al., 2014), which underpins the considerations about busy boards.

Internal ties

In Subsection 2.3.2, it was outlined how board-management relationships can have both positive and negative synergies. Also, internal social capital comprises social ties within the board as well as any other ties within the focal firm. Inside directors and founder directors are perceived to have internal social ties with people across the whole firm. But, for outside directors, with no or little prior affiliation to the firm, the most likely internal ties are those with other directors, because the board meets only occasionally. In their conceptual paper on director selection, Kim and Cannella (2008) specify three benefits of internal ties and relationships: (1) enhanced trust, which promotes effective collaboration and communication between board members, (2) facilitated the exchange of valuable information and knowledge, and (3) increased teamwork. Hence, within the board, internal social capital particular enhances board members bonding.

Accordingly, Tian et al. (2011) measure internal social capital as the average overlap of outside directors' tenures. They find that investors reacted positively to new CEO selection when internal social capital was high. In a more directly to monitoring related framework, but using the same measure for internal social capital, Sauerwald et al. (2016) show that high internal social capital is associated with lower excess CEO returns.

However, using the average overlap of outside directors' tenures as a proxy for outside directors' total internal social capital neglects the possibility that an outside director could have made ties to executive directors and the management. Therefore, Kor and Sundaramurthy (2009) measure internal social capital as the average board tenure of outside directors under the simplification that firm-specific human capital and internal social capital are more or less the same. But, as aforementioned, their analysis of the effect that internal social capital has on firms' rate of sales growth yields a significantly negative relationship instead of a positive but curvilinear relationship. The authors ascribe this to escalating group-think phenomenon among outside directors, which results in a resistance to strategic chances and eventually lower firm performance. Hence, it is unobservable if outside directors utilise their ties within the board or firm to gather useful, task and firm-specific information.

Given that firm-specific human capital and internal social capital are very closely related, an analysis of shared tenure may be more fruitful when more focus is given to the details. Correspondingly, Brandes et al. (2016) analyse whether board members who concurrently serve on both the audit and compensation committee positively contribute to monitoring efficiency. They find that such overlapping memberships can significantly reduce overpayments to the top management. Emphasising the importance of information flow between these committees, the authors claim that audit reports may transfer explicit knowledge. Nonetheless, linking two committees through a director's concurrent membership on both committees also transfers tacit knowledge, which may have a substantial effect on the committee's discussions and decision-making. These findings substantiate the argument that social ties within a work unit facilitate communication and collaboration, and ultimately result in better board task performance (Oh et al., 2006; Kim and Cannella, 2008).

From the previous discussion, it becomes apparent that the analysis of internal social capital's influence on a board's monitoring efficiency is difficult. Specifically, in light of internal ties, it is noteworthy that, particularly at the micro-level, human

interaction within groups (e.g. the board of directors) between groups (e.g. the board and management) and between individuals, involve plenty of behavioural issues that may have unfavourable outcomes. In this context, a growing body of research tries to understand the underlying mechanisms, such as social influencing, helping behaviour, social learning and norms of reciprocity (for a review see Westphal and Zajac, 2013).

Concerning social networks, research of the behavioural aspects of board governance shows that certain mechanisms counteract agency-based mechanisms. As noted earlier, normative pressures from the corporate elite may prompt directors to neglect their monitoring function, when the board is well-positioned within directors' social network (Sauerwald et al., 2016). Similar, internally, directors are also embedded in the social network of board members. However, unlike within their external network, Sauerwald et al. (2016) show that directors may perform more active monitoring, which may result from social influencing among the board members that leads to conformity. Given that board memberships promise advantages in various aspects, individual directors may be more or less exposed to such normative pressures. Hence, Sauerwald et al. (2016) show that high degrees of social ties among board members may result in less excessive CEO pay, and thus demonstrating better board monitoring.

2.4.3 The issue of heterogeneity

The discussion on human and social capital shows that interdependences can be quite substantial, particularly between firm-specific expertise and internal social ties. Hence, as noted earlier, extant literature frequently conflates human and social capital as board capital (e.g. Johnson et al., 2013; Krause et al., 2016; Yoshikawa and Hu, 2017).

Based on the concept of board capital (Hillman and Dalziel, 2003), Haynes and Hillman (2010) propose a construct that decomposes board capital into board capital 'breadth' and board capital 'depth', in which 'breadth' accounts for the heterogeneity of board members' human and social capital. The authors claim that heterogeneity within the board of directors results in more creativity and better decision-making. The results show a strongly significant and positive relationship between board capital breadth, capturing the heterogeneity of directors' functional, occupational, and relational background, and strategic change.

Several other studies substantiate the importance of heterogeneity in analysing board task performance. Tuggle et al. (2010a) provide evidence that boards with more con-

siderable heterogeneity of firm- and industry-specific experience are positively associated with increased board discussion. Knyazeva et al. (2013) confirm that heterogeneity in human capital-based expertise significantly affects corporate decision-making; however, with negative effects on the board's monitoring effectiveness and firm value. A recent study by Adams et al. (2018) shows that boards particularly vary along with the diversity of skills available at the board. Contrary to Haynes and Hillman (2010), boards with greater heterogeneity in skills are associated with lower firm performance. Such ambiguous results concerning human capital diversity reflect the literature on group diversity in general (Tasheva and Hillman, 2019), which highlights the adverse effects of social categorisation in groups.

In the context of the quad model, the heterogeneity of board capital among board members is subordinate to the issue of board capital heterogeneity within individual board members. While group diversity affects the social dynamics of the board and its outcomes, the identification of a quad-qualified director with monitoring domain-related expertise requires to consider the individual-level heterogeneity of human and social capital, which Tasheva and Hillman (2019) add to a director's personal range.

There is only a limited number of studies that consider the relationship of a director's personal range and monitoring effectiveness. When considering the effect of individual-level board capital on monitoring outcomes, most studies focus on domain-specific determinants. Lungeanu and Zajac (2019), however, examine the relevance of directors with broad and deep human capital-based expertise. Their study shows that the personal range in expertise is essential for directors to exert influence. Similarly, Crossland et al. (2014) reveal that CEOs with diverse career experiences pursue more novel strategic approaches than industry peers.

2.4.4 Summary

Indisputable, expertise is the most complex attribute of all in the quad model. Whereas both theory and common sense emphasise the importance of having experienced and knowledgeable outside directors on the board, the results are less compelling. Arguably, this can be attributed to both the fact that most approaches are mere generalisations of what boards really need and the inability to adequately proxy for whatever form of expertise. Most studies attempt to measure director qualification on either generic, industry or firm expertise, but not as a composite of all three types of expertise.

Directors are not one-dimensional; they possess various skills, which makes it difficult to assess director ability. The issue of heterogeneity in expertise substantiates the quad model's perspective on group dynamics. On the one hand, seeking directors with commonalities can reduce frictions among board members and enhance board task performance (Adams et al., 2018). On the other hand, outsized expertise in a single domain neglects the diversity of board tasks. Complex and less specialist monitoring domains require expert directors of several domains or directors with a considerable personal range of expertise (Lungeanu and Zajac, 2019).

Interestingly, supporting the belief that expert directors are more valuable to a firm, the majority of studies discussed here found a positive effect concerning investor reactions. This may be justified in that investors react on the grounds of common sense, although the reality is much more complex when looking at the multitude of tasks involved with directorships. Because then, heterogeneity becomes even more important, since nobody can be expected to be good at everything.

Consequently, the bottom line is to either equate board monitoring effectiveness with firm financial performance while accounting for heterogeneity or highly specialise on distinct monitoring tasks, as proposed by Hambrick et al. (2015).

2.5 Bandwidth

Human capital theory in the context of board governance relies on the assumption that the level of a director's generic-, industry- and firm-specific expertise is a significant indicator to assess board member's ability to fulfil both their monitoring as well as resource provision function.

The literature, however, stresses that even highly skilled and experienced directors have their boundaries when it comes to their capabilities to ensure effective monitoring under the assumption that they are highly motivated (Forbes and Milliken, 1999). Especially in the case of outside directors, their vigilance to effectively monitor might be substantially inhibited by the workload directors are facing due to other responsibilities, such as additional outside board memberships or their executive positions at their home firms. Earlier research by Core et al. (1999), which investigated the relationship between firms' governance structures, agency problems and firm performance, had found that boards with busy directors set excessively high levels of CEO compensation, and showed that this, in turn, leads to poor firm performance.

However, besides effective monitoring, firm performance can also be related to the board's advising and counselling role in its relation to the firm's management, which can, in turn, be assigned to the resource dependence theory (Pfeffer, 1972; Pfeffer and Salancik, 1978). Essentially, the idea is that every firm is dependent on its external environment, which creates risk and uncertainty and hence ultimately affects firm performance. Accordingly, the busyness of a director – most commonly defined as a function of her roles at other corporate organisations – can also have positive implications for the focal firm. While directors might acquire valuable information and access to corporate networks that give rise to their resource provision ability, the monitoring experience that directors, for example, acquire in their other directorships might positively affect the board's monitoring ability. Accordingly, the expected negative relationship between the busyness of directors and firm performance could be more complex than the basic rationale, which suggests that having many commitments at the same time distracts the ability to monitor management vigilantly and consequently reduces firm performance.

The following firstly focuses on the measures that define director busyness and how these relate to monitoring ability. Subsequently, it will discuss the relevant literature from the perspectives of reputation and information processing demands.

2.5.1 Multiple directorships

Following criticism by institutional investors and shareholder activists on the appointment of directors who already hold multiple board memberships in other firms, Ferris et al. (2003) closely examine whether such directors fail in monitoring management adequately. In general, it is observed that boards with directors holding multiple directorships are particularly a phenomenon of large size and profitable firms. Directors holding multiple memberships are older and hold prominent positions at their home firms, i.e. are chief executives. In line with the argument that monetary reasons frequently cause multiple directorships, it is found that, overall, multiple directors have lower equity ownership in focal firms. On the other hand, they argue that directors with substantial stakes in a firm view additional directorships as a distraction with greater personal costs. Overall, the findings in Ferris et al. (2003) contradict the conventional wisdom that busy directors are detrimental for firm performance. Their study exhibits that the number of directorships per director, independent of whether inside or outside director, can be positively associated with firm performance and board committee participation, and a lower likelihood of such

lawsuits. Thus, their results provide evidence that busy directors may even provide benefits for their firms.

Fich and Shivdasani (2006) approach the issue of busy directors similarly, but methodologically largely different. In contrast to Ferris et al. (2003) who are looking only at the mere average number of directorships, the authors define an outside director as busy when she holds at least three board memberships and defining a board busy when at least half of the outside directors are busy. Also, a fundamental difference is the usage of panel data instead of a cross-sectional dataset. Overall, Fich and Shivdasani (2006) find a strongly significant negative effect regarding both market and operating performance indicators such as return on assets, return on sales and sales over assets. Unlike Ferris et al. (2003), this strongly suggests a detrimental effect of busy boards on firm performance. A novelty of Fich and Shivdasani (2006) is to look at the relation between busyness and forced CEO turnover. As hiring and firing the CEO is one of the key monitoring tasks of the board, this approach in particular sheds light on the question of whether busyness affects the ability to monitor. Their analysis provides strong support for deteriorated CEO turnover monitoring when boards are busy. In sum, the results of Fich and Shivdasani (2006) show that there might be indeed a negative relationship between busyness and monitoring effectiveness.

Given the contradicting evidence of both studies, Cashman et al. (2012) focus on the appropriateness of different busyness measures in terms of firm performance. Initially, their results confirm the positive effect of multiple directorships observed by Ferris et al. (2003). However, in splitting the sample into S&P 500 and non-S&P 500 firms, their analysis yields a negative effect of busyness for the sub-sample of larger firms, while the sub-sample of smaller firms shows a positive relationship. Further, in controlling for the firm size on the full sample, they find significantly negative coefficients for each of their busyness measures, suggesting that firm size moderates busyness strongly. In order to further analyse the causality between busyness and firm performance, Cashman et al. (2012) test alternative busyness threshold levels, i.e. having only two or more and four or more directorships. Yet, the results across all measures of firm performance are strongest for directors defined as busy when holding at least three board memberships.

While these results are convincing as to the relationship between a director's busyness and firm performance, Cashman et al. (2012) do not observe distinct monitoring outcomes, which raises the question of how much of busyness is reflected in poor monitoring

effectiveness. However, dependent on the size of the firm, it seems that smaller firms benefit relatively more from the resource provision function of directors who are holding multiple directorships. On the contrary, larger firms that are established and well-connected beyond their own industry might prefer directors who are not distracted and vigilantly monitor their management. Hence, the study by Cashman et al. (2012) substantiates the proposition that busy directors are detrimental to a board's ability to monitor effectively.

In this regard, Field et al. (2013) provide further insights, but not all in support of Cashman et al. (2012) and Fich and Shivdasani (2006). Unlike previous studies, their focus is on newly public firms, as it is assumed that such firms tend to prefer the resource provision function over the monitoring function of boards. Using Fich and Shivdasani's measure of a busy board, which defines a busy board as one on which at least half of the outside directors are busy, their analysis reveals that newly public firms with busy boards are higher valued in their IPO year. Moreover, it appears that board busyness of such firms declines as the firm matures, which underpins the hypothesis that firm preferences about directors shift as firms become more established and larger. And lastly, the probability of firms with a busy board to delist within three years is slightly less and to be acquired within three years is higher than for firms with non-busy boards. Concerning firms' size, such findings largely resemble Cashman et al. (2012). Hence, Field et al. (2013) also examine S&P 1500 firms to find whether the positive effect diminishes with firm size or even becomes negative. Inconsistent with the findings of Cashman et al. (2012) and Fich and Shivdasani (2006), who observe large public firms, Field et al. (2013) document a positive relationship between busy boards and the market-to-book ratio.

Another direction in examining the relationship between busyness and firm performance is taken by Falato et al. (2014). The study observes busy directors who sit on boards where either the CEO or a peer director dies. It is assumed that such boards, and specifically the committees, experience a sharp increase in workload following the death of the CEO or director. In comparison to the previously discussed literature, Falato et al. (2014) define busy directors as those who hold at least two outside directorships. In separate analyses of outside director and CEOs deaths, they examine how the deaths of each group affect the firm's stock market return. For both shocks, the death of a director or the death of a CEO in firms with busy boards, the results show a significant decrease in the firm's market value. Furthermore, in support of a detrimental effect of busyness, it is also investigated how such shocks have long-run implications on the quality of board

monitoring. Given that it is an important monitoring task of the board of directors, CEO compensation significantly increases in the year after the death of an outside director. This finding is even stronger when a director of the compensation committee has died. Similarly, audit committee task performance, measured in terms of earning uncertainty and the probability of earning restatements, deteriorates significantly for firms whose deceased directors were in the audit committee. Since the audit committee constitutes an important governance instrument of the board's monitoring function, this finding strongly supports the quad model concept, in which busy directors have a detrimental effect on a board's ability to monitor management.

Besides the main literature focusing on busyness as a predictor of organisational outcomes, other studies have used busyness as an interaction term. Kor and Sundaramurthy (2009) find some evidence that the average number of outside board memberships mitigates the positive relationship between a board's level of industry-specific expertise and sales growth.

2.5.2 Alternative measures of busyness

The review of the literature mentioned above using multiple directorships as the sole proxy to measure a board's busyness has largely found inconclusive results on its relationship to a firm's monitoring and overall performance. Although some studies find strong evidence for a detrimental effect of busyness measured by the number of directorships, others find positive or insignificant relationships. Thus, several extant studies advocate that this measure alone cannot capture the bandwidth of directors.

The rationale for supplement measures is that the pure incidence of a director serving on a board does not adequately reflect how much this commitment consumes of a director's bandwidth. Each firm is different, and directors may also be chairing the board or be committee members. Therefore, Cashman et al. (2012) introduce alternative measures of busyness that adjust the pure fraction of busy directors (i.e. those with three or more board memberships) by weights relating to firm size, business complexity, and industry heterogeneity. For example, the percentage of busy directors who have at least one directorship at a firm with above-average business segments is found to have a stronger and more significant effect on Tobin's q than the percentage of busy directors. Moreover, their analysis yields significant results for a measure adjusting for the director's specific role, i.e. membership or chair in a board committee. But, only weakly significant results

are found for their measure that restricts the definition of busyness to directors with three and more board memberships who concurrently serve as inside directors at their home firm. Overall, Cashman et al.'s alternative measures are largely valid predictors of board busyness; however, they cannot confirm that these are superior to conventional measures.

In contrast to Cashman et al.'s approach, Khanna et al. (2014) combine a set of three alternative busyness measures into one composite measure. Besides the number of each director's other board appointments, this measure also encompasses the complexity and size of the directors' other board appointments. Using director-level data of US Fortune 1000 firms, Khanna et al. (2014) find that subsequent firm performance is negatively related to this combinatory variable of busyness. Falato et al. (2014) adopt the approach of composite busyness measures. In their study observing board monitoring performance around the death of CEOs, they find a strongly significant negative relationship to firm performance for their busyness factor which is a linear combination of board size, the annual number of board meetings, the percentage of independent directors, and the total number of outside directorships. Nevertheless, although each determinant of the measure used by Khanna et al. (2014) and Falato et al. (2014) is severally significant, the largest effect in both studies is observed for the number of directorships – underpinning the conclusions drawn from Cashman et al. (2012).

The recent study by Renjie and Verwijmeren (2018) attempts the issue of measuring a director's busyness from the perspective of distraction. Following Kempf et al. (2017), the authors develop a director-level distraction measure based on industry shocks. The results exhibit that board members who are distracted by unrelated industry shocks attend fewer board meetings and that the number of distracted board members has a significant negative effect on firm value. These substantiate the argument that outside directors' other board memberships have a detrimental effect on the focal firm since the likelihood of distractive events would increase in the number of outside board memberships.

In summary, the validity of other busyness/bandwidth measures is beyond question. But most of the evidence only takes firm performance into account, which in line with earlier considerations does not adequately explain its effect on monitoring efficiency.

2.5.3 Information processing ability

As discussed above, the number of other board memberships alone may not fully reflect director constrains regarding the ability to devote requisite time and attention to the

focal firm. CEOs and other top managers who serve as outside directors on other boards may be even busier than retired directors who serve on the same number of boards. Fahlenbrach et al. (2010) find that outside CEO directors actually hold more additional directorships than inside or other outside directors. Also, sudden events that require intensive monitoring may mitigate the director's vigilance towards his monitoring task.

Accordingly, previous literature has examined board functioning from the perspective of the board's information-processing capabilities (for a review see Boivie et al., 2016a). Besides the mere number of outside jobs, each director's outside job demands also differ in terms of job complexity and similarity. The degree to which a director's monitoring attention is demanded at his other directorships may depend on board-level factors such as board size, meeting frequency and CEO power. In addition, job demands differ in the size and complexity of the firm. Hence, Boivie et al. (2016a) suggest that board monitoring research should take into account the interaction between various barriers to effective board monitoring, underpinning Hambrick & colleagues' idea to consider independence, expertise, bandwidth, and motivation jointly.

One empirical study that examines the influence of information processing capabilities on the board's task performance is by Khanna et al. (2014). As previously noted, human capital is a significant indicator of the abilities of directors to fulfil their function in being an independent monitor, providing advice & counsel as well as other valuable resources to an organisation. But, Khanna et al. (2014) argue that this indicator is substantially moderated by the information processing demands that individual directors face through other board appointments, which is echoed in their composite busyness measure as discussed earlier. In addition to looking at the number of director's other board appointments, this variable of information-processing demands captures firm size and complexity of the firms, where the director holds a board seat. Assuming that each individual has his cognitive limitations in their ability to handle and process information, they propose that busy directors would then make use of heuristics to cope with their responsibilities as board members. Accordingly, such behaviour arises when the information processing demands exceed a director's information processing ability, and thus adversely affects his vigilance, which is especially important for such an unforeseeable task like monitoring.

Khanna et al. (2014) find that on the board level, a higher average degree of directors' information processing demands is reflected in lower subsequent firm performance.

However, more importantly, they find support for their hypothesis that such demands negatively moderate the positive relationship between directors' human capital and subsequent firm performance. This implicates that directors who are too busy to cope with their (numerous) professional responsibilities may not be able to utilise their human capital fully. Eventually, a board which is exposed to excessive information processing demands may – at least – partially diminish the comparative advantage that can be gained from appointing well-qualified, knowledgeable and well-connected outside directors. Above all, regarding the positive relationship between human capital and information processing capabilities, it can be assumed that a director with higher levels of human capital can process more information. Thereby, the director is less exposed to the information processing demands relative to directors with lower levels of human capital (see Tian et al. (2011) and McDonald et al. (2008)). Hence, this gives rise to the proposition of Hambrick et al. (2015) that a director's likelihood of being an effective monitor is a function of all four attributes, with expertise and bandwidth being positively correlated.

2.5.4 Summary

In summary, it is hardly possible to generalise the issue of busyness onto a clear cause and effect relationship. Seeing the complexity embedded in the reviewed literature, specifically concerning the two themes of the appropriateness of the busyness measure as well as the information processing demands and capabilities, it is highly unlikely that there is a 'one-fits-all' measure of busyness respectively bandwidth. Still, the experiences from previous studies allow us to identify possible interactions with other quad attributes, and are therefore essential in constructing alternative measures to account for bandwidth.

2.6 Motivation

So far, the review has discussed prior literature regarding independence, expertise and bandwidth. However, important questions remain: How to trigger directors to act in the company's best interest? How to direct a director's attention towards the firm, particularly, in the case that she also has other responsibilities? According to agency theory, outside directors should have adequate incentives to fulfil their duties and do not collude with managers (Fama and Jensen, 1983).

Studying various forms of director incentives, Yermack (2004) finds that outside directors do not only receive monetary benefits such as cash and equity compensation

(cf. Figure 2.2), but also benefit from the firm's reputation, especially when firms perform well, and other special benefits such as consulting mandates. Although Yermack (2004) shows how manifold director incentives can be, the study does not answer how firms can ensure having highly motivated and responsible directors. To find an answer to this question, the following first reviews the literature on how financial incentives can motivate directors, before moving on to other forms of incentives.

2.6.1 Financial incentives

Financial alignment of the top management's compensation is an important instrument of board monitoring. However, outside directors are also an agency that needs to be incentivised to perform their tasks effectively (Finkelstein et al., 2009, p. 248). This has prompted several studies to analyse specifically how monetary rewards can motivate directors. Similar to executive compensation, director compensation packages may consist of both cash and equity compensation. These usually consist of an annual retainer, plus stock grants, stock options, and fees for attending meetings or serving on committees. But unlike executives, director compensation is quite uniform across the board, because boards are seen as teams (Boivie et al., 2012a). Still, across the literature, it is generally expected that directors shift their attention towards directorships that make good money. Thus, given that many outside directors have additional professional commitments, financial incentives may then help to gain their attention.

Bhagat et al. (1999) study the connection of director share ownership and firm performance, arguing that especially an ownership in the focal company triggers directors to perform more effectively. Using data from 1,700 US firms, categorised by market capitalisation, the authors focus their analysis on how director stock holdings can explain both CEO turnover and firm performance. Their results find that director shareholdings are indeed highly correlated with firm performance, which admittedly could refer to better board monitoring. Regarding a board's discrete decision-making, Bhagat et al. (1999) also find that boards of poorly performing firms, but with high director shareholdings, have a greater likelihood of CEO successions as a consequence of disciplinary actions. Yet, regarding the positive link between directors' equity ownership and firm performance, the authors suggest that it may likewise be the result of directors' own investment decisions, since their insider information may allow them to predict future firm performance more accurately.

Another possible determinant is whether equity ownership is voluntary or mandatory, given that some firms have mandatory holdings policies in place that require their outside directors to own a certain amount of firm's shares. Bhagat and Tookes (2012) provide evidence that corporate policies with equity holding requirements for directors should be considered. Firms appear to enact director equity ownership requirements as an answer to poor corporate governance. Furthermore, director equity shareholdings often deviate substantially from the required level when mandatory holdings policies are in place. However, as suggested by Bhagat et al. (1999), there is no relationship between mandatory equity holdings and future firm performance, while voluntary equity holdings including holdings above the required level have a positive effect on subsequent firm performance indeed. The findings by Bhagat et al. (1999) amplify the literature on director compensation as a tool of corporate governance; however, it is noteworthy that their study covers only a short time frame and it does not observe the effect on particular monitoring activities.

Interestingly, Bhagat et al. (1999) also find that the dollar value of the annual retainer of director compensation is a positive and significant determinant. Considering the oftentimes low amount of the annual retainer in comparison to a director's total wealth or income, this suggests that directors may be incentivised even by small amounts of compensation. In this regard, Adams and Ferreira (2008) find that even meeting fees, which in their study account on average for 1,000 USD, can already bring directors to cope with their board responsibilities. Examining the relationship between meeting fees and board meeting attendance, they find that a director's attendance behaviour is surprisingly sensitive. Further, they observe that firms experience a substantial increase in attendance problems after eliminating meeting fees. Since Boivie et al. (2012a) observe that director compensation is generally uniform among outside directors, meeting fees would be the only incentive pay that is tied to each individual director. However, this has changed substantially in recent years (cf. Figure 2.3). Outside directors increasingly receive equity as part of their compensation. Thus, monetary incentives and especially those related to equity options and awards may add to a director's motivation.

In the context of financial incentives, there is also a social aspect of director compensation. Although equity and cash compensation might motivate outside directors to be more committed, it should be noted that usually, the boards themselves set director pay plans and levels. Interestingly, Boivie et al. (2012a) find evidence that directors

are likely to engage in social comparison when setting their own compensation. They argue that individuals are especially likely to compare themselves to others in situations where there is uncertainty regarding the appropriate behaviour. Particularly, directors compare their compensation level at the focal firm's board to that of their other board appointments, and may even adjust it appropriately. The authors provide significant evidence that the greater the difference in compensation levels between directors' other board appointments and the focal firm, the greater the increase in compensation at the focal firm. Moreover, there is also a positive relationship between CEO and director compensation, which the authors ascribe to directors being less inhibited to raise their own compensation after they raised the CEO's pay.

Hence, it appears that financial incentives may indeed trigger directors to monitor more effectively. However, it is open for further investigation on how this can be linked to particular monitoring activities. Moreover, owing to largely uniform compensation across directors, it is not easy to examine how financial incentives can motivate the individual director. Nonetheless, the increasing trend to compensate directors with stock awards aligns outside directors' interest more closely with shareholder, which should elevate their motivation.

2.6.2 Reputation

As noted previously, depending on the context, firms are likely to appoint directors for their reputation, as it may provide a valuable resource for organisations (Hillman and Dalziel, 2003) and send a positive signal to investors (Deutsch and Ross, 2003). Contrariwise, early research emphasises that reputational benefits constitute a significant incentive for outside directors to accept directorships (Fama and Jensen, 1983). Linked to the question of director busyness, research that finds a positive correlation between busyness and organisational outcomes majorly stresses that the number of board appointments is an indicator for quality – a certification in the corporate world (Boivie et al., 2016b; Cashman et al., 2012; Ferris et al., 2003).

It is no wonder that reputational concerns also matter when directors are resigning from their directorship (Finkelstein et al., 2009). Accordingly, Yermack (2004) observes a negative relationship between director turnover and firm performance, but due to a lack of information, he is not able to differentiate between disciplinary and voluntary leaves. In case of a voluntary leave, he suggests that directors either leave because of a higher

workload for the board during times of poor performance, or because they fear reputational damages.

Calling it the dark side of outside directors, Fahlenbrach et al. (2017) further examine this situation. In line with Yermack (2004), they document that director turnover is especially likely when firms are performing poorly. In addition to firm performance, they also look at discrete adverse events such as extreme negative stock returns, earnings restatements and shareholder litigations. To address the issues associated with a director's reason for departure, Fahlenbrach et al. (2017) exclude directors younger than 70 years and examine whether departing directors accept another directorship at another firm of the sample within the following two years. Similar to Yermack (2004), they also control for whether directors leave in situations where the CEO is replaced as well. On the assumption that directors obtain information about such events earlier than the public, they specifically analyse whether a director's departure can be linked to subsequent negative consequences. Their results strongly support this hypothesis, and hence provide further evidence that directors' are substantially concerned about their reputation. However, it is outstanding how much their results are affected by directors leaving for other reasons, such as being unwilling to cope with an increased workload. Anyhow, Fahlenbrach et al. (2017) show that unlike what outside directors are hired for, some tend to leave the firm during hard times.

A similar approach in studying director motivation is taken by Boivie et al. (2012b). Their analysis covers director-level data for US firms between 1996 and 2003. Supporting the findings of Fahlenbrach et al. (2017) and Yermack (2004), they find that directors' likelihood to leave the board is negatively associated with firm performance. Also, a firm's media visibility is shown to affect a director's choice whether to leave or not: meaning that firms with low visibility have comparably lower prestige and therefore do not offer reputational benefits. But in contrast to Fahlenbrach et al. (2017), Boivie et al. (2012b) are not able to support the hypothesis that a reputational crisis, triggered by shareholder lawsuits and financial restatements, can be positively associated with an increase in director turnover. Finding partial support that these reputational crises are specifically relevant for a director's departure from a high performing firm, the contradicting results may be ascribed to the fact that Boivie et al. (2012b), in contrast to Fahlenbrach et al. (2017), do not distinguish between voluntary and disciplinary departures.

Seeing that reputation matters a lot for directors entry and exit to a corporate

board, Masulis and Mobbs (2014) investigate whether directors value their multiple directorships differently with regards to each firm's reputational benefits. Their main finding is that board meeting attendance is higher for an outside director's relatively more prestigious directorship. Further, these board memberships are also more likely to prompt outside directors to sit on the assumingly more time-consuming audit and compensation committees. This shows that reputation is most likely a trait to consider with a director's motivation. These findings so far mostly coincide with the results and considerations of Fahlenbrach et al. (2017) and Yermack (2004). However, Masulis and Mobbs (2014) extend the analysis of director departures by looking at how prestigious the focal firm's board membership is to the individual director. This reveals that directors for whom the focal firm is relatively more prestigious than their other board memberships tend to remain on the board, even during times of poor firm performance. On the other hand, boards with a greater representation of these directors can be associated with less disciplinary CEO turnovers. Masulis and Mobbs (2014) refer this also to their fear of reputation losses due to the frequently higher public visibility of such CEO dismissals.

In sum, reputation should be considered as a significant determinant of a director's motivation to accept board memberships as well as to resign. However, attention should be given to the relative reputational benefits and costs for each individual director, since these seem to affect a director's motivation strongly.

2.6.3 Other incentives

Besides reputational and financial incentives, the literature shows that also other incentives influence a director's motivation. While it is also closely related to a financial benefit, Yermack (2004) suggests that directors may also be incentivised by personal consulting contracts or other businesses with the focal firm. Such directors are often regarded as grey directors (Finkelstein et al., 2009), as their affiliation with the firm exceeds that of an 'independent' outside director. Although their results show only partial evidence to support their hypothesis, it should be noted that a director's motivation can have a multitude of reasons.

This is also reflected in Boivie et al. (2012b). Besides the aforesaid, they examine whether directors with greater influence in the board are less likely to leave the firm. In this case, the degree of influence is dependent upon whether a director chairs the audit and/or compensation committee and/or holds the board chair. However, the hypothesis

is supported only for directors holding the board chair or the audit committee chair. Giving rise to the significance of a director's bandwidth as discussed in the previous section, the results also show that the relationship is weakened by the number of other board appointments and the circumstance that the director is a CEO at another firm. Nonetheless, the ability to influence board decisions as a motivational factor for directors should not be disregarded, despite its potential interdependence with other variables.

2.6.4 Behavioural concerns

Although reputational benefits and adequate compensation, optionally supplemented by incentive pay, are likely to motivate directors to be board members, it does not necessarily mean that directors are equally motivated to be vigilant monitors (Hambrick et al., 2015). Recently, research increasingly emphasises the importance of studying the behavioural aspects of board governance (Westphal and Zajac, 2013). Thus, Hillman et al. (2008) conceptualise a model to capture the effects of social identification on the board's functioning. Under the assumption that human behaviour is affected by individuals' identities, they argue that directors' identities, in turn, affect board functioning. For instance, a director who strongly identifies herself with a supplier of the focal firm is likely to be constrained in her resource provision tasks. Similarly, a director with strong CEO identification is less likely to be inclined to engage in effective monitoring. To measure these effects, the authors suggest holding onto prior empirical research that uses demographic characteristics to capture differences in organisational behaviour.

Another issue regarding motivation is how board members direct their attention. As mentioned above, individuals are limited in their information processing capabilities, which eventually forces them to direct their attention selectively (Khanna et al., 2014). Accordingly, based on a content analysis of board meeting minutes, Tuggle et al. (2010a) provide evidence that boards situationally allocate their attention to monitoring. Firstly, board independence is contingent upon the board's need for monitoring effectiveness (Finkelstein et al., 2009), such that the board's attention declines when firm performance is relatively high, and attention level increase when firm performance is relatively low. Secondly, supporting the power constraints in CEO-board relations mentioned above, CEO duality negatively affects the board's allocation of attention to monitoring. Thirdly, in reference to Renjie and Verwijmeren (2018), directors might feel somewhat motivated to direct their attention towards directorships which are currently in the spotlight.

Altogether, these findings support the view that the behavioural aspects cannot be disregarded.

2.6.5 Summary

In a nutshell, motivation appears to be a substantial determinant in directors' monitoring performance. Given the ambiguity about which motivational factors are eventually decisive for the particular director, a clear causal relationship between specific incentive forms and monitoring effectiveness is impossible. However, each of the determinants of a director's motivation mentioned above has its relevancy.

In general, the expectation is that financial and reputational incentives are most likely relevant to the majority of directors in comparison to those incentives that are primarily subject to personal preferences.

2.7 Conclusions

In essence, the review of the present literature underpins the complexity of the quad model but also substantiates its relevance in improving board monitoring effectiveness. Although the quad model by no means attempts to find the 'unicorn' for board monitoring (Johnson et al., 1996), the multiplicity and interdependences behind the four attributes document that such a director would not exist. It is therefore logical that the quad model authors propose to measure a director's quad-qualification concerning specific monitoring domains.

In light of the recent developments concerning board composition as described in Section 2.1, the literature increasingly questions the suitability of post-SOX regulation (Boivie et al., 2016a; Joseph et al., 2014). The various responsibilities associated with the effective functioning of board monitoring, evidently require different skills, experience, and knowledge (Adams, 2017), which can sometimes only come at the cost of giving up some board independence – particularly about obtaining firm-specific expertise (Tian et al., 2011; Johnson et al., 2013). In this context, the currently prevalent CEO-only board structures appear to be misguided concerning the benefits of board-management collaboration and internal social capital.

The previous review highlights how interdependent the four attributes are. For instance, there is the tradeoff between independence and expertise when boards seek to appoint independent directors with relevant firm-specific expertise. However, also between bandwidth and expertise, which face the tradeoff that a suitable candidate is limited in

the scale of concurrent positions that amplify her personal range in expertise. Likewise, bandwidth and motivation are also fundamentally linked with each other. Directors holding only a few concurrent professional positions may be more motivated to engage fully in board decision-making. Therefore, the above literature review depicts the importance of the quad model for corporate governance research. While the quad model and this thesis specifically focus on the monitoring effectiveness of boards and its directors, relevant experience, skills, and knowledge will result in both better monitoring and advice & counsel (Kroll et al., 2008).

Secondly, the ability to obtain and process information is constraint by the individual's capacity to do so. Facing the complex tasks involved with their advice, counsel, and monitoring responsibilities, directors are likely to be constraint by cognitive barriers when they are concurrently sitting on other several other boards or hold an outside executive position (Boivie et al., 2016a; Khanna et al., 2014).

Thirdly, the question of whether directors have the requisite time to engage with the monitoring responsibilities depends on their motivation to give up other monetary and reputational advantages. A problem to director motivation is that board monitoring quality can at most only be assessed by external stakeholders at the board-level. This circumstance limits a director's motivation to exert influence on board decisions and promotes directors to capitalise on the prestige of board memberships.

These considerations only rudimentary reflect the issues involved in capturing a director's ability and motivation to provide effective monitoring. Accordingly, prior literature supports the advantages of a holistic attempt on director selection and board composition (Boivie et al., 2016a; Tian et al., 2011; Payne et al., 2009; Hillman and Dalziel, 2003), and the quad model is its first conceptualisation.

These articles particular accentuate the complexity of board composition, which, grounded in the multiplicity of complementing and competing effects, fundamentally supports the relevance of the quad model. Similarly to the quad model, Boivie et al. (2016a) argue that the key to higher board monitoring quality is to overcome the barriers that hinder effective obtaining, processing, and sharing of relevant information. Although such barriers are contingent on board-, firm-, and industry characteristics, a director with both ability and motivation is more likely to provide effective on-going monitoring. Moreover, Payne et al. (2009) develop a model that broadly corresponds with the quad model and is further consistent with the above literature review. In order to be effective,

they argue that a board needs to have the knowledge, information, power, incentives, and opportunity/time.

In conclusion, the present literature illustrates that the quad model is a promising solution to greater board monitoring effectiveness because it aligns a firm's monitoring needs with the cognitive abilities and norms of effort regarding both individual and group task performance (Forbes and Milliken, 1999; Boivie et al., 2016a).

Chapter 3

Data & Research Methodology

3.1 Introduction

The main sample of this thesis is composed of 59,940 observations for a total of 11,704 directors at 1,231 firms. The sample corresponds to the universe of board members at S&P 1500 firms between 2009 and 2014, excluding the financial services and utility sectors.

The purpose of the following is to provide an overview of the key steps involved in the collection of sample data relevant to the subsequent empirical chapters. Therefore, in Section 3.2, the primary databases are introduced regarding their particular purposes and major constraints in the sampling process. Subsequently, the sampling process of the main sample is summarised in detail. Section 3.4 describes the director-level measures used across the empirical chapters and presents their descriptive statistics. Section 3.5 introduces the operationalisation of the quad model, which is central to the methodological approach in the application of the quad model.

3.2 Sample Selection

The four attributes of the quad model; independence, expertise, bandwidth and motivation; cover a broad spectrum of individual characteristics that require much information such as relationship, employment and compensation data. For the proposed analysis, data has to be available for each director at a given firm and fiscal year.

The corporate network database BoardEx by Management Diagnostics Ltd. is one of the most popular databases in this area of research, covering mainly biographical, firm-related and relationship information of directors. For this thesis, it provides the greatest extent of information, and therefore it serves as the primary database in the construction

of the main sample. All other databases are consecutively merged with BoardEx.

However, there are three major, notable issues with BoardEx that affect the data collection process. Firstly, the BoardEx data at hand is provided in various tables, which cover different subjects of a director's background such as employment (incl. board committee membership[1]), education, relationships and other activities (see Figure 3.1). Much of this information is summarised in a single dataset (Board Summary) that lists all directors per firm and reporting date. However, the variables in this 'Board Summary' dataset are often either not relevant to this thesis or wrongly constructed. For instance, BoardEx reports aggregate measures that relate to the entire board, whereas the quad model refers explicitly to outside directors only. Also, the summary dataset does not include information on committee tenure. As a consequence, it is necessary to compute additional proxies using the 'Director Profile' datasets. These proxies are calculated after the construction of the main sample, and are discussed in Section 3.3.

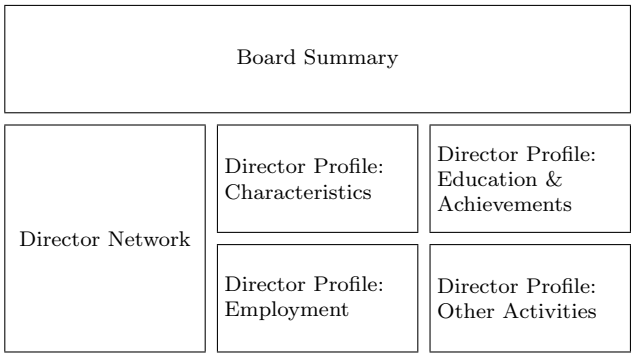
Secondly, BoardEx's coverage of US firms is not reliable before 2006 when using relationship data, since the database only started covering senior managers in that year. Therefore, it is not appropriate to start prior to 2006. Moreover, in parts, the subsequent analysis relies on CEO compensation data, which is provided by Compustat's Execucomp database. Due to accounting changes imposed by the Financial Accounting Standards Board (FASB) as well as changes to disclosure requirements by the United States Securities and Exchange Commission (SEC), the database follows a new format as of 2007, including changes to the valuation of options. Therefore, and also due to the financial crisis in 2007/08, the chosen sample period for this thesis is 2009 to 2014. Accordingly, the final sample does not capture a full economic cycle but instead refers to a period of recovery and economic expansion, which creates sample selection and time period biases.

3.3 Sampling Process

As previously stated, BoardEx serves as the original dataset in the construction of the main sample. Since BoardEx's Board Summary dataset covers public as well as private firms, the first step is to exclude all private firms. Next, all information related to directors' compensation and wealth is dropped, given that the final sample uses Execucomp. Besides

[1]The data on hand differs from the WRDS-version of BoardEx, which does not provide information on the committee service of board members

Figure 3.1: Database Structure of BoardEx



that the availability of earnings and wealth data in BoardEx is limited, the data also causes issues with respect to duplicate observations, because multiple entries for each director-firm-year observation are reported if the particular director receives options with different vesting dates. Hence, all duplicates are also excluded. This results in a refined BoardEx dataset with 64,522 unique directors and 7,071 unique firms.

The fourth step in the sampling process is to merge BoardEx with Standard & Poor's Compustat Fundamental Annual database. The rationale to first merge BoardEx and Compustat instead of merging BoardEx and Execucomp is that Compustat provides additional variables that allow merging the data more accurately. In contrast to Compustat, BoardEx uses the month-year date of the fiscal year-end and does not report the corresponding fiscal year. Using Compustat's variables for the reporting date, fiscal year-end month and the actual period-end date, merging these databases results in a sample of 62,096 directors from 6,826 firms.

The subsequent step is to add Execucomp's director-level compensation data. This process, however, is impeded by the lack of a common director identifier to link directors in BoardEx and Execucomp, which makes it necessary to match directors by name. Since both datasets generally follow common name structures, the strings are tokenised into their main parts: first name, middle name (initials), surname and if available the generational suffix and nickname. This ensures that for instance, academic, aristocratic, legislative, executive, military and ecclesiastical titles cannot interfere with the matching process. In addition, to minimise mismatches, each director-firm-year observation is only merged with all available director observations in the corresponding firm-year. The matching process itself is based on several matching algorithms, such as Damerau-Levenshtein distance, vector decomposition and Soundex, which compute the similarity between the strings.

This automated matching procedure yields 141,016 director-firm-year matches, which corresponds to 71% of the overall Execucomp sample. However, as a matter of principle,

the remaining sample is matched by hand. If required, the director-firm-year link is verified using biographical profiles on the Bloomberg database or company websites. Thereby, another 2,129 matches are obtained, which rounds up to a total of 143,145 observations. Using the linking table created through the described matching process, the compensation data from the two Execucomp datasets is merged with the sample dataset. It is important to note that only firm-year observations are dropped for which not a single director-firm-year observation is retrieved from Execucomp. Thereby, the primary data collection is completed, yielding a raw sample of 56,594 directors from 6,811 firms.

In light of the target sample universe and period, the raw sample is reduced to S&P 1500 firms during the fiscal year 2009 to 2014. Also, in order to avoid issues related to different regulatory standards and other unique conventions, financial services and utility companies are excluded from the sample. Based on the Standard Industrial Classification (SIC) system, this concerns financial services firms with two-digit SIC codes between 60 and 67 and utility firms with a two-digit SIC code of 49.

Finally, two adjustments ensure a high-quality sample. Firstly, all firms, where the reported board size deviates more than one from the actual number of directors in a particular firm-year, are excluded. Secondly, all firms with less than two consecutive firm-year observations are also dropped. The final sample of S&P 1500 firms between 2009 and 2014 consists of 59,940 observation with 11,704 directors from 1,231 firms. An overview of the sample selection process and the sample distribution by industry and fiscal year is presented in Table 3.1.

Table 3.1: Sample Selection and Distribution

Panel A: Sampling Process

Step		Directors	Firms	Observations
1	Original BoardEx (By reporting year: 1999 - 2015)	97,060	12,949	800,636
2	Exclude private firms	(25,867)	(5,067)	(155,612)
3	Exclude multiple observations for vesting date of options	(6,671)	(811)	(145,897)
4	Merge with CS	(2,426)	(245)	(35,706)
5	Merge with Execucomp	(5,499)	(15)	(96,993)
6	Reduce to sample firms (S&P 1500)	(37,208)	(5,073)	(222,265)
7	Reducing to sample period (2009-2014)	(3,279)	(37)	(60,166)
8	Exclude all financial services & utility firms	(4,064)	(407)	(23,488)
9	Exclude firms with insufficiently represented boards	(1)	0	(40)
10	Exclude firms with less than 2 consecutive firm-year observations	(341)	(63)	(529)
Final Sample		11,704	1,231	59,940

Panel B: Sample Distribution by Industry Sector and Fiscal Year

Industry	2009	2010	2011	2012	2013	2014	Directors	Firms	Observations
Agriculture, Forestry & Fishing	23	23	23	22	23	18	28	3	132
Construction	207	211	208	211	214	214	272	24	1,265
Manufacturing	5,462	5,387	5,428	5,399	5,234	4,264	6,409	634	31,174
Mining	542	571	606	616	611	606	848	72	3,552
Public Administration	48	49	48	51	55	43	63	4	294
Retail Trade	1,062	1,038	1,029	1,037	1,049	498	1,387	123	5,713
Services	1,874	1,982	1,904	1,868	1,808	1,493	2,523	243	10,929
Transportation & Public Utilities	672	679	729	718	717	660	905	73	4,175
Wholesale Trade	480	481	502	470	460	313	635	55	2,706
Total	10,370	10,421	10,477	10,392	10,171	8,109			59,940

3.4 Variable Definitions & Construction

The following describes the construction of each variable related to the four attributes. The selection of suitable measures for testing each attribute is one of the main contributions of this thesis, because – to the best of the author's knowledge – there is not any published empirical study on the quad-model.

The quad-model addresses directors' monitoring effectiveness concerning the individual monitoring tasks of boards. Therefore, there is not one single set of variables that measures director's quad-qualification in all monitoring aspects. Accordingly, the selection of variables is described individually in the subsequent empirical chapters. The purpose of this chapter is to describe the data management process and the construction of the director-level variables. Also, the measurement of attributes and the subsequent composition of domain-specific quad-qualification measures are described in the empirical chapters.

3.4.1 Independence

Outsider. The by-far most used variable to account for a director's independence is whether she is a non-executive director, subsequently referred to as an outside director. Accordingly, the first variable *Outsider* is a dummy variable, which is set to one, if the director is defined as a non-executive director by BoardEx. On average, 85.3% of all director's covered in the main sample are outsiders. For comparison, the dummy variable *Independence* is derived from the BoardEx dataset, which defines directors as independent per SEC regulation and listing requirements.[2] Accordingly, 81.1% of directors are 'independent'.

Co-option. Coles et al. (2014) suggest that the independence of a director is directly related to whether he joined the board before or after the current CEO (i.e. co-opted). Thus, BoardEx's subordinate employment datasets are used to obtain the beginning date (month and year) of both the CEO's and the director's tenure. Consequently, all non-CEO directors are classified by the dummy variable *Co-opted*, which equals one if the beginning date of tenure is on or after the CEO's beginning date of tenure. While on average 39.4%

[2]The Sarbanes-Oxley Act (2002) (specifically Section II, Subsection 301) and subsequent regulatory changes and listing requirements by the SEC, NYSE, and Nasdaq impose strict rules on who is defined as 'independent'. Firms are required to disclose a detailed account of director independence on SEC Form 10-K.

of all directors are co-opted, it is worth noting that although 43.5% of outsiders are co-opted, only 15.7% of inside (executive) directors joined the board later than the CEO. This suggests that CEOs tend to intervene in the appointment of outsiders rather than changing their management team after they become CEO.

Still following Coles et al. (2014), another measure of co-option is added: *TW Co-opted*. This describes the number of years of shared tenure between a co-opted director and the current CEO. Thereby, Coles et al. (2014) accommodate for the possibility that the influence of co-opted directors increases over the years. If the director is non-co-opted, the variable is set to zero. The tenure averages of co-opted directors, about 2.23 years for outsiders and 1.15 years for insiders, resemble the difference found in the simple co-option version; the executive management team appears to cohesive over the CEO's tenure.

$$\text{Co-opted} = \begin{cases} 1 & \text{if bdate}_i \geq \text{CEO bdate} \\ 0 & \text{if otherwise} \end{cases} \tag{3.1}$$

$$\text{TW Co-opted} = \begin{cases} \text{Tenure}_i & \text{if Co-opted}_i = 1 \\ 0 & \text{if Co-opted}_i = 0 \end{cases} \tag{3.2}$$

Outside Shared Experience. The final measure of independence *Outside Shared Experience* aims to capture whether a director may be preoccupied in her monitoring role because she has or had an employment relationship to the current CEO before her appointment to the board. Any employment in any private or public firm besides the focal firm counts. By using the beginning and end dates of employment, the total time is calculated during which the focal director and the focal firm's current CEO were employed at the same firm and at the same time.

While the above measure of co-option assumes that any newly added director during a CEO's tenure might be captured by the CEO (e.g. through CEO's interference in the director selection process), it is much more likely that this happens as a consequence of pre-existing relationship. As mentioned previously, nowadays, the 'independence' requirements of regulators and stock exchanges provide that most of the outside directors have in fact little affiliation to the firm. Although 95% of outside directors are defined as 'independent', this formal independence does not extend to gauge directors social independence to the CEO. Several studies underpin this argument by providing evidence that social ties matter

(Hwang and Kim, 2009; Nguyen, 2012; Fracassi and Tate, 2012), and in particular in the context of director-CEO relationships (Hoitash and Mkrtchyan, 2019).

Consistent with the regulators' stance on promoting board independence, outside directors have on average only 0.68 connections through past and current employments to the CEO, while the median director has no connections (cf. Table 3.3). This is significantly different to inside directors, who appear to have much stronger outside ties to the current CEO. Partially, this finding may result from circumstances under which the director and CEO have worked in the same subsidiary[3].

3.4.2 Expertise

The measurement of director expertise is based entirely on BoardEx's director employment profile. In line with the proposed application of the quad model, the measures aim to grasp the generic, industry- and firm-specific expertise of each director.

CEO Experience. The variable *CEO Experience* captures the length that the focal director has so far been working as a CEO in major firms. CEO experience is associated with being a valuable trait of director, as it allows directors to understand the CEO's job better and assess his ability (Westphal and Fredrickson, 2001; Tian et al., 2011; Do et al., 2015). The restriction to major firms only includes private and public firms, which either have revenues over 1 billion USD or are part of the S&P 1500 or S&P Global 1200. Given the size and reputation of S&P 1500 firms, this controls for the legitimacy of the director's skills and knowledge. When compared to the often used variable *CEO-Director*, which captures whether a director is currently employed as a CEO, the descriptive statistics in Table 3.3 show that outside directors have a substantial level of CEO experience. The average director has about 20 years in *CEO Experience*, while only 15.8% of them are currently employed as CEO.

Public Board Experience. The responsibilities that come with being a director of a major US public corporation require a certain level of skill and experience. Even the formal requirements imposed by regulators and stock exchanges demand a level of expertise that goes beyond the experience gained at private firms. Additionally, listed firms face increased public interest, adding pressure to a firm's board and its actions.

[3]BoardEx does not aggregate subsidiaries or assign a parent company identifier.

Accordingly, *Public Board Experience* represents the average years a particular director has been on the board of a quoted firm. In contrast to other variables, the variable is part of BoardEx' 'Board Summary' dataset.

Committee Experience. Next, a pair of committee experience variables are added to the sample. Regulatory requirements regarding committee composition, best practice, and disclosure policy have changed how committees work. This experience can be precious for boards when certain decisions are made (Hermanson et al., 2012; Carcello et al., 2011; Eminet and Guedri, 2010). This thesis attends to the monitoring domains concerning the CEO position and its compensation. Therefore, the focus is on the nomination committee (NC) and compensation committee (CC) only.

The construction of both *CC Experience* and *NC Experience* is very similar. Based on BoardEx's employment datasets, the time a particular director was appointed to one of the two committees in any firm within BoardEx is extracted. It does not matter whether the director was sitting concurrently on two identical committees. Thus, both variables account for the director's total number of years of committee experience. The summary statistics in Table 3.3 show that the median outside director has about seven years of experience on both committees, whereas the median insider has no experience at all.

Industry Expertise. As argued in the model, these generic-type variables of expertise are complemented by industry experience. In constructing a variable that measures a director's experience in a relevant industry, the first decision to make is what type of industry identifier to use. In accordance with related studies (Wang et al., 2015), industry experience is measured on whether the focal director has prior employment history in the same industry, identified by two-digit SIC code of the previous and current firm. However, BoardEx does not report the SIC code.[4] Hence, it is necessary to find the relevant SIC codes for all firms reported in BoardEx's director employment datasets, which cover the employment record in a total of 291,711 firms, of which are 266,927 private and 24,784 public firms. Using Compustat's Fundamental Annual North American and Global database, SIC codes for a total of 13,439 firms could be identified. In terms of private companies, the identification process is more complex since these firms do not have a common firm identifier. Therefore, applying the same string matching procedure

[4]BoardEx reports its own sector variable, which seems to be based upon the Fama-French 48 Industry Classification. However, it has a lot of missing observations.

as in Section 3.3, though with an adjusted common name structure, private companies in BoardEx are matched with the Standard & Poor's CapitalIQ database. However, in order to avoid that industry experience was acquired in far too small firms, only private companies in North America with revenues larger than 1 million USD and in the rest of the world with revenues larger than 100 million USD are selected from CapitalIQ.[5] By this procedure, a total of 19,374 private firms could be assigned with a SIC code. In sum, this gives a sample of 32,813 companies with an assigned two-digit SIC code. As for all directors in the sample and their reported employment history, 157,569 out of 252,417 director-firm pairs are allocated the two-digit SIC code.

By employing this set of two-digit SIC codes on the employment record of all directors, it is computed how many years each director has spent in the relevant 2-digit SIC industry. Similar to the committee experience variables, multiple employments in a particular industry are treated as one. Also, only employments in either public or private companies are included. Under these assumptions, the median director has worked 9.5 years in the focal firm's industry. Notable is that the median inside director has gained about 4.5 years more industry experience than outside directors (see Table 3.3).

Tenure Overlap. Finally, firm-specific expertise is captured by the variable *Tenure Overlap*, which measures the average overlap of directors' tenures u_i following previous studies by Tian et al. (2011) and Sauerwald et al. (2016). The assumption is that shared tenure increases the discussion and strengthens outside directors' cohesiveness, which is particularly important when interfering with powerful CEOs.

At the director-level *Tenure Overlap* is the length of overlapping tenure of each director i with all other board members j. However, given the disparity in the levels between inside and outside directors in total time spent at the focal firm, *Tenure Overlap* is also measured separately for each group. Hence, *Outsider Tenure Overlap* captures a director's average overlap with other outside directors and *Insider Tenure Overlap* captures a director's average overlap with other inside directors.

$$\text{Tenure Overlap} = \frac{1}{n} \sum_{i \neq j}^{n} \min(u_i, u_j) \tag{3.3}$$

[5] The higher threshold for non-North American companies facilitates the data collection and text analysis processes.

$$\text{Outsider Tenure Overlap} = \frac{1}{n}\sum_{i \neq j}^{n} \min(u_i, u_j) Outsider_j \quad \text{with Outsider}_j = 1 \tag{3.4}$$

$$\text{Insider Tenure Overlap} = \frac{1}{n}\sum_{i \neq j}^{n} \min(u_i, u_j) Outsider_j \quad \text{with Outsider}_j = 0 \tag{3.5}$$

The basis for these tenure overlap variables is BoardEx's employment dataset, since the usefulness of the board summary dataset is limited given that it only goes back to 1999. Thus, using the employment data of directors' board appointments, the beginning date of a director tenure is retrieved. Based on this date and the reporting date, the shared tenure in months between the focal director and any other director is computed.[6] Taking the mean of the shared tenures with all her co-workers gives the *Tenure Overlap*. The same procedure is applied to calculate *Outsider Tenure Overlap* and *Insider Tenure Overlap*, but using the variable *Outsider* to account for whether the co-workers are inside (executive) or outside (non-executive directors). Finally, each of the variables is scaled into years.

The descriptive statistics in Table 3.3 document that the median director has about five years of co-working experience. However, from the director type-specific variables, it appears that the median executive director has about six months longer shared tenure with other executives than the median outsider has with his outside director colleagues.

3.4.3 Bandwidth

For the purpose of measuring whether directors have enough time to engage with the focal firm, the focus is on how busy they actually are. The question of a director's busyness has received lots of attention by prior studies (Fich and Shivdasani, 2006; Cashman et al., 2012; Khanna et al., 2014; Chakravarty and Rutherford, 2017). Following the often-used concept of measuring a director's busyness on the number of outside directorships (see Section 2.5), the binary variable *Busy* is set to one if the director is a member of the board at three or more companies (including all public, private as well as the focal firm) as listed in BoardEx's employment records.[7] Since it is not controlled for any firm- or board-specific characteristics (e.g., firm size, public listing), the variable *Busy* weighs the workload associated with board memberships equally.

[6] The version of BoardEx in use always has dates in the month-year format.

[7] The comparability between empirical studies and the corresponding number of board memberships used to define busyness depends on the data. Alternative databases (e.g. ISS/RiskMetrics, Compact Disclosure) differ substantially in the way they count board memberships. BoardEx employment records provide the most detailed record of directors' current and historical employment relationships. Other studies extract the data directly from the SEC through Edgar.

As discussed in the literature review, recent studies question the validity of proxies, which are solely based on the number of outside directorships. For instance, Khanna et al. (2014) and Cashman et al. (2012) use alternative measures based on firm's complexity, size, industry heterogeneity, or the role the director has at her outside board memberships. Based on these concepts, this thesis uses two additional binary proxies *Busy Size* and *Busy Public*, which are set to one if the individual director holds at least three board memberships (including focal firm), conditioned by whether the corresponding firms are considerably large or publicly quoted. The approach follows the construction of the *CEO Experience* variable. Public firms are either listed in the S&P 1500 or S&P Global 1200 index. Large firms are both members of these indices or have annual revenues of more than 1 billion USD.

Overall, 38.3% of all directors are busy based on the commonly used proxy *Busy*, but only 13.3% and 11.1% are busy by *Busy Size* respectively *Busy Public*. This difference between the basic busyness variable *Busy* and the refined measures *Busy Size* and *Busy Public* are in equal measure reflected in both types of directors (see Table 3.3).

3.4.4 Motivation

There are different concepts to account for directors motivation. Although reputation matters (Fich and Shivdasani, 2007; Fahlenbrach et al., 2017; Harrison et al., 2018), prior research mostly links director's motivation to provide effective monitoring to monetary incentive (Bhagat et al., 1999; Perry, 2000; Yermack, 2004). Based on this literature, compensation and stock ownership data is retrieved from Execucomp respectively Thomson Reuters Insiders database.

As mentioned in Chapter 2 director compensation has been subject to substantial changes within the sample period. This, and the fact that a director's motivational factors are of great importance for the identification of a quad-qualified director, necessitates reviewing directors' monetary incentives in more detail and thereby providing a holistic overview over the financial incentives received by the board of directors.

Table 3.2 shows the components of director compensation alongside director stock holdings. The aforementioned changes to the structure of director compensation become apparent. Stock awards account overall for about half of directors' total compensation. Its fraction increases over the course of the sample years. Option awards make up far less of director pay, and the median director appears to not getting any option awards. Stock

Table 3.2: Distribution of Outside Director Compensation Components by Fiscal Year

This table shows the distribution of outside director compensation by fiscal year and the respective compensation component. The upper value corresponds to the respective mean, and the lower value corresponds to the respective median. All values besides the *Percentage Stock Ownership* are measured in kUSD.

	Director Compensation					*Stock Ownership*	
Fiscal Year	Cash	Stock	Options	Other	Total	Percentage	Dollar
2009	70.75	70.02	31.71	10.83	182.66	0.07	3354.46
	(66.00)	(59.99)	(0.00)	(0.00)	(161.75)	(0.00)	(0.00)
2010	74.03	84.20	30.97	13.16	202.00	0.07	4049.17
	(70.00)	(75.00)	(0.00)	(0.00)	(179.87)	(0.00)	(0.00)
2011	77.15	96.62	27.30	10.85	212.15	0.08	3798.30
	(74.00)	(85.81)	(0.00)	(0.00)	(190.00)	(0.00)	(25.85)
2012	80.89	98.72	24.41	12.92	216.90	0.09	4496.19
	(77.50)	(93.75)	(0.00)	(0.00)	(198.42)	(0.00)	(0.12)
2013	83.89	109.64	22.38	9.32	224.66	0.08	4579.63
	(80.00)	(100.02)	(0.00)	(0.00)	(210.00)	(0.00)	(170.14)
2014	88.59	408.65	26.20	11.06	534.63	0.07	7196.73
	(85.00)	(112.50)	(0.00)	(0.00)	(224.68)	(0.01)	(344.01)
Total	78.92	135.35	27.17	11.37	252.58	0.08	4486.97
	(75.00)	(89.95)	(0.00)	(0.00)	(192.88)	(0.00)	(73.45)

ownership overall appears to remain quite constant, which could be related to director cashing in their holdings or leaving the board. Nonetheless, equity-based compensation appears to be an important factor of directors monetary incentives, which contrasts earlier studies relating to director motivation and board meeting fees (Adams and Ferreira, 2008).

Overall, Table 3.2 illustrates how director compensation increasingly ties directors' interests with those of the firm's shareholders. In view of the entire board, there is still a substantial difference in director pay schemes between executive and non-executive directors. For the sake of simplicity, the following subdivides director compensation into *Flat Pay* (fees and retainer paid in cash) and *Contingent Pay* (stock and option awards), which corresponds with the common design of outside directors' compensation contracts. *Flat Pay* captures the minimum compensation a director would receive as a board member.

In order to make executive compensation fit into this simple differentiation of director compensation, both components are adjusted for executives. For executives, *Flat Pay* is only the basic salary and *Contingent Pay* represents the total dollar value of stock rewards,

option rewards, and bonus paid out in cash. Independent of the director's type, *Total Pay* is calculated as the sum of *Flat Pay* and *Contingent Pay*.

Overall, with a total of 57,394 compensation observations out of 59,940, the availability of the compensation data is reasonably high, which confirms the successful string matching described in Section 3.3.

Further, director stock ownership information is retrieved. The matching is based on the TR Insiders-BoardEx Link provided by Wharton Research Data Services (WRDS). Only observations with a maximum matching score of 5 are used. Based on 'Table 1' of Thomson Reuter's Insiders Data on WRDS, director's percentage and dollar ownership in the focal company's stock are calculated and merged directly with the main sample. Thomson Reuter Insiders Data captures all insider activity as reported on SEC forms 3, 4, 5, and 144. Accordingly, the data is processed to receive a director-firm-month dataset, reporting the most recent ownership information that is not a closing transaction. Finally, any director-firm-year observation with no stock ownership information is set to zero.

The descriptive statistics by director type, as presented in Table 3.3, show that compensation and stock ownership on the board is unsurprisingly a matter of director type. While the median outsider gets as little as 75,000 USD in flat pay, the amount for insiders is almost tenfold. Similarly, the median contingent pay of insiders is around 1.8 million USD and of outsiders only around 100,000 USD. In terms of stock ownership, the average inside director has about 2.6% points higher ownership than outsiders who hold on average only about 0.1% of company stock.

Table 3.3: Univariate Test of Director-Level Variables by Director Type

This table reports the mean and median values for all director-level variables by outside and inside directors. The right-hand column reports the difference between the values of the two samples and the significance level of the corresponding two-sample t-test for mean and Wilcoxon rank-sum test for median. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Outside Director (N=51,128)		*Inside Director* (N=8,812)		*Difference* (N=59,940)	
Variables	Mean	Median	Mean	Median	Mean	Median
Co-opted	0.435	0.000	0.157	0.000	0.278***	0.000***
TW-co-opted	2.228	0.000	1.151	0.000	1.077***	0.000***
Non-co-opted	0.565	1.000	0.843	1.000	-0.278***	0.000***
TW-non-co-opted	6.247	3.333	9.842	7.000	-3.595***	-3.667***
Outside Shared Tie	0.681	0.000	2.822	0.000	-2.141***	0.000***
Outside Shared Experience	0.186	0.000	0.633	0.000	-0.447***	0.000***
CEO Experience	19.844	14.833	13.970	11.167	5.874***	3.666***
CC Experience	11.274	7.500	3.118	0.000	8.156***	7.500***
CC Member	0.492	0.000	0.011	0.000	0.481***	0.000***
NC Experience	10.434	6.750	2.927	0.000	7.507***	6.750***
NC Member	0.426	0.000	0.008	0.000	0.418***	0.000***
Industry Experience	10.148	8.833	14.360	13.333	-4.212***	-4.500***
CEO-Director	0.158	0.000	0.734	1.000	-0.576***	-1.000***
Tenure Overlap	5.271	4.983	6.072	5.544	-0.801***	-0.561***
Director Tenure	8.454	6.833	10.966	8.167	-2.512***	-1.334***
Public Board Experience	4.613	3.800	2.574	0.800	2.039***	3.000***
Flat Pay	0.079	0.075	0.740	0.700	-0.661***	-0.625***
Contingent Pay	0.162	0.103	3.383	1.817	-3.221***	-1.714***
Total Pay	0.241	0.188	4.123	2.548	-3.882***	-2.360***
Perc. Ownership	0.001	0.000	0.027	0.001	-0.026***	-0.001***
Dollar Ownership	4.419	0.071	2008.106	2.401	-2003.687***	-2.330***
Busy	0.421	0.000	0.160	0.000	0.261***	0.000***
Busy Size	0.148	0.000	0.046	0.000	0.102***	0.000***
Busy Public	0.123	0.000	0.039	0.000	0.084***	0.000***

Table 3.4: Descriptive Statistics: Director-Level Variables

Variables	Mean	SD	Min	Q1	Median	Q3	Max	N
Independence								
Outsider	0.853	0.354	0.000	1.000	1.000	1.000	1.000	59940
Independent	0.811	0.391	0.000	1.000	1.000	1.000	1.000	59940
Co-opted	0.394	0.489	0.000	0.000	0.000	1.000	1.000	58873
TW-co-opted	2.070	4.002	0.000	0.000	0.000	2.667	42.917	58873
Non-co-opted	0.606	0.489	0.000	0.000	1.000	1.000	1.000	58873
TW-non-co-opted	6.777	8.262	0.000	0.000	4.167	11.000	65.167	58873
Outside Shared Tie	0.110	0.313	0.000	0.000	0.000	0.000	1.000	52556
Outside Shared Experience	0.775	3.303	0.000	0.000	0.000	0.000	108.000	51349
Expertise								
CEO Experience	18.981	17.756	0.000	6.750	14.083	25.833	214.667	59940
CC Experience	10.075	12.676	0.000	0.000	6.083	14.917	145.833	59940
CC Member	0.421	0.494	0.000	0.000	0.000	1.000	1.000	59940
NC Experience	9.330	12.612	0.000	0.000	5.250	13.917	473.833	59940
NC Member	0.365	0.481	0.000	0.000	0.000	1.000	1.000	59940
Industry Experience	10.771	7.490	0.000	5.167	9.583	14.917	65.167	58405
CEO-Director	0.243	0.429	0.000	0.000	0.000	0.000	1.000	59940
Tenure Overlap	5.389	3.424	0.000	2.802	5.054	7.389	24.238	59940
Outsider Tenure Overlap	5.297	3.321	0.000	2.778	5.000	7.278	26.100	59940
Insider Tenure Overlap	5.635	4.985	0.000	2.000	4.417	7.667	39.917	54582
Director Tenure	8.823	7.500	0.000	3.333	6.917	12.167	65.167	59911
Outsider Tenure	8.454	7.013	0.000	3.250	6.833	11.667	56.917	51109
Insider Tenure	10.966	9.588	0.000	3.583	8.167	15.917	65.167	8802
Public Board Experience	4.315	4.741	0.000	0.000	3.400	6.400	48.100	59500
Motivation								
Flat Pay	0.171	0.299	0.000	0.056	0.080	0.115	8.100	57394
Contingent Pay	0.611	8.534	0.000	0.071	0.112	0.176	1927.511	57394
Total Pay	0.782	8.589	0.000	0.143	0.201	0.278	1927.511	57394
Perc. Ownership	0.005	0.379	0.000	0.000	0.000	0.000	70.970	59940
Dollar Ownership	0.299	4.085	0.000	0.000	0.000	0.001	7,391.248	59940
Bandwidth								
Busy	0.383	0.486	0.000	0.000	0.000	0.000	1.000	59940
Busy Size	0.133	0.340	0.000	0.000	0.000	0.000	1.000	59940
Busy Public	0.111	0.314	0.000	0.000	0.000	0.000	1.000	59940

3.5 Operationalisation

This thesis makes two fundamental methodological contributions to the board governance literature; the selection and construction of adequate proxies of the four quad attributes as well as a model that allows identifying quad-qualified directors individually. The latter is described in this section.

3.5.1 The customary vs. the quad model approach

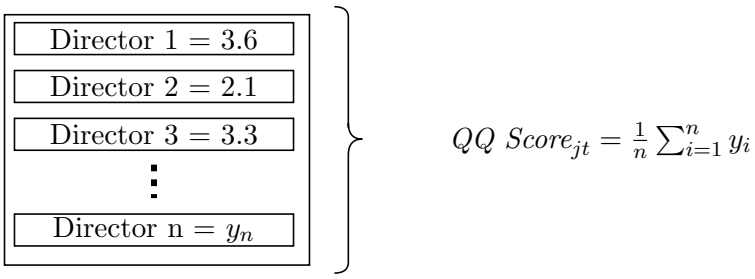
The quad model attempts to capture directors' individual qualification. In contrast, the prior empirical literature examines the average qualification among all board members or groups of board members (e.g. all outside directors). For comparison, this thesis applies both approaches. This section only describes the operationalisation of the two approaches. The empirical chapters will then enlarge upon the particular theoretical as well as practical advantages and disadvantages.

The traditional, customary approach to measure director qualification is to use average measures of qualification proxies, i.e. the percentage of independent directors or the average years of outside director industry experience. Hambrick and colleagues, however, particularly stress that the quad model should be able to identify quad-qualified directors individually. Therefore, the following starts with the method of measuring director quad-qualification.

Based on the variables described in the previous section, each attribute is measured separately using a single or a set of variables. If it is a set of variables, a composite variable is created to make sure that a single variable eventually represents each attribute. By applying percentage normalisation on the attribute variables of all director-firm observations for each time period t separately (i.e. only S&P 1500 firms excl. the utility and financial services sectors), the values of director attributes range between 0 and 1. For each director i, a quad-qualification score ($QQ\ Score$) is calculated on the sum of all four attributes. Thus, each attribute has the same weight in director quad-qualification, which follows Hambrick and colleagues' argument that all of them play an important role in terms of capturing the ability and motivation of a director.

As illustrated in Figure 3.2, each director has a different $QQ\ Score$. The sum of all outside director scores divided by the number of outside directors on the board j then

Figure 3.2: Operationalisation – Board-level Approach



represents the board's $QQ\ Score_{jt}$.

$$QQ\ Score_{ijt} = Independence_{ijt} + Expertise_{ijt} + Motivation_{ijt} + Bandwidth_{ijt} \tag{3.6}$$

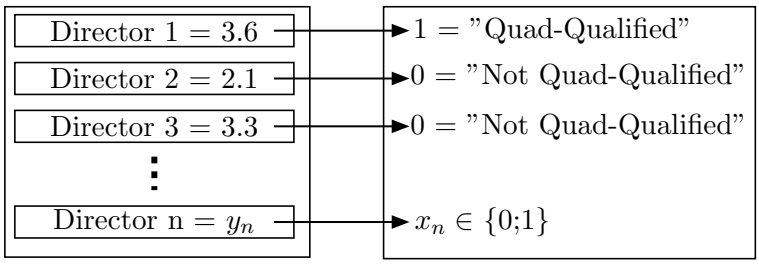
Hambrick and colleagues, however, prefer the director-level approach. The initial step is the same as above; each director has an individual *QQ Score* following Equation 3.6. Then, a decision is made about quad-qualification on each director individually.

As described above, each director-level attribute measures a director's position in the distribution of all other sample directors in the same time period. Hambrick et al. (2015, p. 328) argue that a director only has to satisfy each attribute above a certain threshold. Thus, it is specified that any director in question must score above the median in every single attribute and on aggregate achieve a minimum $QQ\ Score_{ijt}$ of 3.5 in comparison to all other sample directors in the same year. The second condition ($QQ\ Score > 3.5$) restricts directors from being termed 'quad-qualified' who satisfy two quad attributes fully (e.g., $Bandwidth = 1$ and $Motivation = 1$) but fare below the median threshold in the other two attributes. Instead, even a director who achieves top scores in three attributes, but scores below the median in the fourth, is not coded as quad-qualified. This approach allows some flexibility on the individual attribute values but ensures that the average quad-qualified director is among the top 12.5% of fully suitable directors.

$$QQ\ Dir_{ijt} = \begin{cases} 1 & \text{if } QQ\ Score_{ijt} > 3.5 \\ 0 & \text{if otherwise} \end{cases} \tag{3.7}$$

To obtain a board-level proxy for quad-qualification, the number of quad-qualified directors $Nbr.\ QQ\ Dirs_{jt}$ is calculated as the sum of all quad-qualified directors. The approach is illustrated in Figure 3.3.

Figure 3.3: Operationalisation – Director-level Approach



$$Nbr.\ QQ\ Dirs_{jt} = \sum_{i=1}^{n} x_i$$

3.5.2 Examples of quad-qualified directors and Firms

The described operationalisation applies to each of the following three empirical chapters. The input variables, however, change for each chapter and the respective monitoring domain. To exemplify the operationalisation, the following describes the sample of quad-qualified directors in the context of CEO compensation decisions (cf. Chapter 5). In contrast to Chapter 4, the director-level data of Chapter 5 does not require to be time-adjusted for different turnover decisions. Therefore, the following sample descriptions can be directly compared to Chapter 5. The examples refer to directors from three randomly selected companies from different industries with high, medium, and low market capitalisation, and at least one quad-qualified director.

Alliance Data

Alliance Data Systems Corporation is an IT services company providing marketing and loyalty services to consumer companies. It ranks by market value in the upper third of sample companies. All of its outside directors are included in the director-level sample between 2009 and 2014. During this period, the company only had one inside director.

In each year, the board has at least three quad-qualified directors. In 2012, for instance, the board had an average *QQ Score* of 3.362 and four quad-qualified directors (*Nbr. QQ Dirs* = 4). As illustrated in Table 3.6, these four directors have an above threshold-level *QQ Score* (i.e. *QQ Score* > 3.5), which terms them as 'quad-qualified' directors. Two of the other three 'non-quad-qualified' directors have the *QQ Score* just below the threshold. Given that all but one director have above-average values in *Independence* and *Motivation*, it appears that the reason for not making the quad-qualification threshold-level arises from the lack of individual *Expertise*.

All quad-qualified directors have no prior work relationship with the focal company.

Kenneth Jensen (68) is an outside director since 2001. As an insider director, he had previously gained twenty years of public board experience at the 2-digit SIC industry peer company Fiserv Inc. He worked as the CFO for Sungard Data Systems Inc, which also operated in the same 2-digit SIC group. Bruce K. Anderson also has extensive industry-related experience. He had also been with Fiserv Inc., where he served as an outside board member for about 12 years. In addition, he had served as independent chairman and director at UK-based and industry peer company Amdocs Ltd. for in total 15 years. Besides, he had held several executive positions at other IT companies, including IBM. Roger Ballou is also a board service-experienced director. After ten years, he had recently retired as the CEO and President of CDI Corp, a services company operating in the same 2-digit SIC group as Alliance Data. As of 2012, he is also an outside director of Fox Chase Bancorp. He began his career at American Express, which is also in the same 2-digit SIC group. Finally, the fourth quad-qualified director is Robert Arnold Minicucci, who had been on the board of Alliance Data since 1996. As of 2012, he was the board's Independent Chairman, a position he held since 2009 when he transitioned from the lead independent director position. Since 14 years, Mr. Minicucci had served as an outside director for the industry peer company Amdocs Ltd, where he was assumed to board chair in 2011. Since 2009, Mr. Minicucci had also been an outside director at former Nasdaq-listed company Retalix Ltd. which is also in the industry peer group of Alliance Data. Furthermore, he had previously held executive positions in various IT, software, and finance companies, including Alliance Data's 2-digit SIC industry peers American Express and Global Knowledge Network Inc.

Interestingly, all four quad-qualified directors have social ties to at least another quad-qualified director that began before their board membership at Alliance Data Corporation.

Table 3.5: Selected Companies with Quad-Qualified Directors

This table reports board qualification variables and firm characteristics for three selected sample companies. The quad-qualification variables relate to the definitions in Subsection 3.4.3. *MV* is the firm's market value of equity in mil. USD at the corresponding fiscal year-end. *Relative MV* is the relative r *Total Assets* is the firm's total assets in mil. USD. *Inst. Ownership* is the percentage ownership held by active institutional investors. *HHI* is the Herfindahl–Hirschman Index of ownership concentration. All director, board, and firm characteristics refer to the fiscal year-end.

Fiscal Year	QQ Score	Nbr. QQ Dirs	Nbr. Dirs	Nbr. Outside Dirs	MV	Total Assets	Inst. Ownership	HHI
High Market Value Example: *Alliance Data Systems Corporation*								
2009	3.082	3	9	8	3.372	5.226	1.034	0.027
2010	3.076	3	8	7	3.649	8.272	1.017	0.027
2011	3.304	3	8	7	5.174	8.980	1.055	0.024
2012	3.362	4	8	7	7.181	12.000	1.048	0.024
2013	3.405	4	8	7	13.554	13.244	1.025	0.023
2014	3.297	4	8	7	18.253	20.264	0.876	0.031
Medium Market Value Example: *Harsco Corporation*								
2009	2.538	2	10	7	2.590	3.639	0.578	0.032
2010	2.200	1	12	9	2.280	3.469	0.620	0.029
2011	2.212	2	9	8	1.656	3.339	0.672	0.028
2012	2.333	2	10	9	1.894	2.976	0.656	0.030
2013	2.285	2	10	9	2.261	2.442	0.678	0.040
2014	2.016	0	10	9	1.524	2.264	0.690	0.048
Low Market Value Example: *Calavo Growers*								
2009	2.648	1	13	11	0.259	0.123	0.307	0.061
2010	2.415	1	13	11	0.322	0.150	0.391	0.078
2011	2.406	1	13	11	0.333	0.185	0.485	0.108
2012	2.763	2	12	11	0.350	0.208	0.484	0.056
2013	2.787	2	13	12	0.467	0.240	0.465	0.065
2014	2.884	2	13	12	0.839	0.283	0.422	0.050

Harsco

Harsco Corporation is a manufacturing company providing industrial services and engineered products globally. It ranks by market value in the mid-third of sample companies. All of its outside directors are included in the director-level sample between 2009 and 2014. During the sample period, the board shifted from having 70% outside directors to having only one inside director on the board.

Within the sample period, the board had a maximum of two quad-qualified directors. Notably, the number of quad-qualified directors drops from two to zero between 2013 and 2014. On the one hand, this drop could relate to changes in the individual quad-qualification scores, because *Independence*, *Bandwidth*, and *Motivation* can fluctuate in both directions. On the other hand, the drop could be associated with a change in board composition. This is the case in this example when Andrew J. Sordoni III and Robert Charles Wilburn left the board during 2014.

Both directors are also termed 'quad-qualified' in the 2012 sub-sample. Table 3.6 shows that Mr. Sordoni and Mr. Wilburn have strong scores throughout the quad attributes – leaving them with a substantially greater *QQ Score* than their peers. Mr. Sordoni had been an outside director at Harsco since 1988. During his career, he held several outside directorships at companies in the construction, banking, and utility sectors. He primarily gained his executive expertise at the telecommunications company, C-Tec Corporation, and his family business, the construction company Sordoni Enterprises Inc. Mr. Wilburn had been an outside director at Harsco since 1986, partly as the lead independent director. Besides he had served as an outside director on several private and public company boards, most prominently the Fortune 500 insurance company Erie Insurance Group since 1999. Aside from the profile captured by the expertise and bandwidth input measures, Mr. Wilburn was particularly active in academia and politics, but also gained executive experience in mostly finance-related private businesses.

Calavo Growers

Calavo Growers, Inc. is in the wholesale trade industry, packaging and distributing fruits and vegetables to stores, restaurants, and consumers globally. It ranks by market value in the lower third of sample companies. In each year, the board consists of at least one quad-qualified director. The change in the number of quad-qualified directors between 2011 and 2012 is not due to a change in board composition. Instead, John M. Hunt,

who had been an independent director at Calavo Growers since 1993, obtained substantial equity ownership in the focal company in that particular fiscal year. Since Chapter 5 links individual director motivation to the percentage of equity ownership, Mr. Hunt's *QQ Score* increased and thus was termed as a 'quad-qualified' director as of 2012.

The two quad-qualified directors, John M. Hunt and J. Link Leavens are both long-time directors of the board of directors. In 2012, both directors were heading ranches that operate in the same industry as suppliers of Calavo Growers. There are no other entries in the BoardEx Employment database besides these positions, which is likely due to the relatively smaller size of the selected sample company.

Table 3.6: Director-Board Examples

This table reports the quad attributes and quad-qualification variables for outside directors at three sample companies at the fiscal year-end of 2012. The measurement of quad attributes refers to the methodology described in the relevant chapter on CEO pay, Chapter 5.

Director Name	Independent	Expertise	Bandwidth	Motivation	QQ Score	QQ Dir
High Market Value Example: *Alliance Data Systems Corporation*						
Ernest Linn Draper Jr	1.000	0.677	0	0.000	1.677	0
Kenneth R. Jensen	1.000	0.808	1	0.939	3.747	1
Bruce K. Anderson	1.000	0.939	1	1.000	3.939	1
Roger H. Ballou	1.000	0.778	1	0.778	3.556	1
Robert Arnold Minicucci	1.000	0.889	1	0.980	3.869	1
D. Keith Cobb	1.000	0.636	1	0.717	3.354	0
Lawrence M. Benveniste	1.000	0.626	1	0.768	3.394	0
				Avg./Total	**3.362**	**4**
Medium Market Value Example: *Harsco Corporation*						
Stuart E. Graham	1.000	0.354	0	0.000	1.354	0
Andrew J. Sordoni III	1.000	0.960	1	0.970	3.929	1
Terry D. Growcock	1.000	0.374	0	0.000	1.374	0
James M. Loree	1.000	0.081	1	0.000	2.081	0
Kathy G. Eddy	1.000	0.414	1	0.000	2.414	0
James F Earl	1.000	0.010	1	0.000	2.010	0
David C. Everitt	1.000	0.101	1	0.000	2.101	0
Robert Charles Wilburn	1.000	0.980	1	0.657	3.636	1
Henry W. Knueppel	1.000	0.323	0	0.778	2.101	0
				Avg./Total	**2.333**	**2**
Low Market Value Example: *Calavo Growers Inc.*						
Harold S. Edwards	0.082	0.485	1	0.626	2.193	0
Steven W. Hollister	0.510	0.253	1	0.758	2.520	0
James D. Helin	0.837	0.051	1	0.566	2.453	0
Marc Laurence Brown	0.694	0.101	1	0.677	2.472	0
Donald M. Sanders	0.122	0.626	1	0.929	2.678	0
Scott N. Van Der Kar	1.000	0.859	1	0.000	2.859	0
J. Link Leavens	1.000	0.960	1	0.990	3.949	1
Dorcas Thille McFarlane	1.000	0.949	1	0.000	2.949	0
John M. Hunt	1.000	0.879	1	0.960	3.838	1
George H. Barnes	0.204	0.556	1	0.000	1.760	0
Egidio Carbone Jr	0.265	0.576	1	0.879	2.720	0
				Avg./Total	**2.763**	**2**

3.5.3 The distribution of quad-qualified directors

The above examples of three companies show that the operationalisation of the quad model identifies directors as quad-qualified at both large and small firms. Table 3.7 further examines the distribution of quad-qualified directors and boards across the sample used in Chapter 5. Specifically, the table presents the mean and median levels of four firm characteristics, market value, total assets, institutional ownership, and ownership concentration (HHI), across the four quad-qualification measures used in the subsequent empirical chapters.

Panel A shows the corresponding mean and median levels at the director level. Panel A.1. shows that quad-qualified directors can be found particularly at firms with lower market value and lower balance sheet sum, but larger institutional ownership. However, it is undetermined whether ownership concentration plays a role. This finding is confirmed when looking at the individual directors' *QQ Score*. Panel A.2 presents the corresponding values for directors with a high *QQ Score* (i.e., *QQ Score* is within the fourth quartile) and low *QQ Score* (i.e., *QQ Score* is within the first quartile).

Panel B shows the same statistics but at the board level. Panel B.1 refers to the difference between boards having a high average *QQ Score* (i.e., *Board QQ Score* is within the fourth quartile) and boards having a low average *QQ Score* (i.e., *Board QQ Score* is within the first quartile) among their non-executive directors. The results resemble the distribution of quad-qualified directors, as shown in Panel A. The same is valid for the distribution of boards having a high and low number of quad-qualified directors.

Overall, Table 3.7 suggests that quad-qualification is more likely to be present at smaller and less valuable firms. However, it should be noted that this observation depends highly on the selection of quad attribute measures. For instance, it is not very likely that directors of smaller sample firms are on the boards of several large corporations. Consequently, there is a tendency that such directors are likely to fulfil the requirements of the bandwidth attribute.

Table 3.7: Univariate Test of Firm-Level Variables by Individual Quad-Qualification

This table reports the mean and median values for firm-specific variables by quad-qualification (level). Panel A.1 shows the corresponding values for directors who are termed 'quad-qualified' ($QQ\ Dir = 1$) vs. 'not quad-qualified' ($QQ\ Dir = 1$). Panel A.2 shows the corresponding values for directors who have a high *QQ Score* (i.e., within the fourth quartile) vs. low *QQ Score* (i.e., within the first quartile). Panel B.1 shows the corresponding values for boards which have a high average *QQ Score* (i.e., within the fourth quartile) vs. low average *QQ Score* (i.e., within the first quartile). Panel B.2 shows the corresponding values for boards which have a high number of *QQ Dirs* (i.e., within the fourth quartile) vs. low number of *QQ Dirs* (i.e., within the first quartile). *MV* is the firm's total market value of equity in million USD, *Firm Size* is the firm's total assets in million USD, *Inst. Ownership* is the percentage ownership held by active institutional investors, and *HHI* is the ownership concentration measured by the Herfindahl–Hirschman index. All variables refer to the fiscal year in which director qualification is measured. The right-hand column reports the difference between the values of the two samples and the significance level of the corresponding two-sample t-test for mean and Wilcoxon rank-sum test for median. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

Panel A: *Director-level Quad-Qualification*

A.1	$QQDir = 1$		$QQDir = 0$		*Difference*	
	N=4,931		N=36,546		N= 41,477	
Variables	Mean	Median	Mean	Median	Mean	Median
MV	5.735	1.706	15.387	2.954	-9.652***	-1.248***
Total Assets	4.807	1.544	12.532	2.72	-7.725***	-1.176***
Inst. Ownership	0.735	0.757	0.696	0.729	0.039***	0.028***
HHI	0.052	0.043	0.055	0.041	-0.003**	0.002***

A.2	*High QQ Score*		*Low QQ Score*		*Difference*	
	N=10,356		N=10,395		N=20,751	
Variables	Mean	Median	Mean	Median	Mean	Median
MV	9.319	2.039	21.818	4.112	-12.499***	-2.073***
Total Assets	7.572	1.889	18.138	3.857	-10.566***	-1.968***
Inst. Ownership	0.722	0.747	0.674	0.705	0.048***	0.042***
HHI	0.052	0.042	0.054	0.04	-0.002***	0.002***

Panel B: *Board-Level Quad-Qualification*

B.1	*High Board QQ Score*		*Low Board QQ Score*		*Difference*	
	N=958		N=2,985		N=3,943	
	Mean	Median	Mean	Median	Mean	Median
MV	5.087	1.501	14.603	2.219	-9.516***	-0.718***
Total Assets	4.226	1.401	11.366	2.007	-7.14***	-0.606***
Inst. Ownership	0.737	0.756	0.686	0.729	0.051***	0.027***
HHI	0.052	0.043	0.062	0.042	-0.01***	0.001

B.2	*High Nbr QQ Dirs*		*Low Nbr QQ Dirs*		*Difference*	
	N=1,362		N=1,366		N=2,728	
	Mean	Median	Mean	Median	Mean	Median
MV	2.812	1.157	21.141	3.644	-18.329***	-2.487***
Total Assets	2.449	1.012	17.281	3.298	-14.832***	-2.286***
Inst. Ownership	0.739	0.767	0.661	0.7	0.078***	0.067***
HHI	0.057	0.045	0.063	0.041	-0.006***	0.004***

Chapter 4

Are Quad-Qualified Directors Effective Board Monitors? An Analysis of CEO Turnover

4.1 Introduction

The highest echelon of US companies is the board of directors. At the centre of the relationship between shareholders and managers, the board's principal function is, according to agency theory, to monitor managers and oversee their decision making to ensure the maximisation of shareholder wealth (Fama and Jensen, 1983). Naturally, the appointment and dismissal of the CEO are key tasks of the board (Vancil, 1987). Thus, directors should carefully monitor CEO ability and, if necessary, replace the CEO when the firm is underperforming. This key function of the board has led many practitioners, regulators, and academics to examine the critical sources of effective board monitoring concerning the CEO position (e.g. Weisbach, 1988; Huson et al., 2001). However, despite major regulatory changes that were fundamentally supported by extant research, governance failures such as to effectively monitor and dismiss the CEO when necessary are still common. In this context, it is of vital importance of how the board learns about CEO ability (Hermalin, 2005).

As described earlier, the quad model's authors posit that board monitoring effectiveness is a function of the individual qualities of its outside directors: independence, expertise, bandwidth, and motivation. Central to their model is the idea that a director in possession of all four attributes is more likely to be an effective monitor of CEO ability.

The quad model authors relate to governance failures such as financial fraud, acquisition overpayments, and excessive CEO compensation, which result from mismanagement and hence are often related to misjudgements by the board of directors, particularly regarding the CEO's ability. Accordingly, above all, instances of CEO change represent a key strategic board monitoring activity (Hermalin, 2005). Undeniably, the removal of a CEO is an important event in the life of a firm. While CEOs changes are often disruptive and costly (Schepker et al., 2017), the CEO's influential role has wide-ranging implications on firm strategy and future performance (Quigley and Hambrick, 2015). Since such decisions should theoretically be driven by board's confidence in the CEO's ability to steer the firm in the best interest of shareholders (Hermalin, 2005; Taylor, 2010), the underlying proposition of this chapter is that the quad attributes substantially strengthen an individual director's effectiveness in monitoring and assessing CEO ability. Accordingly, this chapter investigates how the presence of quad-qualified directors moderates the negative relationship between firm performance and CEO turnover. Furthermore, given the vital importance of how boards learn about CEO ability (Hermalin, 2005), the subsequent analysis focuses on director ability concerning relative performance evaluation (Gibbons and Murphy, 1990).

The sample of this empirical analysis uses longitudinal data of S&P 1,500 firms between 2009 and 2014. Prior to the analysis, composite quad model measures are constructed for each of the four attributes based on the employment, network and stock ownership data of 14,370 directors. Finally, all outside directors are assigned a composite score of quad-qualification on which board-level variables are based (cf. Chapter 3).

First, the empirical results confirm that CEO turnovers, particularly forced and unplanned turnovers, are preceded by poor firm performance. This negative turnover-performance sensitivity is strengthened when the board has a greater degree of quad-qualification, which is independent on whether quad-qualification is measured by the outside directors' average degree of quad-qualification (i.e. the average QQ Score) or the number of quad-qualified directors on the board. In both cases, the results are qualitatively the same; however, since this director-level approach is more meaningful in terms of director selection and board composition, the conclusion is that the identification of quad-qualified directors is the preferred approach. This corresponds with the propositions by Hambrick et al. (2015) and provides the basis for further analysis regarding group dynamics.

Second, it is further explored how many quad-qualified directors are necessary to generate a significant effect in terms of CEO changes relative to performance. It is shown that the probability of CEO changes is significantly increased (decreased) for low (high) firm stock performance when the board has at least three quad-qualified directors. This finding is consistent with critical mass theory, which suggests that a critical mass of three individuals is needed for a qualified minority to be able to influence decisions in a group (Kanter, 1977b; Granovetter, 1978).

Finally, the empirical analysis attends to the concept of relative performance evaluation. Prior studies highlight that CEO turnovers are often influenced by peer firm performance (e.g. Jenter and Kanaan, 2015; Bushman et al., 2010). The results confirm their findings, which suggests that boards assess CEO ability not only on firm-specific stock performance, i.e. the portion of stock return that is attributable to the CEO but also on the overall industry performance. This substantiates the claim by resource dependence theory that directors with human and social capital beyond the focal firm (e.g., prior industry experience, social ties within the firm's peer network) can contribute to effective monitoring decisions. Hence, the appointment of quad-qualified directors can reduce the firm's exposure to environmental uncertainties.

The remainder of this chapter is organised as follows. First, the subsequent section discusses the quad model, specifically in the context of CEO turnovers, before formulating the research hypotheses. Then, Section 4.3 describes the sample selection process for the director-level dataset, the composition and construction of the attribute measures, and the CEO turnover identification process. The empirical analysis in Section 4.4 investigates the relationship between CEO turnover, firm performance and board quad-qualification capability, based on both an average quad-qualification score across directors and the concentration of quad-qualified directors. Subsequently, the findings are further elaborated in terms of the critical mass theory and investigated whether the results are robust in the context of relative CEO performance evaluation. Finally, the theoretical implications of the results are discussed in Section 4.5.

4.2 Literature Review and Hypothesis Development

4.2.1 The CEO turnover process and its relevance

The board of director engages in several tasks and decisions, ranging from their regular audit responsibilities over crucial strategic decisions such as the appointment, monitoring and dismissal of CEOs. The latter is, indeed, seen as one of the key tasks by agency theorists to alleviate the problems arising from the separation of ownership and control (Jensen and Meckling, 1976). In its traditional goal to maximise shareholder wealth, the board should monitor the performance of the CEO and utilise its power to initiate the CEO succession process if this is deemed necessary (Fama, 1980; Shleifer and Vishny, 1997). Ultimately, the primary determinant of CEO ability is firm performance. Hence, a well-functioning board of directors will eventually remove the CEO when it believes that this is in the overall interest of the firm. Therefore, a CEO's dismissal is the final result of this assessment and the ultimate monitoring decision.

Extant research shows that poor firm performance substantially influences the likelihood of CEO dismissals (Coughlan and Schmidt, 1985; Warner et al., 1988; Weisbach, 1988). However, the context of a CEO change is often ambiguous and not always performance-related. Besides retirement, other opportunities, and health-related reasons, disagreements with the board and shareholders, changes in corporate strategy, or the availability of alternative candidates, play a role in CEO dismissals (Fredrickson et al., 1988; Huang et al., 2020). Such reasons are often complicated to verify although they play an important role in CEO changes (Cornelli et al., 2013). Therefore, this chapter follows the majority of prior studies and analyses the quad model regarding the CEO turnover-performance relationship.

Despite the difficulties in obtaining accurate information on the reasons for a particular CEO change, the existing literature generally categorises turnover in forced and voluntary CEO departures (Parrino, 1997; Denis and Denis, 1995). The evidence shows that forced turnovers are much more likely following bad firm performance than voluntary turnovers (Jenter and Lewellen, 2019; Dikolli et al., 2014; Taylor, 2010). Yet, the so-called voluntary turnovers are also frequently preceded by poor firm performance (Kaplan and Minton, 2012). As a consequence, recent studies consider other turnover classifications. Eisfeldt and Kuhnen (2013), for instance, show how CEO changes, that are announced on short notice follow similar performance patterns as forced turnovers. Fee et al. (2018) find

turnovers which are unrelated to illness, immediate job changes or corporate restructuring are mostly related to poor firm performance. Altogether, these studies show that most turnover decisions constitute effective monitoring.

A problem that is often encountered by prior studies is how boards learn about CEO ability. Stock prices reflect expectations of future cash flows, and hence any movement to news about future cash flows partially reflects how the market assesses CEO ability. However, the empirical evidence is ambiguous whether boards appropriately punish CEOs based on their performance relative to both the industry and market. While absolute stock performance appears to be a valid predictor of CEO replacements, several recent studies observe that turnovers are also driven by peer performance (Bushman et al., 2010; Kaplan and Minton, 2012; Jenter and Kanaan, 2015). Such firms would seemingly not act within the principal-agent framework in which the board evaluates the CEO's relative performance.

In fact, this is short-sighted because poor peer performance is a signal of rising external uncertainty. A diligent board of directors would react by increasing its monitoring intensity and updating their beliefs of the CEO's ability. Notably, the information pertinent to the reassessment of CEO ability can also be non-verifiable. For instance, poor peer performance could increase the availability of suitable external CEO candidates, resulting in lower CEO replacement costs (Fredrickson et al., 1988; Eisfeldt and Kuhnen, 2013). This chapter claims that the quad model addresses this circumstance in multiple ways. First, the existing literature on poor peer performance and CEO turnover underpins the relevance of the quad model and its integration of agency theory and resource dependence theory. The model's emphasis on director expertise ensures that quad-qualified directors are sufficiently equipped with the skills necessary to absorb and react to external uncertainties. Poor peer performance indicates increased uncertainty in the firm's focal market and hence, prompt directors to monitor CEO performance more intensely (Finkelstein et al., 2009). Second, quad-qualified directors have the qualities to do this in an objective and informed way. Thus, they possess the ability to evaluate CEO performance in the context of internal as well as external factors.

4.2.2 The quad model attributes and CEO turnover

This chapter examines the relevance of the quad model on CEO turnover, given that such decisions are fundamental in the pursuit of effective corporate governance, specifically

board monitoring. In light of its importance, the extant literature on the relationship between board composition and CEO turnover decisions is extensive. The following literature review explores the essential traits corresponding to the four quad attributes and extends the previous literature review in Chapter 2 by focusing specifically on CEO turnover decision-making.

Independence

Conventional wisdom suggests that one of the main causes of a board failure in monitoring is frequently due to a lack of independence among board members. It is assumed that boards will function better if their members can exercise autonomy in decision making and are capable of questioning the dominant view in the boardroom. Along with the other attributes, the quad model predicts that independence allows the director to be objective. This raises the point of effectively understanding what comprises an 'independent' director.

Much of the literature on board structure and composition, which emphasises the importance of independent directors, stems from agency theory (Finkelstein et al., 2009). Correspondingly, the most important distinction in studies of board configuration is the one focusing on inside directors vs. outside directors. In the context of the US, the listing requirements of NYSE and Nasdaq have accomplished that all directors except the CEO and the chairman are outside directors, i.e. formally independent. However, in practice, boards are rather composed of directors whose degree of independence varies depending on the strength of affiliation with the focal firm and individuals within it.

Even though the majority of board members are outside directors with no direct affiliation to the firm, their independence may be compromised by existing relationships to the firm's management before the board appointment (Westphal, 1999; Hwang and Kim, 2009; Hoitash, 2011; Fracassi and Tate, 2012; Schmidt, 2015). This especially becomes a problem if the CEO has ample power to influence director selection and replacement, and other functions of the board (Seidel and Westphal, 2004; Finkelstein et al., 2009). Recent studies argue that especially the CEO's role in the director nomination process leads to co-opted directors that harm monitoring quality (Shivdasani and Yermack, 1999; Yermack, 2004; Coles et al., 2014). Moreover, Zhu and Chen (2015) show that powerful CEOs tend to systematically select directors who are easier to influence in their favour. In contrast to the weak and inconsistent findings on the relationship between traditional measures of board independence, monitoring effectiveness, and performance (Dalton et al., 1998;

Rhoades et al., 2000; Deutsch, 2005), co-option appears to be a significant determinant of directors' actual independence.

Consequently, the question remains how influential CEOs select new outside directors. Fracassi and Tate (2012) approach this problem by testing whether management ties to potential directors influence the director selection process, and eventually firm performance. Greater CEO power appears to be associated with a higher degree of outside ties to the focal director. Although this finding alone does not depict their subsequent monitoring effectiveness, it appears that CEOs tend to have their friends on the board, which in reference to Coles et al. (2014) makes them easier to capture. These findings correspond with other studies, strengthening the argument that social ties between CEO and directors undermine monitoring effectiveness (Hwang and Kim, 2009; Nguyen, 2012).

In sum, the underlying dynamics of director independence are various. However, following the quad model predictions, an outside director's formal independence is insufficient for a director to exercise independent and objective monitoring. The application of the quad model shall therefore also consider the social dynamics between the CEO and directors in the identification process of independent directors.

Expertise

The previous discussion highlights that the key idea behind director independence is to strengthen director ability to make independent and objective judgements. Nevertheless, this rationale is preconditioned by a director's ability to obtain, process and share information (Boivie et al., 2016a; Kroll et al., 2008). The quad model is one of the first concepts in the board governance literature that recognises this circumstance.

This stream of research is primarily related to the board's resource provision role, the other principal board function aside monitoring. While the quad model particularly focuses on the board's monitoring function, Hambrick et al. (2015) recognise that both functions are neither mutually exclusive nor antithetical/opposed.

In the context of measuring a director's monitoring expertise, the board governance literature generally emphasises on directors' human capital (Kor and Sundaramurthy, 2009; Johnson et al., 2013), but the literature specific to CEO turnover decisions is limited.

Hambrick et al. (2015, p. 331) argue that "making prudent decisions about CEO dismissals would seem to require considerable director experience in judging CEO effectiveness." Unlike board tasks that require functional expertise (e.g. accounting topics,

financing decisions), it is unlikely that CEO turnover experience, if available, sufficiently equips directors with the ability necessary to obtain, process, and execute such complex and important decisions as it is the case for CEO turnovers. Correspondingly, the author posits that directors acquire this ability through three levels of experienced-based human capital: generic, industry-specific, and firm-specific capital (Castanias and Helfat, 2001).

A director's generic expertise covers knowledge, skills and experience that are transferable across industries (Castanias and Helfat, 2001). About CEO successions, prior studies focus on outside directors' experience as CEO (Tian et al., 2011). The author contends that CEO experience per se falls short in considering the experience in CEO change and retention decisions, and proposes that directors specifically gain CEO turnover-related expertise through the experience in board monitoring processes. Yet, to the best of author's knowledge, such aspects have not been studied. Nevertheless, several studies find a positive relationship between generic expertise and monitoring effectiveness (Mizruchi and Stearns, 1994; Davidson et al., 2004; Adams and Ferreira, 2007).

Industry-specific expertise includes all the knowledge, skills and experience, that is only transferable within an industry. Industry experts are explicitly valuable for their tacit knowledge of the firm's competitive, regulatory, technological environment as well as other threats and opportunities to the firm (Kor and Misangyi, 2008). Kroll et al. (2008) argue that boards without relevant industry experience are unlikely to ensure effective monitoring, irrelevant of how vigilant they pursue their monitoring tasks. In the context of CEO turnovers, Wang et al. (2015) and Masulis et al. (2012) find that a greater representation of independent directors with industry expertise increases the turnover-performance sensitivity.

Lastly, a board also relies on firm-specific information. Within the board, this expertise is mostly clustered in inside directors, so that outside directors rely on the insiders' goodwill to provide such information (Hillman et al., 2000). Due to power relations between inside and outside directors as well as other behavioural issues (Westphal and Zajac, 2013), an objective flow of information towards outside directors may be distorted (Raheja, 2005). Consequently, outside directors mostly depend on the information they gather during their tenure as well as the information provided by other outsiders (Kim et al., 2014; Kor and Sundaramurthy, 2009).

Unlike the quad model's authors, an important claim of this thesis is that CEO turnover decisions are complex decisions that involve knowledge in various domains, not only in

one particular domain (Hambrick et al., 2015). Above all, CEO turnovers are rare events, in which it is difficult to acquire expertise if not through extensive board and industry experience. On the contrary, it is unlikely that outside directors acquire deep functional expertise in CEO turnover decisions, given an annual turnover rate of about 12% (for a long-term sample see Ellis et al., 2018, p. 39). This thesis, therefore, follows recent advances that highlight the importance of more general director expertise in addressing broader organisational issues (Lungeanu and Zajac, 2019; Tasheva and Hillman, 2019).

Bandwidth

The two attributes mentioned above ensure that directors have an independent and objective perspective on monitoring decisions as well as the intellectual ability to process relevant information. However, literature stresses that even highly skilled and experienced directors have their boundaries when it comes to their capabilities to ensure effective monitoring under the assumption that they are highly motivated (Khanna et al., 2014). Especially in the case of outside directors, their vigilance to effectively monitor might be substantially inhibited by the workload directors are facing due to other responsibilities, such as additional outside board memberships or their executive positions at their home firms. In this context, the literature generally refers to director busyness, which is presumed to be detrimental for effective board monitoring. For the sake of aligning this attribute, the quad model authors label it with its inverse 'bandwidth'.

Prior empirical studies generally show that director busyness negatively affects effective monitoring (Ferris et al., 2003; Fich and Shivdasani, 2006; Cashman et al., 2012). Specifically, concerning CEO turnovers, Fich and Shivdasani (2006) show that boards with a majority of busy directors are less sensitive to performance changes and hence less likely to dismiss the CEO. Wang et al. (2015) show, that on boards comprising a high proportion of outside directors with industry expertise, the likelihood of CEO turnover is negatively correlated to the busyness of board members. However, in other monitoring aspects, the findings are not clear. Seo (2014) shows that busy boards are less likely to link CEO pay to firm performance. Ferris et al. (2003) observe no effect concerning director busyness and firm performance. But, Khanna et al. (2014) show similarly to Wang et al. (2015) that director job demands mitigate the positive relationship between human capital and effective monitoring. Their finding reflects an important consideration of the quad model: outside directors can be effective board monitors if their information

processing capabilities meet their information processing demands. While capabilities are enhanced by director expertise, the complexity of outside jobs reduces the time directors can pursue their monitoring responsibilities. This underpins the relevance of the quad model's attempt to integrate the four director attributes.

Motivation

The quad model's main argument is that director monitoring effectiveness depends on the joint presence of ability and motivation. Accordingly, one would expect that sufficiently motivated directors are eager to utilise their abilities, conditioned by independence and bandwidth, to provide effective board monitoring to the firm and its shareholders.

From the perspective of agency theory, outside directors should have adequate incentives to fulfil their duties and do not collude with managers (Fama and Jensen, 1983). Director incentives can be in various forms such as monetary benefits, reputation and other additional opportunities (cf. Chapter 2).

However, the majority of extant literature emphasises on monetary incentives. In the context of CEO turnovers, Bhagat et al. (1999) find that firms with a high ratio of director shareholders and poor firm performance have a greater likelihood of CEO turnovers. Further, they show that director shareholdings are highly correlated with firm performance. In terms of incentive pay, Perry (2000) find that a greater turnover-performance sensitivity links to a higher degree of incentives among independent boards. However, a drawback of director pay in relation to actual director equity holdings is that boards set their own compensation packages.

Few studies have actually observed how director motivation interacts with derivatives of the other three quad attributes. Most notable, Misangyi and Acharya (2014) show that the firm equity ownership held by outside directors enhances a firm's governance effectiveness. Particularly, it complements a director's independence, suggesting that equity ownership motivates directors to utilise their independent monitoring role fully.

4.2.3 Main hypotheses

CEO turnovers are the most prominent and important task of the board's monitoring role (Vancil, 1987). The application of the quad model concerning CEO turnover decision-making constitutes arguably the most rigorous test among the board's monitoring tasks.

Despite the various reasons for a CEO change, the presumption is that the general

emphasis of boards is the maximisation of shareholder wealth. In that, a CEO change can protect against substantial losses in firm value and ideally reverse the stock performance trend. In this context, it is expected that quad-qualified directors are effective in evaluating performance and making related decisions. Accordingly, quad-qualified boards ought to react more sensitive to stock price performance than boards having no such directors.

Having discussed the extant literature, the underlying assumption is that quad-qualified directors have the ability and motivation to, first, challenge the CEO, because they are not succumbing to social pressure. Second, they can utilise their knowledge, skills and experience to gather, process and share information more effectively, while having the time to do so. Third, their equity stakes in the focal firm ensure that their interests are closely aligned with shareholders. Thus, they are sufficiently motivated to critically discuss the CEO's ability and the potential change of the CEO.

A key criticism of the quad model authors is that extant board governance research focuses on the average dispersion of board characteristics among directors (Dalton and Dalton, 2011). Therefore, the initial test of the quad model examines whether the average presence of quad-qualification among all outside board members increases monitoring effectiveness with regard to turnover decisions. This step allows connecting the quad model to previous research, which has mostly analysed relevant characteristics nested within a board rather than at the director individual level (Johnson et al., 2013). However, the customary approach generally neglects the heterogeneity of director characteristics that are distributed among board members (Haynes and Hillman, 2010). First, it impedes to study how group heterogeneity generally affects board outcomes. Recent literature suggests that heterogeneity has indeed positive effects on board discussion and ultimately monitoring outcomes (Tuggle et al., 2010a). Second, it precludes any inference on whether higher qualified directors outweigh other directors' deficiencies in particular areas. As for the customary perspective, a board could be determined as suitably quad-qualified without having any fully qualified director on the board. Therefore, the emphasis on the director level enables to study group dynamics among quad-qualified directors and finally to make more practical recommendations about board composition.

Hypothesis 1 (H1): *The outside directors' average quad-qualification score has a positive effect on turnover-decision making, i.e. the likelihood of CEO turnover is significantly more sensitive to stock price performance in firms with a higher degree of average outsider quad-qualification.*

Following the research agenda outlined by Hambrick et al. (2015), the director-level analysis requires the development of a suitable approach for testing quad-qualification nested in individual directors. Based on this, it is then possible to analyse whether a higher concentration of individually quad-qualified directors improves effective board monitoring in regard to the CEO turnover-performance relationship. Accordingly, the hypothesis is that the presence of quad-qualified directors positively moderates a board's likelihood to induce a CEO turnover in relation to poor firm stock performance. This means that the probability of turnover is increasing in the number of quad-qualified directors for poor (negative) and decreasing in the number of quad-qualified directors for strong (positive) performance.

Hypothesis 2 (H2): *A board's number of quad-qualified directors has a positive effect on CEO turnover-decision making, i.e. the likelihood of CEO turnover is significantly more sensitive to stock price performance in firms with a greater number of quad-qualified outside directors.*

Hambrick et al. (2015) posit that having one quad-qualified director on the board reduces the likelihood of governance failure. Moreover, they propose that two or more quad-qualified directors would reduce this likelihood far more. Beyond two quad-qualified directors, they make no clear propositions but assume that the marginal gain of adding a third quad-qualified director would be comparably smaller than for the first two directors. While acknowledging the benefits of quad-qualified groups, it is questionable whether a single quad-qualified director can assert enough influence in such an important decision. Drawing on minority-oriented research (Kanter, 1977b), such a director, while sufficiently capable and motivated herself, can rather be seen as a token. Further, even if there were two token quad-qualified directors on the board, it would still be difficult for them to form an alliance that is powerful enough to assert significant influence on group-think.

Correspondingly, it is proposed that greater board monitoring effectiveness will only surface above a minimum of three quad-qualified directors. At this point, the sub-group's shared beliefs, ability, and motivation are sufficiently large to influence board decision-making (Forbes and Milliken, 1999).

Hypothesis 3 (H3): *A critical mass of quad-qualified directors (three or more) will have a positive effect on CEO turnover-decision making, i.e. the likelihood of CEO turnover is significantly more sensitive to stock price performance in firms with at least three or more quad-qualified directors.*

4.3 Data & Methodology

4.3.1 Sample

The initial sample is composed of 59,940 observations for a total of 11,704 directors at 1,231 firms. The sample corresponds to the universe of board members at S&P 1,500 firms between 2009 and 2014, excluding the financial services and utility sectors.

The four quad attributes – independence, expertise, bandwidth, and motivation – cover a broad spectrum of individual characteristics that require information such as relationship, employment, and stock ownership data. For the proposed analysis, data has to be available for each director for a given firm and fiscal year. This data's sampling process and the construction of the variables underlying the quad model attributes have been described in Chapter 3. It is important to highlight that, first, the sample excludes all firms where the reported board size deviates more than one from the number of director observations in a particular firm-year. Second, all firms with less than two consecutive firm-year observations are also dropped. Furthermore, a prerequisite for directors to be considered (or not) as quad-qualified is to be outside board members, i.e., those who perform the board's monitoring mandate (Hambrick et al., 2015). Hence, all inside directors are excluded from the sample. On average, 85.3% of all directors covered are outside directors.

4.3.2 Attribute measurement

Following the quad model's predictions, it is inevitable to measure the quad-qualification of directors for each attribute separately based on the director-firm-level dataset described in Chapter 3. Notably, given the novelty of the quad model, no prior methodology for measuring quad-qualification has been published. This section describes the selected variables used for each attribute before combining them into a composite measure of quad-qualification.

Independence

First, as previously explained, only outside directors can qualify as independent. Under this prerequisite requirement, directors' independence is solely measured on the social dynamics between the CEO and the focal director.

Following Coles et al. (2014), it is suggested that a director's independence is directly

related to whether she has joined the board before or after the incumbent CEO. In order to accommodate for the possibility that the influence of co-opted directors increases over time, the number of years of shared tenure between a co-opted director and the current CEO is calculated. If the director is non-co-opted, i.e. was appointed prior to the CEO joining the board, the variable is set to zero.

A director may also be preoccupied in her monitoring role when she had known the CEO before she commenced her directorship at the focal firm (Fracassi and Tate, 2012; Nguyen, 2012). Correspondingly, using BoardEx's network data[1], the *Outside Share Experience* is the number of years each director has shared time with the CEO in outside employment prior to the role as director of the board in the focal firm.

As the two input variables are essentially capturing lesser director independence, for ease of interpretation, the raw values of each variable are inverted. Thus, *Non-TW-co-opted* and *No Outside Shared Experience* should be positively correlated with the independence attribute as proposed by Hambrick et al. (2015). In order to obtain a composite measure, an index is constructed, which ranges from 0 to 3 for each director-firm observation ij at time t. First, the two underlying variables, *Non-TW-co-opted* and *No Outside Shared Experience*, are normalised to range between 0 and 1 by feature scaling[2]. Then, *Independence* for director-firm ij at time t is calculated as the sum of both input variables plus their interaction term. It is assumed that a director with no outside shared employment (i.e., *No Outside Shared Experience* $= 1$) but who was appointed after the incumbent CEO assumed his role and has since then been on the board for a long time (i.e., *Non-TW-co-opted* $\gtrsim 0$), is less independent than a director who has average degrees of both outside shared experience and tenure-weighted co-option. The interaction ensures that this director would receive a higher composite score. A director who has plenty outside shared experience with the CEO (i.e. *No Outside Shared Experience* $\gtrsim 0$) but is non-co-opted (i.e. *Non-TW-co-opted* $= 1$) would likewise also receive a lower *Independence* score than the director with average degrees in both inputs. Accordingly, fully lacking one

[1]The BoardEx Network dataset covers director relationships beyond the chosen sample period and firm universe

[2]This method (also referred to as min-max normalisation) normalises all values of the variable to range between a certain range of values without changing its distribution characteristics. The formula for feature scaling between 0 and 1 is: $x' = (x - \min x)/(\max x - \min x)$

input variable is punished relatively more:

$$Independence_{ijt} = Non\text{-}TW\text{-}co\text{-}opted_{ijt} + No\ Outside\ Shared\ Experience_{ijt} + \left[Non\text{-}TW\text{-}co\text{-}opted_{ijt} \times No\ Outside\ Shared\ Experience_{ijt}\right] \quad (4.1)$$

Since, the resulting values lie between 0 and 3, $Independence_{ijt}$ is transformed to range between 0 and 1 by using percentile normalisation.

Expertise

In line with the quad model's proposed application, this variable aims to gauge the generic, industry-specific, and firm-specific expertise of each director. However, since a single measure cannot meaningfully explain director expertise, exploratory factor analysis is applied on a set of five variables. For the selection of such variables, the correlation with variables of other attributes must be kept at a minimum.

Generic expertise is measured on individual directors' *Public Board Experience* and *NC Experience*. The presumption here is that greater experience on public firm boards raises the director's expertise in handling complex situations, especially concerning their greater exposure to regulations. Also, public firms are generally more visual to the public, among other things precisely because SEC regulations require the disclosure of meaningful financial and other information. Especially in terms of CEO turnover, it is expected that public board experience more profoundly captures a director's ability to act in the best interest of shareholders and to make reasonable decisions under stress.

The responsibility of nomination committees is in principle the process of board appointments, which entails making recommendations about director selection to the board.[3] Since board monitoring effectiveness is ultimately an outcome of the quality of director appointments, the assumption is that the experience gained as nomination committee members is a useful skill in evaluating the current CEO and potential turnover decisions.

Industry Experience is measured as the director's aggregate length of prior employment in the same industry, identified by the two-digit SIC code. Several overlapping employments in a particular industry are treated as one. Further, only employments in either public or private companies are included.

[3]The NYSE requires all firms to have audit, compensation, and nomination committees

Finally, firm-specific expertise is based on tenure periods. *Director Tenure* is simply the length of the director's tenure on the board since her initial appointment (Tuggle et al., 2010a; Kor and Sundaramurthy, 2009). Additionally, *Tenure Overlap* represents the total length of overlapping tenures with any other outside director, based on the idea that outside directors are likely to circulate more non-public information amongst them when they have familiarised with each other (Sauerwald et al., 2016).

Table 4.1 reports the results of the exploratory factor analysis employed on the set of five expertise variables. Panel B shows the eigenvalue only exceeds 1 for the first factor. Hence, following accepted practice (Ford et al., 1986), a single factor can capture the set of director expertise variables. Factor loadings are positive throughout and above an arbitrary cut-off value of 0.3 (DiStefano et al., 2009). Given that all observed variables positively correlate with each other (cf. Panel A), the economic interpretation of the first FA component is that larger values represent a higher level of expertise.

Table 4.1: Factor Analysis for Turnover Expertise

Panel A reports the Pearson correlation coefficient matrix of all observed variables used in the factor analysis. Panel B reports the results of the factor analysis using the principal factor method without rotation.

A. Correlation Matrix

Observed Variable		1	2	3	4	5
1	NC Expertise	1.000				
2	Industry Experience	0.385	1.000			
3	Public Board Experience	0.420	0.215	1.000		
4	Director Tenure	0.492	0.731	0.223	1.000	
5	Tenure Overlap	0.423	0.600	0.219	0.833	1.000

B. Factor Analysis using principal-factor method

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalue	2.518	0.331	0.011	-0.114	-0.19725
Explained Variance	0.504	0.066	0.002	-0.023	-0.0394
Observed Variable					
1 NC Expertise	0.565	0.345			
2 Industry Experience	0.738				
3 Public Board Experience	0.336	0.399			
4 Director Tenure	0.919				
5 Tenure Overlap	0.835				

Bandwidth

The quad model predicts that on top of a director's independence and expertise, the focal director should have the ability to focus on her monitoring tasks and not be preoccupied

with too many other responsibilities. Hence, drawing from Khanna et al. (2014) and Cashman et al. (2012), a director is defined as busy if she serves on at least three companies with annual revenue larger than 1 billion USD revenue. This sample of director employment relations includes not only major domestic and international public firms but also consider private firms while confining the sample to medium and large firms. Such firms are not only demanding and complex but also are assumed to have more structure and regulatory exposure than smaller firms. Similar to the independence measures, *Busy Size* is inverted to obtain a positively correlated *Bandwidth* measure.

Motivation

Lastly, a director's motivation is proxied by the director's monetary incentives, which are quantifiable and readily available. Building on previous literature (cf. Chapter 3), if outside board members hold firm stocks, their interests are more closely aligned to shareholders. Thus, *Stock Ownership*, measuring the percentage of director's shareholdings in the focal firm, is a direct measure of a director compensation package that is observable by directors at any time during a decision-making process.

It should be noted that directors could have acquired equity prior to joining the board or during their tenure. Hence, beyond capturing the director's received stock awards, the measure refers to the director's current overall equity interest.

Besides the director's option to acquire stocks privately, it should be acknowledged that stock awards constitute the largest proportion of director compensation (cf., Table 3.2) and are used by the majority of US corporate boards (cf., Figure 2.3). Accordingly, for all these features of *Stock Ownership*, the focus is particularly on director equity ownership and not on other forms of financial incentives (e.g. stock options, board meeting fee, annual retainer), which are have also been studied as determinants of director motivation (see Chapter 2).

4.3.3 Quad-qualification measures

The challenge in the application of the quad model is to obtain a meaningful and comprehensive measure of individual quad-qualification (QQ). Following the operationalisation outlined in Chapter 3, Section 3.4, the first step is to compute an individual *QQ Score* for each director i at time t. Therefore, all continuous attribute variables are adjusted to a range between 0 and 1 using percentile normalisation. The composite measure *QQ Score*

is then the sum of all four attribute variables with a resulting score band from 0 to 4.

$$QQ\ Score_{ijt} = Independence_{ijt} + Expertise_{ijt} + Motivation_{ijt} + Bandwidth_{ijt} \tag{4.2}$$

As noted in Chapter 3 and related to hypothesis H1, the board-average proxy of quad-qualification is simply the average *QQ Score* among outside directors. In the case of the director-level approach, individual directors are classified as quad-qualified if they attain a combined *QQ Score* of at least 3.5.

$$QQ\ Dir_{ijt} = QQ\ Score_{ijt} > 3.5 \tag{4.3}$$

Lastly, the number of quad-qualified directors (i.e. if $QQ\ Dir_{ijt} = 1$) represents the alternative board-level proxy to the customary board-average approach.

$$Nbr.\ QQ\ Dirs_{jt} = \sum_{i=1}^{n} QQ\ Dir_{ijt} \tag{4.4}$$

The descriptive statistics for all director-level quad-qualification attributes and their underlying inputs are reported in Table 4.2. Table 4.12 of the appendix shows the corresponding correlation matrix.

As reported in Table 4.2, the sub-sample of quad-qualified directors accounts only for 10.2% of all observed outside directors. It further appears that *Motivation* with an average value of 0.392 is the attribute that directors fulfil the least. Conversely, about 82% of outside directors are defined as non-busy, hence satisfying the *Bandwidth* attribute criteria.

Table 4.2: Descriptive Statistics of Director-Level Quad Attributes and Input Variables

This table reports the descriptive statistics for all outside director-level attribute variables, including the underlying input director-level measures.

Variable	Mean	SD	Min	Q1	Median	Q3	Max	N
QQ Score	2.440	0.743	0.273	1.850	2.455	2.919	4.000	47,804
QQ Dir	0.102	0.303	0.000	0.000	0.000	0.000	1.000	47,804
Independent	0.728	0.336	0.000	0.440	0.940	1.000	1.000	47,715
Turnover Expertise	0.498	0.291	0.000	0.242	0.495	0.747	1.000	47,804
Motivation	0.392	0.383	0.000	0.000	0.485	0.758	1.000	47,804
Bandwidth	0.823	0.381	0.000	1.000	1.000	1.000	1.000	47,804
Non-TW-co-opted	0.880	0.202	0.000	0.816	1.000	1.000	1.000	47,803
No Outside Shared Experience	0.994	0.027	0.000	1.000	1.000	1.000	1.000	47,715
NC Experience	7.648	7.459	0.000	0.000	6.333	12.083	32.000	47,804
Industry Experience	11.252	8.878	0.250	4.750	9.083	15.208	45.000	47,804
Public Board Experience	4.544	4.470	0.000	0.400	3.800	6.800	21.600	47,804
Director Tenure	8.491	7.000	0.083	3.333	6.833	11.667	38.917	47,804
Tenure Overlap	5.210	3.161	0.083	2.792	4.958	7.167	15.500	47,804
Stock Ownership	0.001	0.003	0.000	0.000	0.000	0.000	0.043	47,804
Busy Size	0.177	0.381	0.000	0.000	0.000	0.000	1.000	47,804

4.3.4 Identifying CEO turnovers

The approach to classifying CEO turnovers follows earlier work of Parrino (1997) and Denis and Denis (1995) who developed algorithms that distinguish between voluntary and forced CEO turnovers. These rely on a qualitative analysis of press reports surrounding the announcement of the CEO turnover. Therefore, in the first step, all CEO turnovers are categorised by assessing whether the CEO has changed between two financial reporting periods. Subsequently, information on various turnover characteristics (e.g., CEO destination, reasons for departure, etc.), as well as the announcement date, are collected from newspapers and news agencies for each CEO change.

Forced CEO turnovers are classified following Parrino (1997) algorithm: first, all turnovers where the departing CEO is fired, forced from her position, or leaves due to policy differences with the board and/or shareholders, are classified as forced. Second, all remaining turnovers not classified as forced and with a CEO younger than 60 are reviewed and reclassified as forced if the reason for departure is other than death/illness or starting a new job. Finally, all cases classified as forced in the previous step are further investigated to understand whether the CEO's departure is unrelated to the firm's activities (e.g., restructuring, succession policy) or that the CEO stays on the board as chair for longer than a transition period. In case that reliable CEO turnover information was unavailable, the observations were removed from the sample.

Turnovers are then further classified into three categories. Any non-forced turnover, but excluding CEO departures due to illness or death, is categorised as voluntary turnover. However, doubts have been expressed in the literature in relation to the real 'voluntary'

Table 4.3: CEO Turnover Classification

This table reports the classification of collected CEO turnover information for turnovers between 2009 and 2014. Observations and percentages only add up for the *Destination of Departing CEO*.

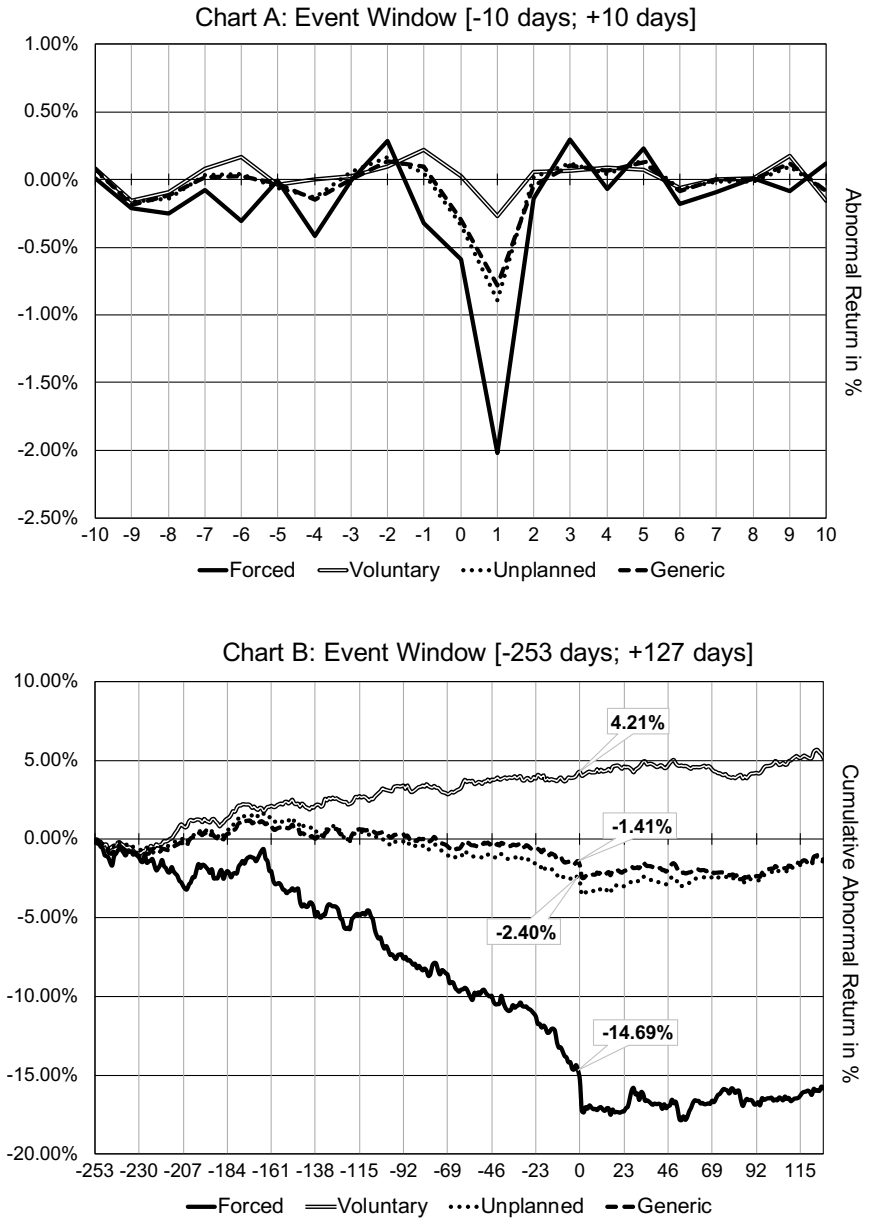
	%	N		%	N
Type of Turnover			*Reason for Turnover*		
Generic	91.7%	517	Replacement for interim CEO	1.1%	6
Unplanned	81.4%	459	Retirement	33.7%	190
Voluntary	68.1%	384	Unexpected retirement	3.4%	19
Forced	26.8%	151	Part of restructuring process	3.2%	18
			Death/illness	5.1%	29
Destination of Departing CEO			Pursuing other interests	6.0%	34
Remained director	41.5%	234	New job	3.2%	18
Remained other employee	43.3%	244	Fired	2.3%	13
Leaves firm	15.2%	86	Forced from position	2.8%	16
			Policy differences	0.7%	4
Additional Characteristics			with board/shareholders		
Part of succession plan	21.5%	121	Other	11.3%	64
Departing CEO is founder/family	8.9%	50	No reason given	17.2%	97
Total Number of CEO Turnovers		564			

nature of non-forced (Kaplan and Minton, 2012; Fee et al., 2018). Thus, following Eisfeldt and Kuhnen (2013), also the number of unplanned turnovers is calculated. Unplanned turnovers are defined as all turnovers announced less than six months prior to the CEO departure and are not due to health issues or death. Finally, turnovers are categorised by whether they are generic, including all turnovers except those related to illness, death, and corporate restructuring (Fee et al., 2018). In total, 564 CEO turnovers are identified for the sample period 2009-2014. 26.2% are classified as forced though only a few can be deduced from CEOs' actual statements being ousted, fired, or forced from their position (see Table 4.3). Interestingly, unplanned turnovers make up 81.4% of all turnovers, exceeding voluntary turnovers (68.1%). Generic turnovers amount to 91.7% in the final CEO turnover sample. Since the announcement and actual departure may not be in the same fiscal year, CEO turnovers are assigned to the fiscal period in which the turnover is announced. When there is more than one turnover per firm-fiscal-year, the sample includes only the earliest turnover.

Following the turnover classification process, the applied algorithms' reliability is examined by running a univariate analysis of abnormal stock performance around the CEO turnover announcement date. Figure 4.1 illustrates that the abnormal stock performance in the year prior to the turnover is very similar to prior studies (Worrell et al., 1993; Denis and Denis, 1995). A period of strongly deteriorating firm performance precedes

Figure 4.1: Firm Stock Performance around CEO Turnover Date

This figure shows the abnormal returns (in %) of forced (= 151), voluntary (= 384), unplanned (= 459) and generic CEO turnover (= 517) around the announcement date. Abnormal returns are calculated in excess of CRSP value-weighted market return, requiring 95% valid returns for a turnover to be included. Chart A shows the average abnormal return for the −10 days to +10 days event window. Chart B shows the mean cumulative abnormal returns for the −253 days to +127 days event window (253 days is the equivalent of a trading year). In both charts, it is not controlled for confounding events.



forced turnovers in comparison to voluntary turnovers. On average, the annual abnormal return on the day prior to the turnover announcement day is -14.69%, whereas voluntary turnovers document a positive annual abnormal return of 4.21%. Unplanned and generic turnovers lie between the two previous turnover types and have a cumulative average abnormal return of -2.49% and -1.41%, respectively. Given that 317 of the 384 voluntary turnovers are also coded as unplanned departures, the negative return of unplanned

Table 4.4: Event Study: CEO Turnover Announcements

The table reports the mean and median cumulative abnormal returns (in %) of forced (= 151), voluntary (= 384), unplanned (= 459) and generic CEO turnover (= 517) around the announcement date. Abnormal returns are calculated in excess of CRSP value-weighted market return. The table reports t-values based on a standard parametric t-test and z-values based on a non-parametric Wilcoxon signed-rank test.

Turnover Type	Event Window	N	Mean CAR	Median CAR	t-value	z-value
Forced	(-2,+2)	142	-2.75%	-1.83%	-5.015***	-2.768***
	(-1,+1)	142	-2.82%	-1.94%	-6.638***	-4.097***
	(0,+2)	142	-2.71%	-1.93%	-6.375***	-2.514**
	(0,+1)	142	-2.54%	-1.88%	-7.336***	-3.719***
Voluntary	(-2,+2)	367	0.17%	-0.31%	0.638	-0.126
	(-1,+1)	367	0.01%	-0.16%	0.0580	-0.088
	(0,+2)	367	-0.17%	-0.13%	-0.822	-0.933
	(0,+1)	367	-0.25%	-0.25%	-1.500	-1.239
Generic	(-2,+2)	492	-0.88%	-0.63%	-3.508***	-1.806*
	(-1,+1)	492	-0.93%	-0.54%	-4.780***	-2.313**
	(0,+2)	492	-1.12%	-0.40%	-5.759***	-2.332**
	(0,+1)	492	-1.07%	-0.48%	-6.746***	-3.188***
Unplanned	(-2,+2)	431	-0.95%	-0.70%	-3.488***	-1.881*
	(-1,+1)	431	-1.11%	-0.76%	-5.264***	-2.860**
	(0,+2)	431	-1.18%	-0.48%	-5.596***	-2.360**
	(0,+1)	431	-1.21%	-0.68%	-7.038***	-3.629***

turnovers presumes that many voluntary turnovers are likely to be the consequence of the board's action.

Moreover, an event study is carried out to examine the cumulative average abnormal returns over the 5-day event window around the CEO turnover announcement date. Table 4.4 shows the results for the event windows (-2,2), (-1,1), (0,2), and (0,1) using market-adjusted returns. The table clearly shows that forced CEO turnover exhibit the strongest investor reaction around the announcement date. However, unplanned turnovers also induce a significant negative reaction.

In sum, the univariate analysis underpins the substantial difference between types of turnover and provides a meaningful basis for investigating the predictions of the quad model and the CEO turnover-performance relationship.

4.3.5 Baseline model

As outlined previously, the empirical approach follows Hambrick et al. (2015) in their prediction that it is not sufficient for the quad attributes to exist somewhere among all

directors. To evaluate this assumption, the prevalent board-averages approach (*QQ Score*) and the number of directors approach (*Nbr. QQ Dirs*) are both used in the baseline model. Correspondingly, this means that only the measure of quad-qualification changes between the baseline model of both approaches.

In essence, the baseline regression models below reflect the standard models for evaluating the effect of director and board characteristics on the turnover-performance sensitivity (e.g., Coles et al., 2014; Hwang and Kim, 2009; Fich and Shivdasani, 2006). While the quad-qualified variables may have a main effect on the probability of CEO turnover, the hypotheses suggest that quad-qualification moderates the relationship between *Abnormal Return* and *CEO Turnover*. Accordingly, it is expected that the interaction effect (e.g., *Abnormal Return* × *QQ Score*) is significantly negative.

The models include both the variables of the two main effects and its interaction effect; only then it is possible to draw conclusions about whether the focal variables *QQ Score* and *Nbr. QQ Dirs* have a significant main effect on turnover probability or whether they moderate the relationship between *Abnormal Return* and turnover probability. Accordingly, the baseline models of each approach are as follows:

$$\begin{aligned}\frac{P(CEO\ Turnover_{j,t})}{1-P(CEO\ Turnover_{j,t})} &= \beta_1 QQ\ Score_{j,t} + \gamma_1 Abnormal\ Return_{j,t-1} \\ &+ \beta_2 QQ\ Score_{j,t} \times Abnormal\ Return_{j,t-1} + \gamma_2 CEO\ Controls_{j,t} \\ &+ \gamma_3 Board\ Controls_{j,t} + \gamma_4 Firm\ Controls_{j,t} + u_{j,t} \quad (4.5)\end{aligned}$$

$$\begin{aligned}\frac{P(CEO\ Turnover_{j,t})}{1-P(CEO\ Turnover_{j,t})} &= \beta_1 Nbr.\ QQ\ Dirs_{j,t} + \gamma_1 Abnormal\ Return_{j,t-1} \\ &+ \beta_2 Nbr.\ QQ\ Dirs_{j,t} \times Abnormal\ Return_{j,t-1} + \gamma_2 CEO\ Controls_{j,t} \\ &+ \gamma_3 Board\ Controls_{j,t} + \gamma_4 Firm\ Controls_{j,t} + u_{j,t} \quad (4.6)\end{aligned}$$

As for the above stated regression equations (Equation 4.5 & Equation 4.6), daily stock market data of *Abnormal Return* is obtained through CRSP. Following Coles et al. (2014), *Abnormal Return* is calculated as the stock's excess return in the year prior to the turnover announcement date over the value-weighted market return in the same period. For non-turnover years, *Abnormal Return* refers to the 12 months prior to the financial year-end. For turnover years, *Abnormal Return* refers to the 12 months prior to the trading day before the CEO turnover announcement. This adjustment is applied separately for all

Table 4.5: Descriptive Statistics of Analysis

Variables	Mean	SD	Min	Q1	Median	Q3	Max	N
Forced Turnover	0.02	0.12	0.00	0.00	0.00	0.00	1.00	4533
Voluntary Turnover	0.05	0.22	0.00	0.00	0.00	0.00	1.00	4533
Generic Turnover	0.07	0.25	0.00	0.00	0.00	0.00	1.00	4533
Unplanned Turnover	0.06	0.23	0.00	0.00	0.00	0.00	1.00	4533
Abnormal Return	0.06	0.32	-0.64	-0.13	0.02	0.20	2.73	4533
Idiosync. Return	-0.01	0.35	-1.10	-0.20	-0.03	0.16	2.85	4533
Peer Return	0.21	0.29	-0.48	0.01	0.18	0.37	1.42	4533
QQ Score	2.52	0.46	1.08	2.21	2.51	2.83	3.84	4533
Nbr. QQ Dirs	0.91	1.31	0.00	0.00	0.00	2.00	8.00	4533
CEO Age	4.03	0.12	3.69	3.95	4.03	4.11	4.36	4533
CEO Ownership	0.01	0.01	0.00	0.00	0.00	0.01	0.05	4533
Duality	0.53	0.50	0.00	0.00	1.00	1.00	1.00	4533
CEO Tenure	8.57	7.32	0.08	3.42	6.58	11.25	37.92	4533
Board Size	2.20	0.23	1.61	2.08	2.20	2.40	2.77	4533
Outsider Age	4.14	0.06	3.95	4.10	4.14	4.18	4.28	4533
Outsider Ratio	0.85	0.08	0.57	0.83	0.88	0.90	0.94	4533
Firm Size	7.79	1.56	4.48	6.65	7.61	8.77	12.36	4533
HHI	0.71	0.18	0.00	0.64	0.74	0.83	1.06	4533
Inst. Ownership	0.05	0.06	0.02	0.03	0.04	0.05	0.61	4533

S&P 1500 firms excluding the financial services and utility sectors, fiscal years 2009–2014

turnover types. Consequently, abnormal return in *Forced Turnover* years in which a voluntary turnover took place is the abnormal return during the 12 month prior to the financial year-end. Accordingly, the time-subscripts for *Abnormal Return* is $t-1$) as it is, depending on whether a turnover occurred or not, the annual abnormal return on the day prior to the turnover announcement or the annual abnormal return at fiscal year end. It is thus the past abnormal return that the board would retrospectively consider for its decision.

It is also accounted for the timing difference between the CEO turnover announcement and fiscal year-end pertaining to the *Independence* variables. Given that both underlying variables are directly related to the departing CEO, using their respective year-end values would identify the wrong CEO. Thus, following Coles et al. (2014) and their approach to adjusting the co-option measure, *Non-TW-co-opted*, *Non Outside Shared Experience*, and the CEO control variables are lagged by one period for turnover years. This adjustment approximates the CEO-director relationship at the time of the turnover announcement. For non-turnover years, the variables are set to the respective average of their contemporaneous and lagged values, approximating the average CEO-director relationship during the fiscal year period. Altogether, the adjustments reflect the CEO-director relationship during the board's decision-making period t. This is done before

computing the *QQ Score* and *Nbr. QQ Dirs*, but executed for each type of turnover separately.

Besides the focal variable, the model also considers agency conditions concerning the CEO, the board, and the firm. As to CEO controls, *Duality* measures whether the CEO concurrently serves as board chair, *CEO Tenure* is the length of the incumbent CEO's tenure, *CEO Ownership* is the percentage ownership in corporate stock, and *CEO Age* is the natural logarithm of the CEO's age. Each one is lagged by one period for turnover years, ensuring that the departing CEO is correctly identified. It is noteworthy that apart from the independence-related portion of the quad-qualification scores, the CEO and stock performance controls, all other variables are considered with their contemporaneous values.

As to the board controls, *Board Size* is the natural logarithm of the total number of board members, *Outsider Age* is the natural logarithm of the average age of outside directors, and *Outsider Ratio* is the percentage of outside directors on the board. *Outsider Ratio* is important, given that the attributes only cover outside directors. Thus, this variable weights their overall representation on the board, i.e. the degree of board independence, and therefore their potential say in board decision-making. Each of the board controls is measured at fiscal year-end t.

With respect to firm characteristics, *Firm Size* is the natural logarithm of the firm's total assets, *HHI* is the Herfindahl-Hirschman Index for ownership concentration, and *Institutional Ownership* is the percentage in ownership held by active institutional investors.[4] Both variables are measured at fiscal year-end t. The descriptive statistics of the baseline model are reported in Table 4.5.

Each model is estimated using logistic regression with Fama-French 12 industry classification dummies to account for firms' heterogeneity and fiscal year dummies to account for macroeconomic effects. Within the sample period 2009 to 2014, only CEO turnovers are considered where the CEO held the position for at least 12 months before the beginning of the fiscal year.

A detailed step-by-step regression analysis using different configurations of control variables is reported in the appendix (Table 4.13 and Table 4.14) alongside an overview of variable descriptions (Table 4.11).

[4]Percentage of shares held by institutional investors excluding banks and insurance companies.

4.4 Empirical Results

4.4.1 Quad-qualification score

About the first hypothesis H1, the expectation is that the sensitivity of forced CEO turnovers to the firm's abnormal (market-adjusted) performance is affected by the presence of a board with a high degree of quad-qualification.

First, the empirical model is tested without its interaction term along with the four different CEO turnover classifications. As for the main variable of interest, *QQ Score*, no significant effect on the likelihood of any turnover type can be observed. While this does not contradict the hypothesis, it suggests that a greater *QQ Score* does not increase the frequency of CEO turnovers. Conversely, the significantly negative effect of *Abnormal Return*, concerning forced, generic, and unplanned turnover, confirms the expectations about the turnover-performance sensitivity. This also corresponds with the results of the event study and prior research (Fee et al., 2018; Eisfeldt and Kuhnen, 2013), suggesting that underperforming firms are more likely to remove their CEOs (cf. Figure 4.1).

With respect to the control variables, it is noteworthy that forced turnovers greatly differ in terms of *CEO Age*. While voluntary, generic and unplanned CEO changes appear to be positively correlated with *CEO age*, which indicates that especially older CEOs are likely to step down, CEO dismissals are found to be more likely for CEOs who are younger. This finding is consistent with prior research but reveals a substantial weakness in the analysis of forced CEO turnovers. As previously noted by Fee et al. (2018), this difference is likely related to the applied turnover identification algorithm for forced CEO turnovers, which codes all CEO departures as forced if the turnover is not the result of understandable reasons, and the CEO is younger than 60 years.

Moreover, a firm's board size appears to have a significantly positive effect on all but forced turnovers. Also, such turnovers are negatively related to the average age of outside directors and the proportion of outside directors on the board.

Having established that CEO turnovers generally coincide with weak stock performance, the second step is to examine how the effect of abnormal stock performance on turnover probability is moderated by the degree of quad-qualification, i.e. the effect of *QQ Score* on the firm's turnover-performance sensitivity. Table 4.6 (see columns 2, 4, 6, and 8) shows a significantly negative turnover-performance sensitivity to increases in *QQ Score* for all but forced turnovers. Accordingly, a board with an average high degree of quad-

Table 4.6: Average Quad-Qualification and Turnover-Performance Sensitivity

This table shows the estimation results from the logistic regression of *QQ Score* on CEO turnover. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outsiders in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced Turnover (N=67)		*Voluntary Turnover*		*Unplanned Turnover*		*Generic Turnover*	
	(N=67)		*(N=233)*		*(N=250)*		*(N=288)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
QQ Score$_t$	-0.100	-0.110	0.026	0.076	-0.125	-0.111	-0.082	-0.065
	(0.329)	(0.344)	(0.186)	(0.188)	(0.177)	(0.177)	(0.165)	(0.166)
Abnormal Return$_{t-1}$	-3.022***	-2.811	-0.139	2.065*	-0.720***	2.436**	-0.683***	1.866
	(0.592)	(2.617)	(0.240)	(1.124)	(0.278)	(1.185)	(0.253)	(1.153)
QQ Score$_t$		-0.083		-0.908**		-1.295***		-1.042**
* Abnormal Return$_{t-1}$		(0.989)		(0.442)		(0.469)		(0.449)
CEO Age$_t$	-2.630**	-2.631**	6.406***	6.411***	3.537***	3.544***	4.100***	4.105***
	(1.242)	(1.241)	(0.757)	(0.755)	(0.685)	(0.683)	(0.646)	(0.645)
CEO Ownership$_t$	-15.780	-15.803	-9.375	-9.762	-10.072	-10.622	-8.945	-9.396
	(12.704)	(12.720)	(7.633)	(7.655)	(6.887)	(6.915)	(6.497)	(6.518)
Duality$_t$	-0.414	-0.414	0.338**	0.336**	0.113	0.111	0.138	0.137
	(0.305)	(0.305)	(0.158)	(0.158)	(0.144)	(0.144)	(0.135)	(0.135)
CEO Tenure$_t$	-0.027	-0.027	-0.020	-0.020	-0.021	-0.021	-0.021*	-0.020*
	(0.032)	(0.032)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
Board Size$_t$	1.184	1.183	1.737***	1.735***	1.423***	1.418***	1.550***	1.545***
	(0.779)	(0.780)	(0.397)	(0.397)	(0.382)	(0.383)	(0.350)	(0.350)
Outsider Age$_t$	-2.890	-2.881	-4.641***	-4.579***	-4.219***	-4.136***	-3.935***	-3.863***
	(2.083)	(2.068)	(1.213)	(1.217)	(1.099)	(1.104)	(1.040)	(1.046)
Outsider Ratio$_t$	1.162	1.161	-4.024***	-3.990***	-2.779***	-2.759***	-2.913***	-2.891***
	(1.889)	(1.889)	(1.057)	(1.060)	(0.964)	(0.968)	(0.922)	(0.927)
Firm Size$_t$	-0.051	-0.051	0.021	0.021	-0.042	-0.040	-0.016	-0.015
	(0.099)	(0.099)	(0.062)	(0.062)	(0.055)	(0.055)	(0.052)	(0.052)
Inst. Ownership$_t$	-0.867	-0.865	1.141**	1.094**	0.454	0.407	0.608	0.567
	(0.792)	(0.791)	(0.543)	(0.545)	(0.482)	(0.479)	(0.452)	(0.452)
HHI$_t$	0.402	0.403	0.399	0.237	1.068	0.935	1.079	0.961
	(2.086)	(2.086)	(2.011)	(2.054)	(1.397)	(1.424)	(1.368)	(1.398)
Constant	16.024*	16.015*	-12.173**	-12.574**	-0.743	-1.164	-4.709	-5.068
	(8.460)	(8.447)	(5.380)	(5.405)	(4.681)	(4.705)	(4.466)	(4.496)
Observations	4,038	4,038	4,260	4,260	4,307	4,307	4,310	4,310
Firms	858	858	884	884	884	884	884	884
Pseudo R^2	0.110	0.110	0.0932	0.0949	0.0466	0.0498	0.0554	0.0576
Wald χ^2	99.25	101.80	154.50	159.50	99.67	108.70	126.10	133.70

qualification among its outside directors is more sensitive to negative changes in market-adjusted stock performance. In other words, this suggests quad-qualified boards are more likely to trigger a turnover in the case of more negative abnormal returns, which supports hypothesis H1. However, as pointed out by Ai and Norton (2003), the interpretation of the interaction effect is problematic in non-linear models since the magnitude of the interaction effect is dependent on all the covariates in the model.

To shed light on the dynamics between quad-qualification and turnover-performance sensitivity, the average marginal effects (AMEs) of the main predictor *QQ Score* are

computed for all levels of *Abnormal Return* as well as *QQ Score*.[5] Both are graphically illustrated in Figure 4.2 and Figure 4.3. Since the 95%-confidence intervals in Figure 4.2 overlap with the zero baseline along any performance level, a one-unit increase in *QQ Score* does not induce a significant effect on the probability of any turnover. In the case of *QQ Score*, Figure 4.3 shows that a one-unit increase in *Abnormal Return* has only a significant negative effect on turnover probability when *QQ Score* is about 2.5 or higher (i.e., for generic turnovers). The downward slope reflects the negative sign of the interaction coefficient in Table 4.6.

In sum, *QQ Score* is suggested to be an effective measure to evaluate whether an increase in the board's average quad-qualification results in effective turnover decisions. However, while we find that the board's level of quad-qualification significantly moderates the turnover-performance sensitivity, the informative value of the average *QQ Score* regarding marginal effects is limited when seeking a distinct and tangible measure. Despite that Figure 4.3 suggests that a *QQ Score* of about 2.5 and larger sufficiently activates effective board decision-making in terms on the turnover-performance relationship, *QQ Score* does not explain how quad-qualification is dispersed among the directors.

4.4.2 Number of quad-qualified directors on the board

In reference to the second hypothesis, the expectation is that the presence of quad-qualified directors on the board enhances the effectiveness in board monitoring tasks. The corresponding test uses the previously stated baseline model, replacing only *QQ Score* with *Nbr. QQ Dirs*. As previously specified, the variable represents the total number of outside directors who are quad-qualified, i.e. individual *QQ Score* is larger or equal to 3.5.

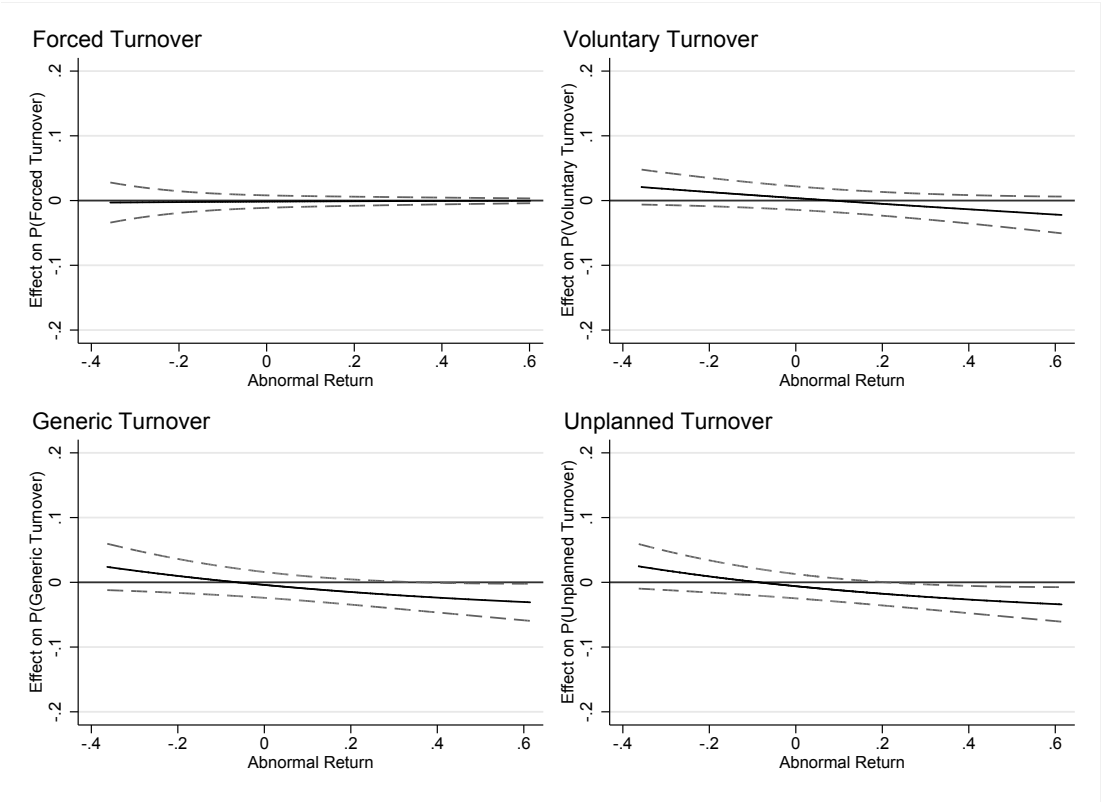
Similar to Table 4.6, the main independent variable *Nbr. QQ Dirs* has no significant effect on CEO turnover probability. Also, *Abnormal Return* is significantly negative for all but voluntary turnovers, which again underpins the results from the univariate analysis of abnormal stock performance around the turnover announcement date. Moreover, the coefficients and statistical significance of the control variables have only marginally changed. Altogether, the results correspond greatly to the previous findings.

About the specification of the model, one question remains: Is the predictive power of using *Nbr. QQ Dirs* instead of *QQ Score* increased? In the case of logistic regressions,

[5] It should be noted that the marginal effects are estimated at the means of its covariates. The marginal effect can have different sign and magnitude for different observations.

Figure 4.2: Average Marginal Effect of QQ Score on Turnover Probability

This figure shows for each type of turnover, the average marginal effect of a one unit increase in *QQ Score* on turnover probability across *Abnormal Return* . The dashed lines represent the corresponding 95%-confidence intervals. All other variables are held constant at their means.



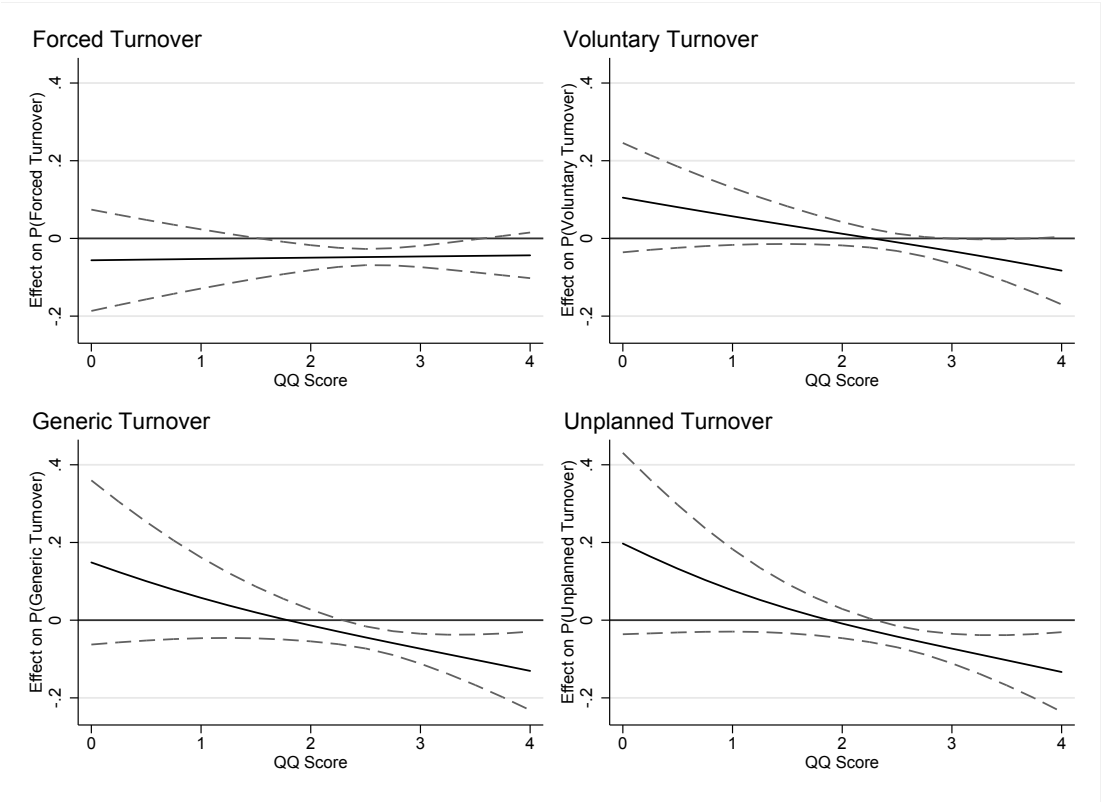
the explained variance, as measured by Pseudo R^2, is not an appropriate measure to determine this difference. Therefore, the corresponding receiver operating characteristic (ROC) curves are plotted, and the area under the curves (AUCs) are compared. The ROC curve plots the false positive rate vs. the true positive rate when predicting a binary outcome. It is independent of the number of independent variables and can be used to compare different models directly. Figure 4.4 shows the four ROC curves that correspond to the baseline models (2) and (8) in Table 4.6 and Table 4.7 respectively. There are only marginal differences between the *QQ Score* charts on the top and the *Nbr. QQ Dirs* charts on the bottom. Statistically, the differences of both pairs are insignificant.[6] This implies that *Nbr. QQ Dirs* is equally suited to predict turnover outcomes than the commonly-used board-average measure *QQ Score*. The former has greater practical applicability and allows testing the quad model predictions regarding critical mass levels.

Since the presented results do not allow any economic interpretation, the average marginal effects of *Nbr. QQ Dirs* are again plotted for each level of *Abnormal Return*

[6] Using the Stata command roccomp, the null hypothesis that the area under the ROC curve is the same cannot be rejected.

Figure 4.3: Average Marginal Effect of Abnormal Return on Turnover Probability

This figure shows for each type of turnover, the average marginal effect of a one unit increase in *Abnormal Return* on turnover probability across *QQ Score* $\in [0, 4]$. The dashed lines represent the corresponding 95%-confidence intervals. All other variables are held constant at their means.



as well as *Nbr. QQ Dirs*. Figure 4.5 shows a declining slope in the marginal effect of *Nbr. QQ Dirs* for increasing performance on all but forced CEO turnover. It appears that a one-unit increase in *Nbr. QQ Dirs*, i.e. an additional quad-qualified director, significantly increases the probability of voluntary and generic turnover for low values of *Abnormal Return* between 1% and 2%. The effect is similar in the case of unplanned CEO turnovers. While it is statically indeterminate at the 5% significance level given that the confidence intervals overlap with the zero baseline, unreported results exhibit a statistically significant effect at the 10% level.

For unplanned and generic turnovers, Figure 4.6 shows that effective decisions are made when the board has one or more quad-qualified directors. However, the charts do not reveal whether this effect is significantly different from having no quad-qualified directors. Still, the negative and significant slope of the marginal effects of *Abnormal Return* by the number of quad-qualified directors supports hypothesis H2. In sum, the slope and confidence intervals reflect the logistic regression results in Table 4.7.

Next, a post-hoc probing analysis is conducted to verify the validity of the interaction effects (Holmbeck, 2002). As shown in Table 4.8, the findings fundamentally confirm

Table 4.7: Number of Quad-Qualified Directors and Turnover-Performance Sensitivity

This table shows the estimation results from the logistic regression of *Nbr. QQ Dirs* on CEO turnover. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outsiders in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

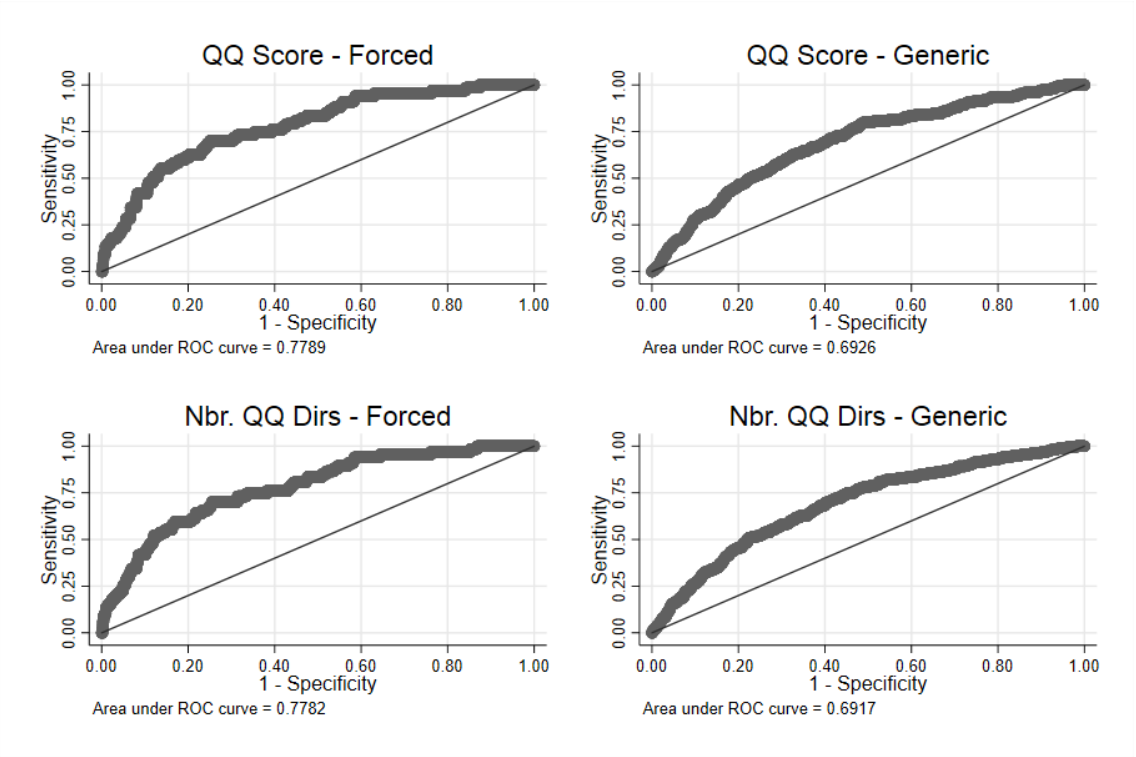
	Forced Turnover (N=67)		*Voluntary Turnover*		*Unplanned Turnover*		*Generic Turnover*	
	(N=67)		*(N=233)*		*(N=250)*		*(N=288)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nbr. QQ Dirs$_t$	-0.030	-0.024	0.084	0.089	0.016	0.009	0.032	0.026
	(0.103)	(0.107)	(0.057)	(0.056)	(0.053)	(0.053)	(0.049)	(0.049)
Abnormal Return$_{t-1}$	-3.019***	-3.072***	-0.137	0.185	-0.720***	-0.440	-0.682***	-0.377
	(0.588)	(0.720)	(0.240)	(0.278)	(0.279)	(0.320)	(0.253)	(0.292)
Nbr. QQ Dirs$_t$		0.066		-0.430**		-0.379**		-0.407**
* Abnormal Return$_{t-1}$		(0.337)		(0.178)		(0.188)		(0.167)
CEO Age$_t$	-2.645**	-2.638**	6.445***	6.437***	3.540***	3.531***	4.114***	4.101***
	(1.234)	(1.235)	(0.757)	(0.757)	(0.686)	(0.684)	(0.649)	(0.648)
CEO Ownership$_t$	-15.798	-15.783	-10.194	-10.044	-10.910	-10.833	-9.774	-9.667
	(12.709)	(12.707)	(7.604)	(7.627)	(6.889)	(6.907)	(6.487)	(6.504)
Duality$_t$	-0.414	-0.414	0.357**	0.354**	0.130	0.126	0.154	0.152
	(0.308)	(0.309)	(0.158)	(0.157)	(0.145)	(0.144)	(0.135)	(0.134)
CEO Tenure$_t$	-0.025	-0.025	-0.018	-0.018	-0.018	-0.017	-0.018	-0.017
	(0.030)	(0.030)	(0.013)	(0.013)	(0.012)	(0.012)	(0.011)	(0.011)
Board Size$_t$	1.219	1.222	1.668***	1.653***	1.420***	1.405***	1.531***	1.516***
	(0.772)	(0.770)	(0.401)	(0.401)	(0.383)	(0.384)	(0.353)	(0.354)
Outsider Age$_t$	-2.878	-2.889	-4.953***	-4.866***	-4.455***	-4.398***	-4.187***	-4.117***
	(2.047)	(2.044)	(1.221)	(1.230)	(1.100)	(1.103)	(1.048)	(1.053)
Outsider Ratio$_t$	1.204	1.206	-4.160***	-4.046***	-2.826***	-2.756***	-2.977***	-2.891***
	(1.899)	(1.902)	(1.057)	(1.060)	(0.964)	(0.963)	(0.921)	(0.923)
Firm Size$_t$	-0.049	-0.049	0.038	0.039	-0.027	-0.025	-0.001	0.000
	(0.102)	(0.101)	(0.062)	(0.062)	(0.055)	(0.055)	(0.052)	(0.052)
Inst. Ownership$_t$	-0.856	-0.858	1.135**	1.098**	0.432	0.407	0.589	0.561
	(0.797)	(0.798)	(0.546)	(0.547)	(0.480)	(0.479)	(0.452)	(0.452)
HHI$_t$	0.414	0.401	0.474	0.403	1.096	1.070	1.120	1.083
	(2.093)	(2.093)	(2.038)	(2.056)	(1.399)	(1.407)	(1.378)	(1.392)
Constant	15.657*	15.666*	-10.923**	-11.314**	-0.168	-0.395	-3.970	-4.242
	(8.549)	(8.553)	(5.449)	(5.511)	(4.725)	(4.755)	(4.528)	(4.570)
Observations	4,038	4,038	4,260	4,260	4,307	4,307	4,310	4,310
Firms	858	858	884	884	884	884	884	884
Pseudo R^2	0.11	0.11	0.0940	0.0967	0.0464	0.0481	0.0555	0.0576
Wald χ^2	99.33	104.00	154.80	160.10	98.78	105.50	125.00	134.60

the previously presented plots of average marginal effects. When *Abnormal Return* is low (i.e. -1 standard deviation (SD) from the mean), it is suggested that an additional quad-qualified director significantly increases the probability of voluntary, unplanned and generic turnovers. In the case of generic turnovers, the marginal effect is -1.3% for low and $+1.2\%$ for high *Abnormal Return*.

Furthermore, for high levels in *Nbr. QQ Dirs* (i.e. $+1$ standard deviation from the mean), the results indicate that an increase in *Abnormal Return* decreases the probability of voluntary, unplanned and generic turnovers. As for the probability of a generic turnover,

Figure 4.4: ROC-Curves of Baseline Model: *QQ Score* vs. *Nbr. QQ Dirs*

This figure shows the receiver operating characteristic (ROC) curves for using the baseline model with *QQ Score* and *Nbr. QQ Dirs* on forced and generic turnovers. The graphs relate to models (2) and (8) of Table 4.6 and Table 4.7. ROC curves plot the true positives (sensitivity) against the false negative (1-specificity) of the prediction. The greater the area under the curve (AUC) is, the more accurate the prediction of the model.



the marginal effect of *Abnormal Return* is -9.5%. In contrast, for low levels in *Nbr. QQ Dirs*, the positive coefficients and even a significantly positive effect for voluntary turnovers. In sum, this supports hypothesis H2 that an increase in the number of quad-qualified directors yields higher turnover-performance sensitivity. However, as with the board-averages approach of *QQ Score*, forced turnovers are seemingly not influenced by quad-qualification.

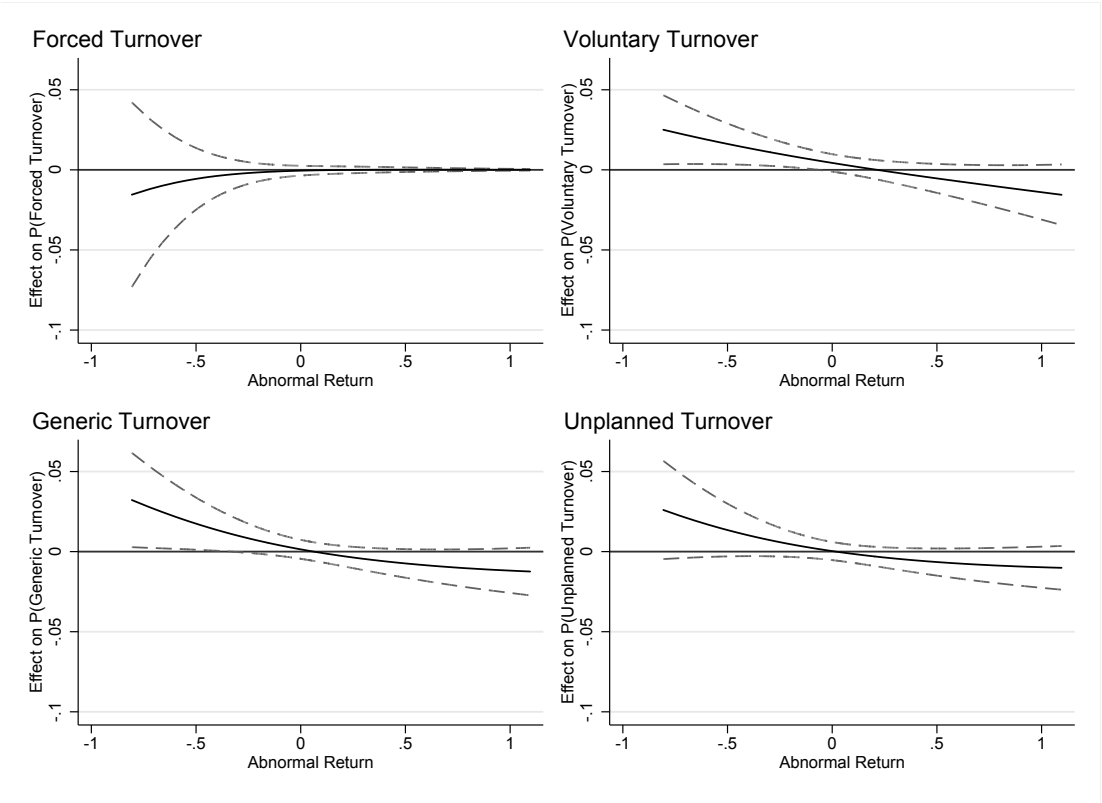
4.4.3 Critical mass hypothesis

A central argument of Hambrick et al. (2015) is that effective board monitoring is particularly strengthened when there is a group of quad-qualified directors on the board. In reference to hypothesis 3, this involves testing at which minimum group size the turnover-performance sensitivity is maximised. Therefore, the previous variable *Nbr. QQ Dirs* is replaced by dummy measures indicating whether the number of quad-qualified directors is larger than or equal to 1,2,3 or 4.

In this approach, the main emphasis is on generic turnovers, which constitute the norm of CEO changes and hence reflect the highest frequency. Figure 4.7 illustrates the

Figure 4.5: Average Marginal Effect of Nbr. of QQ Directors on Turnover Probability

This figure shows for each type of turnover, the average marginal effect of a one unit increase in *Nbr. QQ Dirs* on turnover probability across *Abnormal Return*. The dashed lines represent the corresponding 95%-confidence intervals. All other variables are held constant at their means.

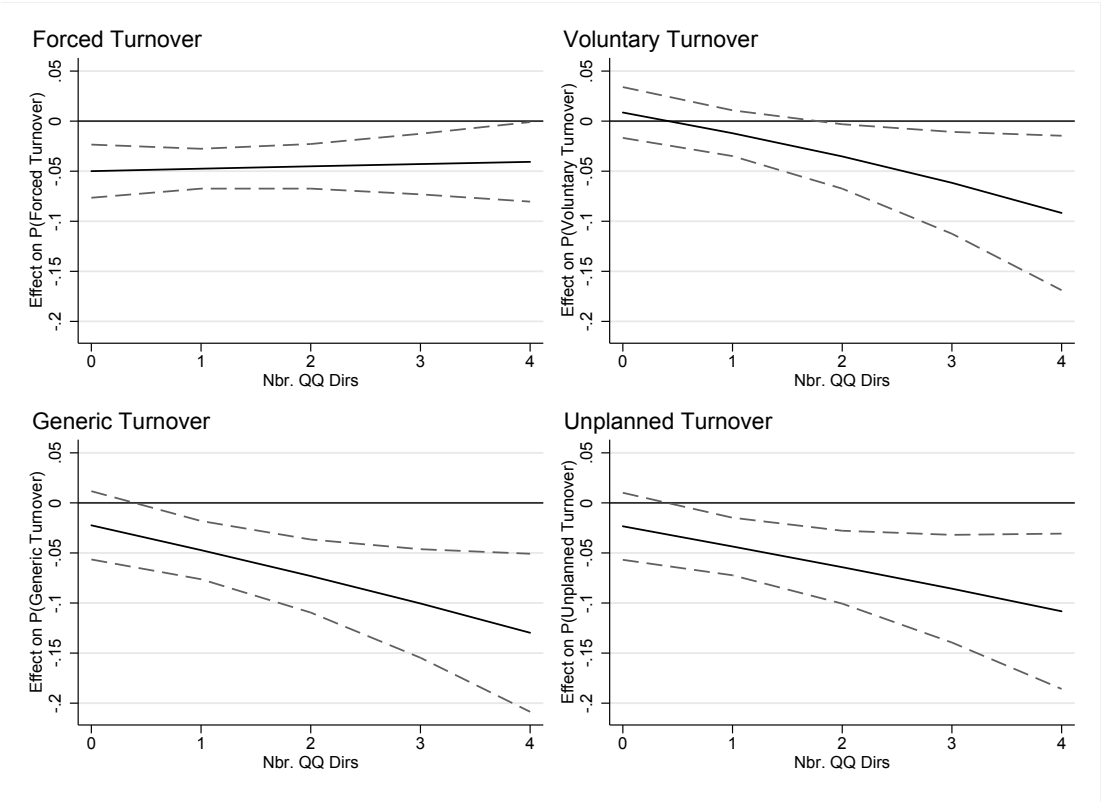


marginal effect of *Abnormal Return* on generic turnover probability for increasing critical mass levels. Statistical significance is only established for boards which have three or more quad-qualified directors, given that for all other cases the 95% confidence intervals overlap. This effect is primarily significant at the lower and upper end of abnormal stock performance. When performance declines and the board has at least three quad-qualified directors, the likelihood of a generic turnover increases to about 25%. Likewise, when performance improves, the likelihood converges to zero. Accordingly, sufficiently endowed boards are not only more effective in their reaction to poor performance but also retain the CEO if performance is high.

In the case of other turnovers, very similar patterns are observed (see Figure 4.8, Figure 4.9 and Figure 4.10 in the appendix). While the plots for voluntary and unplanned turnovers greatly correspond to Figure 4.7, the plots for forced CEO turnovers show flat and overlapping lines.

Figure 4.6: Average Marginal Effect of Abnormal Return on Turnover Probability

This figure shows for each type of turnover, the average marginal effect of a one unit increase in *Abnormal Return* on turnover probability by *Nbr. QQ Dirs*. The dashed lines represent the corresponding 95%-confidence intervals. All other variables are held constant at their means.



4.4.4 Evaluating CEO performance

Having established that quad-qualification plays a greater role concerning non-forced CEO turnover, the next step is to examine where the greater scrutinising ability and motivation of quad-qualified directors really transpose. Accordingly, the baseline model is adapted in consideration of the concept of relative performance evaluation (RPE).

Generally, boards are expected to establish their turnover decision only on firm-specific determinants, i.e. the idiosyncratic portion of a firm's stock performance (Gibbons and Murphy, 1990). Thus, if a CEO heads an underperforming firm, the board is more likely to dismiss her. However, as to stock market performance, Jenter and Kanaan (2015) as well as Bushman et al. (2010) show that CEO turnovers often follow poor industry and to a lesser degree market performance. Consequently, boards appear to oust CEOs without accounting for exogenous market or industry shocks, therefore violating the rationale for RPE. This finding raises the question of whether *Abnormal Return* is a suitable benchmark of CEO ability. Following the principles of RPE and the quad model, the expectation is that quad-qualified directors can correctly filter out market and industry shocks and evaluate the CEO purely on the idiosyncratic portion of the firm's stock performance.

Table 4.8: Post-Hoc Probing of Interaction Effects

This table reports the post-hoc probing analysis of the interaction between *Nbr. QQ Dirs* and *Abnormal Return*. Each variable is probed with the same regression as in Table 4.7 but including the respective conditional moderator, high (+1 SD) vs. low (-1 SD). Marginal effects are reported in brackets. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced Turnover				*Voluntary Turnover*			
	Nbr. QQ $Dirs_t$		Abnormal $Return_{t-1}$		Nbr. QQ $Dirs_t$		Abnormal $Return_{t-1}$	
	High	Low	High	Low	High	Low	High	Low
	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD
Nbr. QQ $Dirs_t$	-0.021	-0.021	0.021	-0.062	0.062	0.062	-0.212	0.337***
	(0.114)	(0.114)	(0.281)	(0.192)	(0.056)	(0.056)	(0.132)	(0.122)
	[-0.000]	[-0.000]	[0.000]	[-0.001]	[0.003]	[0.003]	[-0.010]	[0.017]
Abnormal	-2.839***	-3.185***	-3.012***	-3.012***	-0.935**	1.310**	0.185	0.185
$Return_{t-1}$	(0.925)	(1.173)	(0.577)	(0.577)	(0.396)	(0.667)	(0.278)	(0.278)
	[-0.045]	[-0.050]	[-0.048]	[-0.048]	[-0.046]	[0.064]	[0.009]	[0.009]
Interaction	0.066	0.066	0.066	0.066	-0.430**	-0.430**	-0.430**	-0.430**
	(0.337)	(0.337)	(0.337)	(0.337)	(0.178)	(0.178)	(0.178)	(0.178)
	[0.001]	[0.001]	[0.001]	[0.001]	[-0.021]	[-0.021]	[-0.021]	[-0.021]
Observations	4,038	4,038	4,038	4,038	4,260	4,260	4,260	4,260

	Unplanned Turnover				*Generic Turnover*			
	Nbr. QQ $Dirs_t$		Abnormal $Return_{t-1}$		Nbr. QQ $Dirs_t$		Abnormal $Return_{t-1}$	
	High	Low	High	Low	High	Low	High	Low
	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD
Nbr. QQ $Dirs_t$	-0.013	-0.013	-0.252*	0.225*	0.001	0.001	-0.255**	0.255**
	(0.054)	(0.054)	(0.140)	(0.120)	(0.050)	(0.050)	(0.125)	(0.107)
	[0.000]	[0.000]	[-0.015]	[0.016]	[-0.001]	[-0.001]	[-0.013]	[0.012]
Abnormal	-1.773***	0.206	-0.784***	-0.784***	-1.808***	0.317	-0.745***	-0.745***
$Return_{t-1}$	(0.565)	(0.557)	(0.273)	(0.273)	(0.494)	(0.506)	(0.245)	(0.245)
	[-0.109]	[0.019]	[-0.045]	[-0.045]	[-0.095]	[0.011]	[-0.042]	[-0.042]
Interaction	-0.379**	-0.379**	-0.379**	-0.379**	-0.407**	-0.407**	-0.407**	-0.407**
	(0.187)	(0.187)	(0.187)	(0.187)	(0.167)	(0.167)	(0.167)	(0.167)
	[-0.025]	[-0.025]	[-0.025]	[-0.025]	[-0.020]	[-0.020]	[-0.020]	[-0.020]
Observations	4,307	4,307	4,307	4,307	4,310	4,310	4,310	4,310

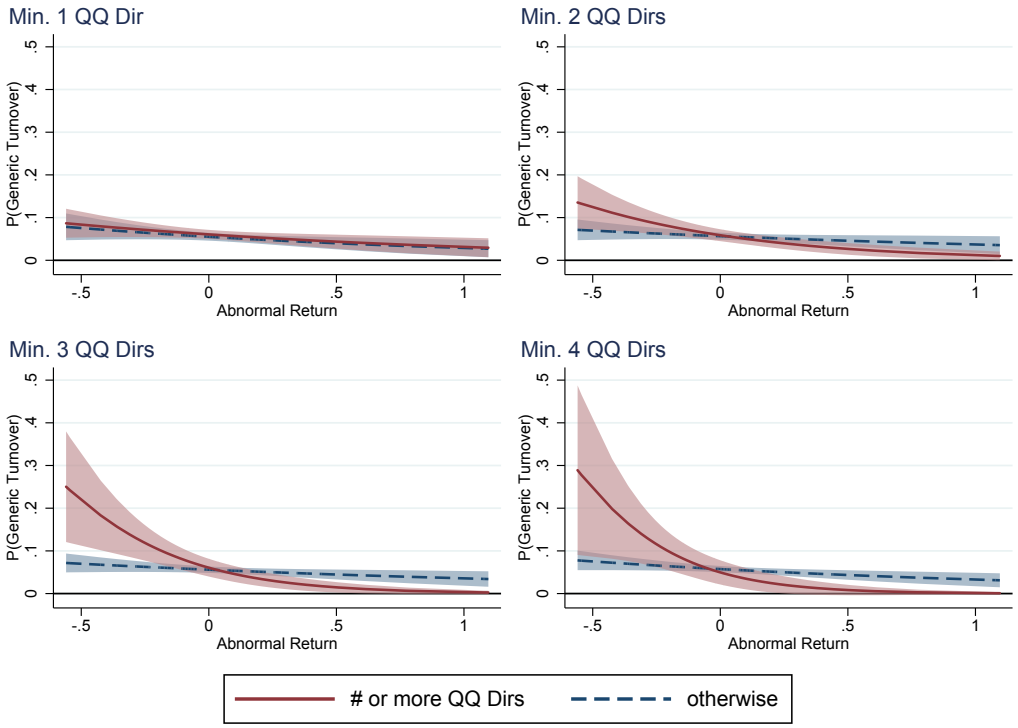
Based on the insights given by Jenter and Kanaan (2015) and Bushman et al. (2010), relevant idiosyncratic and peer measures replace the previous performance variable *Abnormal Return*. These measures are based on a cross-sectional regression model of annual peer median returns on annual firm stock returns. The peer median return is the respective median return of all other firms in the same 2-digit SIC industry within the CRSP daily return dataset, excluding the focal firm.

$$\textit{Firm's Annual Return} = \beta_0 + \beta_1 \textit{Industry's Annual Median Return}_{j,t} + u_{j,t} \tag{4.7}$$

The residuals of the cross-sectional estimation of equation 4.7 yield the *Idiosyncratic Return*, i.e. the annual return that cannot be explained by peer return. Therefore, this is the firm-specific component of firm's annual stock return that is attributable to CEO ability. Conversely, *Peer Return* is the predicted value from the regression, which is the

Figure 4.7: Marginal Effect on Generic Turnover by Minimum Level of QQ Directors

This figure shows the marginal effect on generic turnover probability by the minimum level of quad-qualified directors across *Abnormal Return* (each within their 95%-intervals), whilst holding all other variables at their means.



exogenous component of firm stock performance and hence unrelated to CEO ability.[7]

Next, two additional regression models are estimated for each turnover type: one that purely replaces *Abnormal Return* with *Idiosyncratic Return* and one that uses both *Idiosyncratic Return* and *Peer Return* as predictors (see Table 4.9). The results are generally very similar to Table 4.7. Quad-Qualification appears to be only relevant in terms of non-forced turnovers, while both *Idiosyncratic Return* and *Peer Return* have a significantly negative main effect on the probability of forced CEO turnovers. The interaction effects of quad-qualification and the components of firm stock performance, which are in line with the turnover-performance sensitivity hypothesis, show that the effects of both *Idiosyncratic Return* and *Peer Return* on turnover probability are moderated by the degree of quad-qualification. Interestingly, when *Peer Return* is excluded from the regression model (see column 3,5,7), the interaction effect is, if at all, only weakly significant. This finding lets us assume that *Peer Return* oftentimes drives non-forced turnovers.

[7] Technically, this approach yields different results in contrast to simply subtracting industry and market benchmark returns from the firm's stock performance

Table 4.9: Relative Performance Measures and Turnover-Performance Sensitivity

This table shows the estimation results from the logistic regression of *Nbr. QQ Dirs* on CEO turnover, using *Idiosync. Return* and *Peer Return*. Control variables are the same as in Table 4.6 and Table 4.7. Variable definitions and descriptive statistics are also reported in Table 4.11 and Table 4.5. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced Turnover (N=67)		*Voluntary Turnover*		*Unplanned Turnover*		*Generic Turnover*	
	(N=67)		*(N=233)*		*(N=250)*		*(N=288)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nbr. QQ Dirs$_t$	-0.039	0.021	0.074	0.123**	0.003	0.051	0.017	0.064
	(0.110)	(0.113)	(0.057)	(0.058)	(0.054)	(0.056)	(0.050)	(0.052)
Idiosync. Return$_{t-1}$	-1.945***	-2.735***	0.151	0.085	-0.285	-0.447	-0.221	-0.369
	(0.574)	(0.660)	(0.247)	(0.270)	(0.259)	(0.296)	(0.239)	(0.272)
Peer Return$_{t-1}$		-3.755***		-0.946**		-1.386***		-1.320***
		(0.900)		(0.439)		(0.429)		(0.402)
Nbr. QQ Dirs$_t$	0.079	-0.005	-0.254*	-0.410**	-0.207	-0.399**	-0.246*	-0.435***
* Idiosync. Return$_{t-1}$	(0.277)	(0.347)	(0.149)	(0.177)	(0.140)	(0.182)	(0.135)	(0.167)
Nbr. QQ Dirs$_t$		-0.336		-0.396**		-0.451***		-0.435***
* Peer Return$_{t-1}$		(0.297)		(0.159)		(0.170)		(0.155)
CEO Age (t)	-2.675**	-2.682**	6.435***	6.508***	3.502***	3.573***	4.076***	4.141***
	(1.213)	(1.250)	(0.758)	(0.753)	(0.686)	(0.688)	(0.651)	(0.649)
CEO Ownership$_t$	-15.344	-16.476	-9.919	-9.686	-10.989	-10.529	-9.786	-9.365
	(13.098)	(12.532)	(7.631)	(7.544)	(6.924)	(6.866)	(6.522)	(6.429)
Duality$_t$	-0.401	-0.390	0.357**	0.368**	0.131	0.128	0.155	0.158
	(0.311)	(0.298)	(0.158)	(0.156)	(0.145)	(0.143)	(0.135)	(0.133)
CEO Tenure$_t$	-0.026	-0.027	-0.018	-0.019	-0.017	-0.018	-0.017	-0.018
	(0.030)	(0.030)	(0.013)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)
Board Size$_t$	1.206	1.163	1.654***	1.640***	1.416***	1.396***	1.526***	1.498***
	(0.801)	(0.793)	(0.401)	(0.399)	(0.383)	(0.386)	(0.354)	(0.353)
Outsider Age$_t$	-2.613	-3.087	-4.876***	-4.961***	-4.343***	-4.470***	-4.065***	-4.176***
	(2.029)	(2.055)	(1.225)	(1.229)	(1.097)	(1.112)	(1.048)	(1.058)
Outsider Ratio$_t$	1.218	1.249	-4.098***	-4.111***	-2.770***	-2.790***	-2.910***	-2.934***
	(1.905)	(1.865)	(1.057)	(1.052)	(0.959)	(0.970)	(0.919)	(0.922)
Firm Size$_t$	-0.077	-0.033	0.039	0.046	-0.030	-0.017	-0.003	0.009
	(0.102)	(0.101)	(0.062)	(0.061)	(0.055)	(0.055)	(0.052)	(0.051)
Inst. Ownership$_t$	-0.911	-0.987	1.129**	1.043*	0.420	0.333	0.578	0.496
	(0.792)	(0.804)	(0.545)	(0.540)	(0.480)	(0.472)	(0.452)	(0.448)
HHI$_t$	0.639	0.184	0.488	0.285	1.155	0.900	1.178	0.927
	(1.974)	(2.153)	(2.036)	(2.052)	(1.391)	(1.427)	(1.374)	(1.410)
Constant	14.276*	17.333**	-11.264**	-10.705*	-0.667	0.220	-4.510	-3.673
	(8.400)	(8.734)	(5.476)	(5.488)	(4.721)	(4.787)	(4.537)	(4.594)
Observations	4,038	4,038	4,260	4,260	4,307	4,307	4,310	4,310
Firms	858	858	884	884	884	884	884	884
Pseudo R^2	0.0877	0.1340	0.0951	0.104	0.0446	0.0618	0.0542	0.0707
Wald χ^2	88.58	117.10	155.50	195.10	98.98	149.40	123.50	180.40

Finally, it is examined how the two performance measures contribute to turnover probability at different levels of quad-qualification and performance levels. Therefore, for illustration purposes, Table 4.10 only reports the average marginal effects for high (+1 standard deviation) and low (-1 standard deviation) levels of quad-qualified directors. The results clearly show that both *Idiosyncratic Return* and *Peer Return* are significant for higher levels of quad-qualification (+1 SD) and insignificant at lower levels (-1 SD). Further, the size of the marginal effect of *Peer Return* is consistently larger than for *Idiosyncratic Return*; however, the marginal effect of the interaction effect of the quad model variable with firm-related performance is consistently larger and has greater

Table 4.10: Marginal Effects and Relative Performance Measures

This table reports the post-hoc probing analysis of the interaction between *Nbr. QQ Dirs* and *Abnormal Return*. *Nbr. QQ Dirs* is probed with the same regression as in Table 4.9 but including the respective conditional moderator, high (+1 SD) vs. low (-1 SD). Marginal effects are reported in brackets. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced		*Voluntary*	
Nbr. QQ $Dirs_t$	High	Low	High	Low
	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD
Nbr. QQ $Dirs_t$	-0.001	-0.001	0.051**	0.051**
	(0.013)	(0.013)	(0.023)	(0.023)
Idiosync. $Return_{t-1}$	-0.048***	-0.038**	-0.066***	0.041
	(0.017)	(0.015)	(0.025)	(0.025)
Peer $Return_{t-1}$	-0.054***	-0.074***	-0.101***	-0.024
	(0.016)	(0.024)	(0.031)	(0.030)
Nbr. QQ $Dirs_t$	0.015	0.015	-0.152**	-0.152**
* Idiosync. $Return_{t-1}$	(0.038)	(0.038)	(0.064)	(0.064)
Nbr. QQ $Dirs_t$	-0.028	-0.028	-0.110*	-0.110*
* Peer $Return_{t-1}$	(0.037)	(0.037)	(0.064)	(0.064)
Observations	4,038	4,038	4,260	4,260

	Unplanned		*Generic*	
Nbr. QQ $Dirs_t$	High	Low	High	Low
	+ 1 SD	- 1 SD	+ 1 SD	- 1 SD
Nbr. QQ $Dirs_t$	0.017	0.017	0.027	0.027
	(0.023)	(0.023)	(0.024)	(0.024)
Idiosync. $Return_{t-1}$	-0.097***	0.013	-0.110***	0.021
	(0.027)	(0.028)	(0.029)	(0.030)
Peer $Return_{t-1}$	-0.140***	-0.048	-0.151***	-0.052
	(0.035)	(0.032)	(0.037)	(0.034)
Nbr. QQ $Dirs_t$	-0.158**	-0.158**	-0.187**	-0.187**
* Idiosync. $Return_{t-1}$	(0.069)	(0.069)	(0.074)	(0.074)
Nbr. QQ $Dirs_t$	-0.132*	-0.132*	-0.142*	-0.142*
* Peer $Return_{t-1}$	(0.072)	(0.072)	(0.077)	(0.077)
Observations	4,307	4,307	4,310	4,310

significance. These findings greatly correspond with the results using *Abnormal Return* in the previous subsection. Quad-qualified boards are more likely to trigger a CEO turnover in the case of more negative firm-related performance.

In principle, the results coincide with previous studies of the RPE concept and CEO turnover. Yet, when it comes to quad-qualified boards, turnover-performance sensitivity appears to be greatly moderated by both the idiosyncratic and peer component of a firm's stock market return. On the whole, the differences are marginal, and hence, the conclusion is that boards with quad-qualified directors do not tend to rest their turnover decision on firm-related performance only. Further, the additional performance variables underpin the robustness of the model, especially concerning the base performance measure *Abnormal Return*.

4.5 Discussion

This chapter empirically justifies the relevance of the quad model. Along with the successful application of the quad model to a critical monitoring task, namely CEO turnover, this chapter first and foremost demonstrates that the 'ideal director' for effective board monitoring does exist. As predicted by the quad model, it is shown that when all four qualities are satisfied by individual directors, the board can overcome the multiple obstacles of effective monitoring. The findings suggest that this is particularly the case for board inherent group barriers (i.e. group dynamics that inhibit effective group decision-making). While the presence of a single quad-qualified director does not affect the effectiveness of the board's CEO turnover-related decision-making, effective monitoring is only established when there is a critical mass of three quad-qualified directors in place. Moreover, this also underpins the importance of minority views when the average board consists of nine directors[8]. These findings greatly correspond with the predictions of Hambrick and colleagues who claim that a "quad-qualified director will be able to exert minority influence [...], prompting fellow directors to reconsider their own views and possibly add their own expressions of concern" (Hambrick et al., 2015, p. 335).

Lastly, by revisiting the theory of relative performance evaluation, it is shown that quad-qualified directors provide good governance by assuming the internal and external factor of CEO ability. The quad-qualified board is more likely to induce a CEO change when firm-related performance is poor.

4.5.1 Theoretical contribution

The quad model constitutes a comprehensive extension of theory by framing board monitoring effectiveness within the ability × motivation framework. According to organisational behaviour theory, these aspects are pivotal and interconnected for individuals task effectiveness. Hence, the three ability qualities combined with motivation, allow directors to acquire and process information more independently and ultimately raise the quality of board monitoring (Boivie et al., 2016a). In fact, the majority of prior research on board monitoring effectiveness observes them separately, which conforms with the common split between agency theory and resource dependence theory (Boivie et al., 2016a). Consequently, the successful application of the quad model supports the

[8]The average board size of the firm-year observations is nine (in natural logarithm equal to 2.20), cf. Table 4.5.

recent emphasis on examining board effectiveness jointly from the agency and resource dependence perspective.

Hambrick et al. (2015) also highlight the need to move from the customary board averages perspective to a more individual or group-based approach, which allows the analysis of the marginal contribution to monitoring effectiveness of adding a further quad-qualified director. Following the insights from critical mass theory, it is shown that the presence of three or more quad-qualified directors enhances the effectiveness of board monitoring. Such boards are up to 15 percentage points more likely to respond to poor firm stock performance than boards with only one quad-qualified director. This strong increase in turnover probability is likely related to the fact that the minority group of quad-qualified directors has exceeded its critical mass necessary to induce collective action (Kanter, 1977b; Granovetter, 1978). Furthermore, the critical mass level allows the group to gain the trust and ultimately, the support of other board members. The findings support the quad model's proposition that the monitoring effectiveness is substantially raised by the presence of a group of quad-qualified directors on the board. Consequently, this chapter provides empirical evidence that social interactions within the board matter, strengthening support for a behavioural theory of boards (Westphal and Zajac, 2013).

The detailed approach towards examining CEO turnover decisions yields some important conclusions concerning the board's role. Firstly, the results validate a negative CEO turnover-performance relationship and further confirm that this relationship and its strength is greatly contextual. Nonetheless, when considering how the presence of quad-qualified directors moderates the turnover-performance relationship, the presented results suggest that quad-qualification matters only in the context of non-forced turnovers. In such cases, quad-qualified directors' superior ability and motivation allows them to process information more efficiently and interpret signals regarding CEO ability more effectively. Thus, quad-qualified directors question CEO ability in relation to firm performance in a more timely manner when resistance against a CEO turnover is still high with their peers, and public signals such as the firm's stock price are still weak. In contrast, the high correlation between forced CEO turnovers and firm performance suggests that CEOs are fired rather subject to public signals than private information. So, if the public signal is strong enough, a consensus among directors could be reached easier, because directors would simply act upon the public signal (Chemmanur and Fedaseyeu, 2017). Moreover, poor performing firms are often subject to extensive media scrutiny, which mitigates

the information processing demands of the board and eases the need for quad-qualified directors.

While directors would certainly assess firm-specific public signals, external contingencies also have ramifications for the focal firm and the fate of the current CEO. In fact, the analysis of CEO turnovers concerning peer performance shows that quad-qualified boards appear to be more involved in decisions that indirectly affect the focal firm. Poor peer performance reflects greater environmental uncertainty, which may stipulate the need for a strategic CEO change. In reference to Hambrick et al. (2015), such decisions are exemplary for the symbiotic characteristic of the board's main functions, monitoring and resource provision. Quad-qualified directors possess a level of expertise, which allows them to assess and manage inter-organisational dependencies and other external constraints critically. Therefore, the findings suggest that quad-qualified boards act within their role when they induce a CEO change following poor peer performance. This fundamentally supports the recent efforts of integrating both agency and resource-dependence perspective (Zona et al., 2018; Hillman and Dalziel, 2003), and inherently affirms the quad model's first proposition about the monitoring effectiveness of individually quad-qualified directors in Chapter 2.

In terms of the relative performance evaluation concept, peer performance is not a benchmark of CEO ability, and instead, boards assess CEO ability by filtering out all observable exogenous shocks. The results strongly rebut this concept, confirming findings by Bushman et al. (2010), Kaplan and Minton (2012), and Jenter and Kanaan (2015). Nonetheless, these findings do not implicate that board monitoring is ineffective. On the contrary, as mentioned above, peer performance is a public signal of changing industry conditions with wide-ranging implications for the focal firm, including corporate strategy, investment decisions, and the CEO labour market (Fredrickson et al., 1988; Eisfeldt and Kuhnen, 2013; Keum, 2020).

Correspondingly, a firm's stock market performance, as well as the performance of its peers, serve as public signals to the board of directors. They prompt boards to update their beliefs and expectations about CEO ability. However, in contrast to non-quad-qualified directors, a quad-qualified would be more effective in the interpretation of CEO ability considering both internal and external effects. Consequently, if only a single quad-qualified director proposed a CEO change, he would face the resistance of other non-quad-qualified directors. Given the commonly rarefied atmosphere of boardrooms, a critical mass is hence

needed to overcome resistance.

4.5.2 Concluding remarks

In summary, this chapter makes three important contributions to the corporate governance literature. First, it strengthens prior calls to focus on a director's task effectiveness and to recognise the social/minority influence behaviour. Second, the ability and motivation of quad-qualified boards come primarily into effect for more complex CEO turnover decisions. Overtly forced turnovers, attended by strong public signals, are unaffected. Third, instead, quad-qualified directors seem to integrate external factors when evaluating CEO ability, which confirms earlier calls to jointly consider agency and resource-dependence theory in the attempt to seek an 'ideal director' for board monitoring.

4.A Appendix

Table 4.11: List of Explanatory Variables at Firm-Level

Variable	Description	Source
Dependent Variables		
Turnover	All CEO turnovers as identified in the BoardEx sample and subsequently double-checked	BoardEx, Eikon, Bloomberg
Forced Turnover	Forced CEO turnovers classified according o the Parrino (1997) algorithm	BoardEx, News, Eikon, Bloomberg
Voluntary Turnover	Voluntary CEO turnovers classified according to the Parrino (1997) algorithm	BoardEx, News, Eikon, Bloomberg
Unplanned Turnover	All turnovers that are announced less than six month prior to the CEO departure and are not due to health issues or death (cf. Eisfeldt and Kuhnen (2013))	BoardEx, News, Eikon, Bloomberg
Generic Turnover	All turnovers except those related to illness, death and corporate restructuring (cf. Fee et al. (2018))	BoardEx, News, Eikon, Bloomberg
Main Model		
QQ Score	Outside directors average Quad-Qualification Score	See Subsection 4.3.3
Nbr. QQ Dirs	Number of quad-qualified outside directors on the board	See Subsection 4.3.3
Independence	Scaled score of director's independence	See Subsection 4.3.2
Expertise	Scaled score of director's expertise	See Subsection 4.3.2
Bandwidth	:=1 if outside director is not busy $Busy\ Size = 0$	See Chapter 3
Motivation	Scaled score of director's percentage stock ownership in focal firm	See Chapter 3
CEO Controls		
Duality	Binary: =1 if CEO is the board's chair	BoardEx
CEO Age	Natural log of CEO's Age	BoardEx
CEO Ownership	Percentage of CEO's stock ownership	Thomson Reuters Insiders
CEO Tenure	Length of incumbent CEO's tenure	BoardEx
Board Controls		
Outsider Age	Natural log of the average age of all outside directors	BoardEx
Board Size	Natural log of the total number of board members	BoardEx
Outsider Ratio	Ratio of outside/non-executive directors to board size	BoardEx
Firm Controls		
Abnormal Return	Annual stock return less same-periodvalue-weighted market return in the year leading to the CEO turnover	CRSP
Idiosync. Return	Calculated as the residuals from the cross-sectional regressions on industry median annual returns (two-digit SIC)	CRSP
Peer Return	Calculated as the predicted values from the cross-sectional regressions on industry median annual returns (two-digit SIC)	CRSP
Firm Size	Log of total assets	Compustat
HHI	Herfindahl-Hirschmann index of ownership concentration	Thomson Reuters 13-F
Inst. Ownership	Ownership of active institutional investors (i.e. excl. banks & insurance companies)	Thomson Reuters 13-F
FF12	Fama-French 12 Industries Classification	

Table 4.12: Correlation Matrix - Director-level Variables

This table reports the correlation matrix after list-wise deletion for all director-level attribute variables including the underlying input director-level measures.

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Independent	1.000												
2	Turnover Expertise	0.089	1.000											
3	Motivation	-0.008	0.144	1.000										
4	Bandwidth	-0.014	-0.016	0.041	1.000									
5	Non-TW-coopted	0.904	-0.108	-0.028	-0.030	1.000								
6	No Outside Shared Experience	0.168	-0.038	-0.020	0.027	0.012	1.000							
7	NC Experience	0.076	0.586	0.053	-0.139	-0.032	-0.045	1.000						
8	Industry Experience	0.100	0.719	0.094	0.057	-0.022	-0.077	0.385	1.000					
9	Public Board Experience	0.040	0.370	0.040	-0.165	0.007	-0.134	0.420	0.215	1.000				
10	Director Tenure	0.149	0.883	0.130	0.047	-0.041	-0.021	0.492	0.731	0.223	1.000			
11	Tenure Overlap	0.039	0.886	0.150	0.033	-0.146	-0.025	0.423	0.600	0.219	0.833	1.000		
12	Stock Ownership	0.037	0.121	0.250	0.042	0.021	-0.036	0.030	0.148	-0.003	0.173	0.126	1.000	
13	Busy Size	0.014	0.016	-0.041	-1.000	0.030	-0.027	0.139	-0.057	0.165	-0.047	-0.033	-0.042	1.000

N (list-wise) = 47,715

Table 4.13: Baseline Model Specification – *QQ Score*

This table shows the estimation results from the logistic regression of *QQ Score* on CEO turnover. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outside directors in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. The χ^2 and p-value of the Hosmer-Lemeshow test, which tests for the null of a correctly specified model, are reported in the last row. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced Turnover				*Generic Turnover*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
QQ Score$_t$	0.020	-0.280	-0.100	-0.110	-0.340***	-0.273*	-0.082	-0.065
	(0.262)	(0.290)	(0.329)	(0.344)	(0.129)	(0.142)	(0.165)	(0.166)
Abnormal Return$_{t-1}$	-3.018***	-3.040***	-3.022***	-2.811	-0.622**	-0.634**	-0.683***	1.866
	(0.578)	(0.575)	(0.592)	(2.617)	(0.242)	(0.250)	(0.253)	(1.153)
QQ Score$_t$				-0.083				-1.042**
* Abnormal Return$_{t-1}$				(0.989)				(0.449)
CEO Age$_t$		-2.485**	-2.630**	-2.631**		3.868***	4.100***	4.105***
		(1.117)	(1.242)	(1.241)		(0.616)	(0.646)	(0.645)
CEO Ownership$_t$		-16.313	-15.780	-15.803		-9.402	-8.945	-9.396
		(13.573)	(12.704)	(12.720)		(6.255)	(6.497)	(6.518)
Duality$_t$		-0.378	-0.414	-0.414		0.089	0.138	0.137
		(0.287)	(0.305)	(0.305)		(0.127)	(0.135)	(0.135)
CEO Tenure$_t$		-0.046	-0.027	-0.027		-0.023**	-0.021*	-0.020*
		(0.031)	(0.032)	(0.032)		(0.011)	(0.012)	(0.012)
Board Size$_t$			1.184	1.183			1.550***	1.545***
			(0.779)	(0.780)			(0.350)	(0.350)
Outsider Age$_t$			-2.890	-2.881			-3.935***	-3.863***
			(2.083)	(2.068)			(1.040)	(1.046)
Outsider Ratio$_t$			1.162	1.161			-2.913***	-2.891***
			(1.889)	(1.889)			(0.922)	(0.927)
Firm Size$_t$			-0.051	-0.051			-0.016	-0.015
			(0.099)	(0.099)			(0.052)	(0.052)
Inst. Ownership$_t$			-0.867	-0.865			0.608	0.567
			(0.792)	(0.791)			(0.452)	(0.452)
HHI$_t$			0.402	0.403			1.079	0.961
			(2.086)	(2.086)			(1.368)	(1.398)
Constant	-4.454***	6.886	16.024*	16.015*	-2.370***	-17.991***	-4.709	-5.068
	(0.749)	(4.275)	(8.460)	(8.447)	(0.414)	(2.494)	(4.466)	(4.496)
Observations	4,038	4,038	4,038	4,038	4,310	4,310	4,310	4,310
Firms	858	858	858	858	884	884	884	884
Pseudo R^2	0.0670	0.0987	0.110	0.110	0.0167	0.0393	0.0554	0.0576
Wald χ^2	50.50	75.72	99.33	104.00	29.99	79.68	125.00	134.60
Hosmer-Lemeshow χ^2	10.07	16.77	7.22	7.77	12.01	12.77	24.56	13.32
	[0.2598]	[0.0326]	[0.5131]	[0.4561]	[0.1507]	[0.1201]	[0.0018]	[0.1014]

Table 4.14: Baseline Model Specification - *Nbr. QQ Dirs*

This table shows the estimation results from the logistic regression of *Nbr. QQ Dirs* on CEO turnover. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outside directors in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. The χ^2 and p-value of the Hosmer-Lemeshow test, which tests for the null of a correctly specified model, are reported in the last row. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced Turnover				*Generic Turnover*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nbr. QQ Directors$_t$	-0.005	-0.055	-0.030	-0.024	-0.033	-0.005	0.032	0.026
	(0.091)	(0.096)	(0.103)	(0.107)	(0.043)	(0.045)	(0.049)	(0.049)
Abnormal Return$_{t-1}$	-3.015***	-3.031***	-3.019***	-3.072***	-0.623***	-0.632**	-0.682***	-0.377
	(0.576)	(0.568)	(0.588)	(0.720)	(0.241)	(0.250)	(0.253)	(0.292)
Nbr. QQ Directors$_t$				0.066				-0.407**
* Abnormal Return$_{t-1}$				(0.337)				(0.167)
CEO Age$_t$		-2.495**	-2.645**	-2.638**		3.846***	4.114***	4.101***
		(1.105)	(1.234)	(1.235)		(0.616)	(0.649)	(0.648)
CEO Ownership$_t$		-17.672	-15.798	-15.783		-11.617*	-9.774	-9.667
		(13.708)	(12.709)	(12.707)		(6.285)	(6.487)	(6.504)
Duality$_t$		-0.360	-0.414	-0.414		0.127	0.154	0.152
		(0.292)	(0.308)	(0.309)		(0.127)	(0.135)	(0.134)
CEO Tenure$_t$		-0.041	-0.025	-0.025		-0.017*	-0.018	-0.017
		(0.030)	(0.030)	(0.030)		(0.010)	(0.011)	(0.011)
Board Size$_t$			1.219	1.222			1.531***	1.516***
			(0.772)	(0.770)			(0.353)	(0.354)
Outsider Age$_t$			-2.878	-2.889			-4.187***	-4.117***
			(2.047)	(2.044)			(1.048)	(1.053)
Outsider Ratio$_t$			1.204	1.206			-2.977***	-2.891***
			(1.899)	(1.902)			(0.921)	(0.923)
Firm Size$_t$			-0.049	-0.049			-0.001	0.000
			(0.102)	(0.101)			(0.052)	(0.052)
Inst. Ownership$_t$			-0.856	-0.858			0.589	0.561
			(0.797)	(0.798)			(0.452)	(0.452)
HHI$_t$			0.414	0.401			1.120	1.083
			(2.093)	(2.093)			(1.378)	(1.392)
Constant	-4.405***	6.260	15.657*	15.666*	-3.124***	-18.573***	-3.970	-4.242
	(0.528)	(4.309)	(8.549)	(8.553)	(0.289)	(2.491)	(4.528)	(4.570)
Observations	4,038	4,038	4,038	4,038	4,310	4,310	4,310	4,310
Firms	858	858	858	858	884	884	884	884
Pseudo R^2	0.0670	0.0979	0.110	0.110	0.0139	0.0377	0.0555	0.057
Wald χ^2	50.50	75.72	99.33	104.00	29.99	79.68	125.00	134.60
Hosmer-Lemeshow χ^2	8.74	10.69	7.19	7.18	8.46	7.68	9.87	8.43
	[0.3643]	[0.2201]	[0.5158]	[0.5169]	[0.3899]	[0.4649]	[0.2743]	[0.3926]

Table 4.15: Critical Mass Regressions - *Forced & Voluntary Turnovers*

This table shows the estimation results from the logistic regressions of critical mass levels of *Nbr. QQ Dirs* on CEO turnover. Dummy variables indicate whether the board has a minimum number of 1,2,3 or 4 quad-qualified directors. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outside directors in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Forced CEO Turnover (N=67)				*Voluntary CEO Turnover (N=233)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Abnormal Return$_{t-1}$	-3.19***	-2.99***	-3.00***	-3.07***	-0.17	0.08	0.10	-0.02
	(0.84)	(0.69)	(0.62)	(0.61)	(0.34)	(0.27)	(0.24)	(0.24)
Min. 1 QQ Dir$_t$	0.10				0.14			
	(0.31)				(0.15)			
Min. 1 QQ Dir$_t$	0.34				0.07			
* Abnormal Return$_{t-1}$	(1.03)				(0.46)			
Min. 2 QQ Dirs$_t$		-0.07				0.20		
		(0.34)				(0.17)		
Min. 2 QQ Dirs$_t$		-0.17				-1.15**		
* Abnormal Return$_{t-1}$		(1.05)				(0.53)		
Min. 3 QQ Dirs$_t$			-0.23				0.36	
			(0.44)				(0.22)	
Min. 3 QQ Dirs$_t$			-0.19				-2.83***	
* Abnormal Return$_{t-1}$			(1.11)				(0.78)	
Min. 4 QQ Dirs$_t$				-0.11				0.19
				(0.62)				(0.34)
Min. 4 QQ Dirs$_t$				1.21				-3.59***
* Abnormal Return$_{t-1}$				(1.47)				(1.28)
CEO Age$_t$	-2.63**	-2.65**	-2.67**	-2.64**	6.40***	6.45***	6.47***	6.39***
	(1.24)	(1.23)	(1.24)	(1.23)	(0.76)	(0.76)	(0.75)	(0.75)
CEO Ownership$_t$	-16.97	-16.10	-15.76	-16.31	-9.84	-9.95	-9.48	-9.55
	(12.65)	(13.00)	(12.46)	(12.28)	(7.56)	(7.59)	(7.69)	(7.73)
Duality$_t$	-0.40	-0.41	-0.41	-0.41	0.35**	0.35**	0.36**	0.35**
	(0.31)	(0.31)	(0.30)	(0.30)	(0.16)	(0.16)	(0.16)	(0.16)
CEO Tenure$_t$	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)
Board Size$_t$	1.17	1.20	1.22	1.20	1.71***	1.69***	1.69***	1.71***
	(0.76)	(0.78)	(0.78)	(0.78)	(0.40)	(0.40)	(0.40)	(0.40)
Outsider Age$_t$	-3.15	-2.95	-2.82	-2.95	-4.77***	-4.72***	-4.88***	-4.70***
	(2.03)	(2.01)	(2.00)	(2.03)	(1.20)	(1.22)	(1.23)	(1.21)
Outsider Ratio$_t$	1.12	1.18	1.23	1.18	-4.13***	-4.00***	-4.07***	-4.01***
	(1.92)	(1.90)	(1.89)	(1.88)	(1.05)	(1.06)	(1.07)	(1.06)
Firm Size$_t$	-0.04	-0.05	-0.05	-0.05	0.03	0.03	0.04	0.03
	(0.10)	(0.10)	(0.10)	(0.10)	(0.06)	(0.06)	(0.06)	(0.06)
Inst. Ownership$_t$	-0.90	-0.87	-0.85	-0.86	1.14**	1.08**	1.09**	1.16**
	(0.80)	(0.79)	(0.80)	(0.80)	(0.55)	(0.54)	(0.55)	(0.54)
HHI$_t$	0.42	0.42	0.46	0.40	0.48	0.35	0.33	0.50
	(2.10)	(2.09)	(2.10)	(2.11)	(2.03)	(2.04)	(2.07)	(2.03)
Constant	16.80**	15.98*	15.46*	15.98*	-11.55**	-11.95**	-11.47**	-11.89**
	(8.46)	(8.44)	(8.37)	(8.38)	(5.40)	(5.47)	(5.50)	(5.42)
Observations	4,038	4,038	4,038	4,038	4,260	4,260	4,260	4,260
Firms	858	858	858	858	884	884	884	884
Pseudo R^2	0.110	0.110	0.110	0.110	0.0937	0.0957	0.101	0.0976
Wald χ^2	101.6	101.4	107.4	101.1	156.0	162.2	170.2	163.9

Table 4.16: Critical Mass Regressions - *Generic & Unplanned Turnovers*

This table shows the estimation results from the logistic regressions of critical mass levels of *Nbr. QQ Dirs* on CEO turnover. Dummy variables indicate whether the board has a minimum number of 1,2,3 or 4 quad-qualified directors. CEO control variables include: the natural log of the departing CEO's age (*CEO Age*), the percentage stock ownership held by the CEO (*CEO Ownership*), a binary variable indicating whether the departing CEO also holds the board chair (*Duality*), and the natural log of the departing CEO's tenure (*CEO Tenure*). It is further controlled for board and firm characteristics: ratio of outside directors (*Outsider Ratio*), the total numbers of directors on the board in natural logarithm (*Board Size*), the average age of outside directors in natural logarithm (*Outsider Age*), firm's total assets in natural logarithm (*Firm Size*), percentage ownership held by active institutional investors (*Inst. Ownership*), and ownership concentration measured by the Herfindahl–Hirschman Index *HHI*. Each regression includes Fama-French 12 Industry dummies and fiscal-year dummies. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	Generic CEO Turnover (N=288)				*Unplanned CEO Turnover (N=250)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Abnormal Return$_{t-1}$	-0.67*	-0.44	-0.47*	-0.58**	-0.79**	-0.49	-0.51*	-0.61**
	(0.35)	(0.28)	(0.26)	(0.25)	(0.38)	(0.31)	(0.28)	(0.28)
Min. 1 QQ Dir$_t$	0.10				0.06			
	(0.13)				(0.14)			
Min. 1 QQ Dir$_t$	-0.02				0.17			
* Abnormal Return$_{t-1}$	(0.49)				(0.54)			
Min. 2 QQ Dirs$_t$		0.04				0.02		
		(0.15)				(0.17)		
Min. 2 QQ Dirs$_t$		-1.20**				-1.15**		
* Abnormal Return$_{t-1}$		(0.52)				(0.58)		
Min. 3 QQ Dirs$_t$			0.09				-0.01	
			(0.20)				(0.23)	
Min. 3 QQ Dirs$_t$			-2.46***				-2.62***	
* Abnormal Return$_{t-1}$			(0.69)				(0.81)	
Min. 4 QQ Dirs$_t$				-0.15				-0.12
				(0.31)				(0.34)
Min. 4 QQ Dirs$_t$				-3.08***				-3.18***
* Abnormal Return$_{t-1}$				(1.10)				(1.20)
CEO Age$_t$	4.10***	4.11***	4.13***	4.07***	3.53***	3.54***	3.56***	3.52***
	(0.65)	(0.65)	(0.64)	(0.64)	(0.68)	(0.69)	(0.68)	(0.68)
CEO Ownership$_t$	-9.86	-9.55	-9.42	-9.31	-11.01	-10.80	-10.67	-10.74
	(6.45)	(6.51)	(6.52)	(6.53)	(6.84)	(6.92)	(6.94)	(6.95)
Duality$_t$	0.16	0.15	0.15	0.15	0.13	0.13	0.13	0.13
	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)	(0.14)	(0.14)	(0.14)
CEO Tenure$_t$	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Board Size$_t$	1.54***	1.54***	1.54***	1.56***	1.43***	1.42***	1.42***	1.42***
	(0.35)	(0.35)	(0.35)	(0.35)	(0.38)	(0.38)	(0.38)	(0.38)
Outsider Age$_t$	-4.16***	-4.03***	-4.13***	-4.01***	-4.46***	-4.35***	-4.41***	-4.38***
	(1.03)	(1.04)	(1.04)	(1.02)	(1.09)	(1.09)	(1.09)	(1.08)
Outsider Ratio$_t$	-2.99***	-2.88***	-2.92***	-2.89***	-2.85***	-2.75***	-2.78***	-2.77***
	(0.92)	(0.93)	(0.93)	(0.92)	(0.96)	(0.97)	(0.97)	(0.96)
Firm Size$_t$	-0.00	-0.01	0.00	-0.00	-0.03	-0.03	-0.02	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Inst. Ownership$_t$	0.59	0.56	0.56	0.60	0.44	0.40	0.40	0.44
	(0.45)	(0.45)	(0.45)	(0.45)	(0.48)	(0.48)	(0.48)	(0.48)
HHI$_t$	1.15	1.06	1.05	1.17	1.12	1.06	1.04	1.17
	(1.38)	(1.39)	(1.40)	(1.38)	(1.40)	(1.41)	(1.41)	(1.40)
Constant	-4.00	-4.64	-4.30	-4.63	-0.13	-0.63	-0.46	-0.45
	(4.50)	(4.54)	(4.55)	(4.48)	(4.68)	(4.72)	(4.72)	(4.69)
Observations	4,310	4,310	4,310	4,310	4,307	4,307	4,307	4,307
Firms	884	884	884	884	884	884	884	884
Pseudo R^2	0.0556	0.0574	0.0599	0.0579	0.0465	0.0482	0.0508	0.0492
Wald χ^2	125.5	138.1	143.0	134.5	99.13	108.0	114.3	106.3

Figure 4.8: Marginal Effect on Forced Turnover by Minimum Level of QQ Directors

This figure shows the marginal effect on forced turnover probability by the minimum level of quad-qualified directors across *Abnormal Return* (each within their 95%-intervals), whilst holding all other variables at their means.

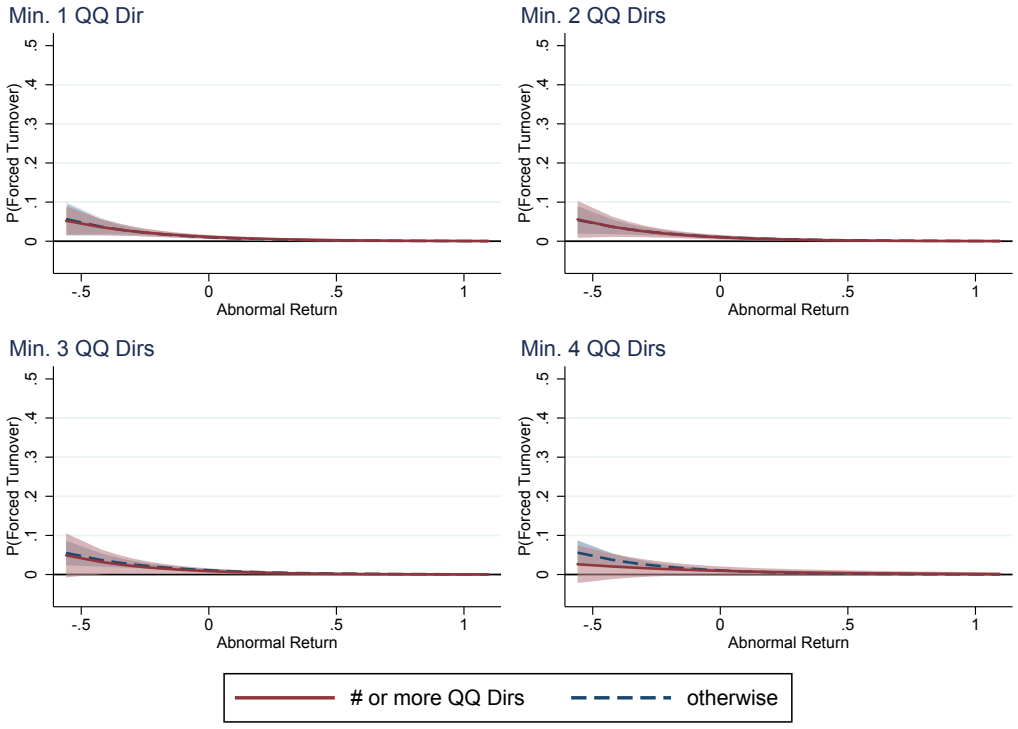


Figure 4.9: Marginal Effect on Voluntary Turnover by Minimum Level of QQ Directors

This figure shows the marginal effect on voluntary turnover probability by the minimum level of quad-qualified directors across *Abnormal Return* (each within their 95%-intervals), whilst holding all other variables at their means.

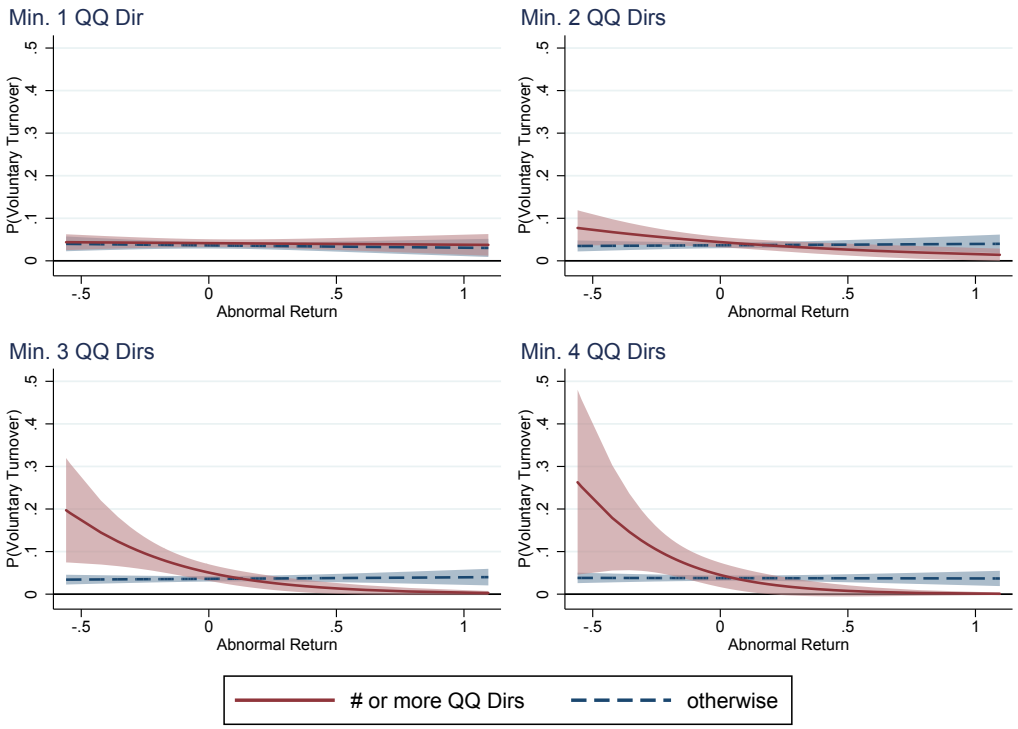
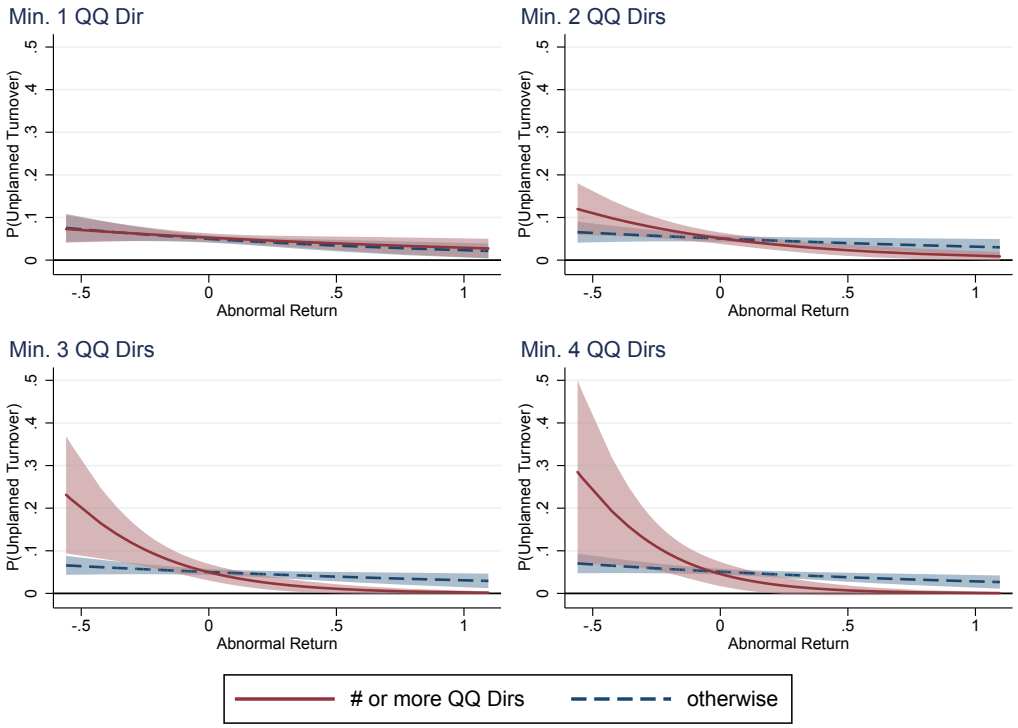


Figure 4.10: Marginal Effect on Unplanned Turnover by Minimum Level of QQ Directors

This figure shows the marginal effect on unplanned turnover probability by the minimum level of quad-qualified directors across *Abnormal Return* (each within their 95%-intervals), whilst holding all other variables at their means.



Chapter 5

Are Quad-Qualified Directors More Effective in Setting CEO pay?

5.1 Introduction

A further critical monitoring task of corporate boards is the compensation of top executives, and most prominently its chief executive. Among governance failures, CEO compensation is one of the most controversial topics in corporate governance research, which attracts attention not only by academics but also by the general public. Regardless, the literature still documents a high CEO pay disparity and insufficient pay-performance sensitivity (Edmans et al., 2017; Bebchuk and Weisbach, 2010).

Traditionally, given the principal-agent conflict between the board and the firm's top management, agency theorists argue that managers should receive long-term contingent pay contracts to align the interest between shareholders and management (Holmström, 1979). However, proponents of the managerial power theory have challenged this 'optimal contracting' approach. While boards ideally negotiate with the CEO at arm's length, powerful CEOs can capitalise on their bargaining power to undermine optimal contracting and extract excessive rents in their favour (Bebchuk and Fried, 2003, 2004). Accordingly, the central research question in this chapter is whether quad-qualified boards are more effective in keeping CEO compensation aligned with the interests of shareholders.

This process essentially involves the board in two ways. First, similarly to CEO turnover decisions, directors should have the ability and motivation to make an informed

assessment of the CEO's abilities considering firm performance and the CEO labour market (Gibbons and Murphy, 1992). Second, they should be able to withstand executives' self-serving interests, and design as well as implement incentive-aligned contracts (Bebchuk and Fried, 2004). The quad-qualified director, above all, should have the qualities to fulfil this role in an effective manner (Hambrick et al., 2015).

In this chapter, the relationship between the presence of quad-qualified directors and effective CEO compensation monitoring is examined using the same sample of S&P 1500 firms between 2009 and 2014 discussed in Chapter 3.

First, contrary to the main hypothesis, the analysis suggests that excess CEO pay increases in the number of quad-qualified directors. This finding contradicts the predictions of both agency theory and managerial power theory, and suggests that CEOs have greater bargaining power over the pay-setting process when quad-qualified directors are present.

Hermalin (2005) argues that the increased monitoring propensity of a capable board increases CEO effort because the board wants to learn about the CEO's true ability. At the same time, the CEO, even if she would not increase her effort, faces a greater employment risk given that the board may learn about her ability and make inferences about retaining her or not. Consequently, both effects decrease the CEO's expected utility, and hence the CEO requires greater pay to compensate for the loss in expected utility. Accordingly, while the presence of quad-qualified directors per se may induce overall effective monitoring, CEOs are relatively paid more generously.

A positive relationship between board monitoring propensity and CEO compensation corresponds with recent studies suggesting that high CEO pay reflects the specificity of CEO labour markets and the fact that large firms use extravagant pay to attract top talent (Quigley et al., 2020; Eisfeldt and Kuhnen, 2013). Moreover, as manifested by Chapter 4, quad-qualified directors have a greater scrutinising ability and motivation to assess CEO performance and are less reliant on public information (i.e. the focal firm's stock performance) (Nanda and Onal, 2016). Correspondingly, optimal CEO pay contracts would consider private as well as public information, and would represent the board's assessment of CEO ability (Quigley et al., 2020).

Second, the results suggest that also a quad-qualified director on the compensation committee has a positive effect on the level of CEO compensation, which contradicts the common conception of optimal CEO pay contracting. While this first of all underpins the

robustness of the results when considering the entire board, it also supports the narrative that the addition of quad-qualified directors to domain-related committees may prove beneficial for improving overall monitoring effectiveness even when it means to compensate the CEO more generously.

Third, the findings particularly hold for boards which are examined on the individual quad-qualified director level. In fact, even the addition of a single quad-qualified director leads to the described effect. The customary board-averages approach appears to yield considerable weaker and insignificant results as for the relationship between board quad-qualification and monitoring effectiveness. On the one hand, by taking a dyadic approach to the application of the quad model, this chapter underpins the importance of group dynamics as evidenced by the critical mass analysis. On the other hand, the results highlight how different levels of diversity, individual vs. board, can impact monitoring outcomes. Similar to integrating different levels of diversity about human and social capital (Tasheva and Hillman, 2019), more attention should be given to the importance of distinguishing between individual and board task effectiveness.

The remainder of the chapter is organised as follows. First, the subsequent section discusses the quad model and its attributes, specifically in the context of CEO compensation monitoring, before formulating the research hypotheses. Then, Section 5.3 describes the sample selection process for the director-level dataset, the composition and construction of the attribute measures. It further reports the baseline methodology and the corresponding descriptive statistics. The empirical analysis in Section 5.4 investigates the relationship between quad-qualification and the four proxies of CEO compensation monitoring, based on both an average quad-qualification score across directors and the concentration of quad-qualified directors on the board as well as on the compensation committee. The findings are subsequently further examined in terms of critical mass theory. Finally, all results are discussed in Section 5.5.

5.2 Literature Review and Hypotheses Development

5.2.1 CEO compensation in the context of the quad model

Principally, agency theory concerning corporate boards suggests that directors use pay contracts to motivate CEOs to act in the best interest of shareholders (Fama and Jensen, 1983). Therefore, directors shall regularly assess management's ability in order to

effectively respond and align these contracts in the pursuit to maximise shareholder value (Holmström, 1979). To deliver such optimal contracts, directors need to have the ability and incentives to monitor CEO ability in relation to the competitive market forces, most prominently the CEO labour market.

This 'optimal contracting' approach to CEO compensation has often been scrutinised over its impracticality in explaining CEO pay-decision making. Particularly, it does not reflect the well-observed agency problems associated with the CEO-board relationship (Bebchuk and Fried, 2003). In that, the managerial power theory expands the agency theory perspective and recognises its structural as well as social-psychological deficiencies (for a comprehensive review see van Essen et al., 2015). For instance, prior research corroborates that CEOs may utilise their power to sway the board nomination process in favour of well-disposed directors (Bebchuk and Fried, 2003; Westphal and Zajac, 1995). Moreover, directors generally have an incentive to avoid greater conflicts with the CEO because a reputation for being a rigid monitor would impair the director's chances of future directorships. Finally, while total CEO compensation is an outcome of a complex contract involving various cash and equity pay instruments, director compensation is relatively straightforward and less aligned with firm performance. Thus, directors often lack the motivation to carry out their monitoring role in an effective manner.

In summary, an effective monitor of CEO pay would need to be diligent, objective, and motivated, yet able to comprehensively assess CEO ability and pay in the context of market forces. In reference to the formulation of the quad model, it is the quad-qualified director who has all such qualities.

5.2.2 Effective monitoring and CEO compensation

Assuming that the board has a sufficient number of quad-qualified directors with CEO pay-setting competence, the question that remains is whether such boards have relatively lower and more performance-aligned CEO pay.

The prior literature is ambivalent about this relationship. In theory, quad-qualified directors have greater ability to bargain for optimal CEO pay contracts, i.e. there is an inverse relationship between a board's monitoring diligence and CEO compensation. Accordingly, Core et al. (1999), for instance, find that CEOs at firms with greater agency problems receive greater compensation. The meta-analysis by van Essen et al. (2015) shows that board independence positively moderates the pay-performance relationship.

In contrast, several studies also observe contradicting associations. About board independence, some studies observe a positive relationship between outside director representation and CEO compensation (see for a meta-analysis Deutsch, 2005). Others fail to find any significant relationship between measures of monitoring vigilance and CEO compensation (Conyon and Peck, 1998; Finkelstein and Hambrick, 1989).

A prominent explanation of these findings can be found in the theoretical model by Hermalin (2005), henceforth termed the Hermalin model. While the hiring and firing of CEOs is a primary board task, the board constantly learns about CEO ability and periodically bargains with the CEO about her pay. Directors learn about CEO ability through public or private signals. Unlike public signals such as corporate stock market performance, private signals may prove costly and hard to get. Hence, only directors dedicated to effective monitoring might be able to obtain such signals to complement the board's assessment of CEO ability. Hermalin (2005) argues that the board's propensity to monitor CEO ability is a function of its independence from the CEO. Therefore, greater board independence is positively correlated with the CEO's risk of dismissal. All else equal, to accommodate for greater personal risk, the CEO will demand higher compensation.

In the context of the quad model, Hambrick et al. (2015, p. 336) note that "the presence of at least one quad-qualified director confers a combination of ex-ante prevention and ex-post detection and correction of managerial missteps." While CEOs would accordingly take fewer risks when quad-qualified directors are present, the chance of getting punished also increases. Thus, talented CEOs can bargain either for a less diligent board or higher compensation, because CEO's bargaining power depends on her perceived managerial ability relative to potential successors in the CEO labour market (Hermalin and Weisbach, 1998). Altogether, this does neither refute the conclusions drawn from agency theory nor managerial power theory.

5.2.3 CEO compensation in the context of the quad model attributes

Independence

Agency theory advises that boards should primarily consist of outside directors to induce effective decision control (Fama and Jensen, 1983). In the context of this thesis, the expectation has been that the presence of such directors would lead to well-balanced executive pay, i.e. more incentive-aligned and not excessive compensation contracts. The common belief is that this structural board independence enhances its objectivity in

assessing CEO ability and designing incentive-aligned compensation contracts, which leads towards optimal contracting (Holmström, 1979). In the past two decades, the structural independence of US corporate boards has been vastly promoted by regulations and revised listing standards.[1] In fact, corporate boards nowadays consist almost entirely of outside directors with more than 50% separating the CEO and chair position (see Figure 2.1).

Despite this development, the empirical evidence of a negative relationship between structural independence and CEO compensation is limited. For instance, Core et al. (1999) find that less independent boards and those where the CEO also is the board chair exhibit excess CEO compensation. Further, Chhaochharia and Grinstein (2009) investigate the effect of the Sarbanes-Oxley Act and the associated new listing requirements on the level of CEO compensation. They find that firms, which had previously not complied with the listing requirements, reduced CEO compensation significantly. However, revisiting these results, Guthrie et al. (2012) ascribe this effect largely to outliers. In fact, they find that independent directors on compensation committees cause excess CEO pay.

In terms of structural board independence, several other studies support the findings of Guthrie et al. (2012). In their meta-analysis of prior empirical studies, van Essen et al. (2015) find that the degree of board independence has a positive effect on CEO compensation. Zorn et al. (2017) show that boards where the CEO is the only insider are more likely to exhibit excess CEO pay. Altogether, this stream of literature argues that a positive effect is well-grounded in the managerial power theory and that its determinants lie within the social dynamics of the CEO-board relationship (O'Reilly and Main, 2010; van Essen et al., 2015).

In support of the managerial power theory, Hoitash (2011) shows that social ties between independent directors and managers lead to greater levels of CEO compensation. Specifically, their results relate to those independent directors who are on the compensation committee and thus powerful enough to influence the CEO pay contract. This would corroborate that CEOs tactically ingratiate oneself with compensation committee members to sway their stance for higher pay (Westphal, 1998). Consequently, Hermanson et al. (2012) report that independence and objectivity is the most important attribute of an effective compensation committee member.

Generally, the literature can substantiate a negative association between neither structural nor social board independence and CEO compensation. Instead, the empirical

[1] Sarbanes-Oxley Act of 2002, NYSE and Nasdaq

evidence indicates a positive effect, which underpins the Hermalin model that higher pay compensates CEOs when they are exposed to greater scrutiny due to the presence of more independent and objective board monitors. These findings coincide with a recent study by Graham et al. (2017), which documents a strong association between the CEO's bargaining power and the level of pay.

Expertise

By design, the quad model intends to capture the domain-related portion of director expertise only (Hambrick et al., 2015). Consequently, one would measure the level of knowledge, skills, and experience that directors gained in the CEO pay-setting process. However, it is disputable whether this expertise would adequately assist the decision-making process, which ideally starts with a thorough assessment of CEO ability.

In contrast to the financial expertise that directors gain through certain jobs and education, which qualifies them for the board's financial monitoring tasks, CEO compensation expertise could hardly be attributed to particular experience or education. Accordingly, while the SEC requires an audit committee to be composed of a certain number of financial experts and sets certain specifications about what makes a director be a financial expert[2], there is no requirement or definition of a compensation expert per se. Moreover, a review of the board and compensation committee literature does also not yield promising task-related determinants of expertise. For that matter, Brandes et al. (2016) note that a lack of accounting, financial, tax, and valuation expertise on compensation committees may have contributed to the deficiencies in the pay-setting process.

Nevertheless, second to none in the CEO pay-setting process is the board's assessment of CEO ability, which from an agency perspective should be directly related to firm performance. Thus, similar to CEO turnover decisions, directors should, first of all, have the ability to make a proper assessment. Beyond that, both board and compensation committee experience would deem helpful to understand the pay-setting process, design pay contracts, and execute pay-related decisions (Hermanson et al., 2012).

Altogether, the assumption is that the domain-specific expertise relates to a broad set of experienced-based human capital. Hence, congruent to Chapter 4, the following discusses the literature on how CEO pay is affected by the board's generic, industry-specific, and firm-specific capital (Castanias and Helfat, 1991, 2001).

[2]SEC, Sarbanes-Oxley Act, Sections 406-407

A director's generic expertise covers knowledge, skills and experience that are transferable across industries (Castanias and Helfat, 1991). While the literature on the relationship between generic expertise and CEO compensation monitoring is scarce, in the case of CEO experience, Faleye et al. (2011) and Faleye (2011) show that CEO compensation is higher when CEOs of other firms are appointed to the board. Further, Faleye (2011) also finds that this results in a less sensitive pay-for-performance relationship.

Industry-specific expertise includes all the knowledge, skills and experience, that is only transferable within an industry. About CEO pay decisions, industry experts are, among other things, valuable for their knowledge of industry-specific characteristics and trends. In view of the CEO labour market, this knowledge allows boards to determine a reasonable yet competitive level of executive compensation. Correspondingly, Wang et al. (2015) find that CEO compensation is negatively associated with the percentage of independent industry experts on the compensation committee. Moreover, Masulis et al. (2012) illustrate that the CEO pay-performance sensitivity is greater for boards with at least one industry expert on the board.

An essential determinant in the CEO pay-setting process is indisputable that boards have a comprehensive account of the firm. In contrast to explicit knowledge, which directors can readily access, it is the tacit knowledge of the firm that can only be gained through experience. Correspondingly, Kim et al. (2014) examine how outside director tenure is related to CEO compensation monitoring. Their results show greater board monitoring effectiveness when outside directors exhibit longer board tenure. Alternatively, directors can obtain firm-specific information from other board members. However, such expertise is mostly clustered in inside directors, and hence outside directors further rely on their goodwill to provide such information (Hillman et al., 2008). Tian et al. (2011) argue that outside directors can, therefore, acquire this information through their co-working experience with other outside directors. Accordingly, Sauerwald et al. (2016) show that outside directors co-working experience reduces the incidents of excess CEO compensation.

Bandwidth

The two aforementioned attributes ensure that directors have an independent and objective perspective on monitoring decisions as well as the intellectual ability to process relevant information. However, literature stresses that even highly skilled and experienced directors have their boundaries when it comes to their capabilities to ensure effective monitoring

under the assumption that they are highly motivated (Khanna et al., 2014). Especially in the case of outside directors, their vigilance to effectively monitor might be substantially inhibited by the workload directors are facing due to other responsibilities, such as additional outside board memberships or their executive positions at their home firms. In this context, the literature generally refers to director busyness, which is presumed to be detrimental for effective board monitoring. For the sake of aligning this attribute, the quad model authors label it with its inverse, namely 'bandwidth'.

Prior empirical studies generally show that director busyness negatively affects effective monitoring (Ferris et al., 2003; Fich and Shivdasani, 2006; Cashman et al., 2012). There are also some studies which particularly examine this relationship in the case of CEO compensation monitoring. The general expectation is that (excess) CEO compensation increases in the board's busyness.

Core et al. (1999) and Armstrong et al. (2012) show that CEO compensation is indeed higher, when outside directors hold multiple board seats. Likewise, Faleye et al. (2011) illustrate that board busyness reduces the likelihood of excess CEO compensation. But, as to the pay-for-performance relationship, Seo (2014) cannot observe a significant relationship between board busyness and the CEO pay-performance sensitivity. Also, in the case of firms which recently had their IPO, Field et al. (2013) find no significant difference when there are busy directors on the compensation committee. They argue that this conflicting evidence might be related to IPO firms' greater advising needs. Moreover, it should be noted that the compensation committee has only subordinate power in the CEO pay-setting process (Hermanson et al., 2012).

Motivation

One of the main features of the quad model is its joint consideration of director ability and motivation. Correspondingly, the expectation is that sufficiently motivated directors are eager to utilise their abilities, conditioned by independence and bandwidth, to provide effective board monitoring to the firm and its shareholders.

Agency theory argues that outside directors should have adequate incentives to fulfil their duties and do not collude with managers (Fama and Jensen, 1983). As outlined in Chapter 2, director incentives can be in various forms such as monetary benefits (Yermack, 2004), reputation (Boivie et al., 2012a; Masulis and Mobbs, 2014) and other additional opportunities (Boivie et al., 2012a).

As to monetary incentives and CEO compensation monitoring, the extant literature exhibits a serious endogeneity problem because of the correlation between outside and inside director compensation. This is not particularly surprising, given that the vast majority receives performance-related pay similar to executives (Yermack, 2004). Yet, Brick et al. (2006) observe that both excess CEO and excess director compensation are associated with firm underperformance, suggesting that excess pay is the result of mutual back-scratching or cronyism.

Altogether, the empirical evidence on monetary incentives and CEO compensation monitoring is very scarce. Core et al. (1999) cannot observe any significant association between outside director stock holdings and CEO compensation. Agrawal and Nasser (2019) find that independent directors with at least 1% in firm equity holdings mitigate the presence of excess CEO pay as well as improve the CEO pay-performance sensitivity. Given the strong correlation between director and CEO pay as well as fact that directors eventually decide their own compensation, the focus on equity holdings rather than annual compensation as a proxy for director motivation seems more sensible. Directors with equity holdings must have similar interests as other shareholders. Thus, in the context of the quad model, its integration should complement a director's independence, seeing that equity ownership motivates directors to utilise their independent monitoring role fully.

5.2.4 Main hypotheses

The discussion of the quad attributes and the related CEO compensation monitoring literature once more underpins the relevance of the quad model. It becomes apparent that one director quality alone cannot sufficiently describe a director's monitoring ability and motivation. Further, the ambiguity in the results reveals a lack in the understanding of the board monitoring processes, specifically with regard to the CEO-board relationship. When considering the presented literature, one might argue in support of the Hermalin model. A board which has a greater propensity to monitor the CEO is a greater threat for the CEO's job, and hence the CEO would require more pay as a compensation for the greater risk of losing her job. Yet, the quad model predicts that it mitigates the occurrence of governance failures. Hambrick et al. (2015) specifically suggest the analysis of the quad model regarding CEO overpayments. Correspondingly, the main hypotheses follow the traditional agency perspective and expect that quad-qualification improves a board's effectiveness in CEO compensation monitoring.

Prior empirical studies mainly examine this monitoring effectiveness using three proxies: (a) the level of CEO compensation in relation to an economic firm performance model (excess CEO compensation), (b) the sensitivity of CEO pay to changes in firm performance (CEO pay-performance sensitivity), and (c) the proportion of CEO pay in relation to total top management pay (CEO pay slice).

Excess CEO Compensation. On the principles of agency theory, better board monitoring of CEO pay would have a negative effect on total CEO compensation, when it is accounted for firm heterogeneity in financial and market performance as well as other factors (Core et al., 1999; Faleye et al., 2011). In terms of examining board's monitoring effectiveness, the metric holds the advantages that it is a frequent and readily observable board decision for public firms. The hypothesis is that quad-qualified boards are better in assessing CEO ability, and hence are more effective in making CEO pay-setting decisions in relation to firm performance.

CEO Pay-Performance Sensitivity. Similarly, agency theory contends that a tighter association of CEO pay to performance constitutes more effective monitoring because it ensures that the interests between CEO and shareholders are more closely aligned (Jensen and Meckling, 1976). Accordingly, prior literature expects that boards prone to effective monitoring would induce increased pay-performance sensitivity (Jensen and Murphy, 1990). Hence, a change in firm performance should have a stronger effect on CEO pay, i.e. increased pay-performance sensitivity, when the board is quad-qualified.

CEO Pay Slice. Lastly, rather recently, Bebchuk et al. (2011) introduced the CEO pay slice (CPS) as a measure for executive pay disparity. In general, there are two contrasting views about a greater pay disparity (Chen et al., 2013). One is that a greater gap between non-CEO executives and the CEO motivates the non-CEO executives to compete more rigorously for the top position (Kale et al., 2009). This would raise the availability of internal candidates for CEO succession and hence reduces the entrenchment of the incumbent CEO because it increases the bargaining power of the board. The other view is that of the managerial power theory, which suggests that increased CEO pay is the result of the CEO's greater bargaining power over the board. Thus, a greater disparity of executive pay indicates an entrenched CEO (Bebchuk et al., 2011), which is commonly being linked to governance problems (Finkelstein et al., 2009). By the quad model's

definition, the hypothesis is that a negative relationship between quad-qualification and CEO pay slice indicates effective monitoring.

Consistent with the research agenda of the previous chapter, the relationship between quad-qualification and CEO compensation monitoring effectiveness is first tested in terms of the outside directors' average degree of quad-qualification. This customary board-averages approach is a key criticism of Hambrick et al. (2015) and other papers (Johnson et al., 2013; Dalton and Dalton, 2011), because the unit of analysis is the board rather than the individual. Yet, rather than dropping it, the customary approach allows us to connect the quad model to previous empirical studies.

Hypothesis 1 (H1): *The outside directors' average quad-qualification score has a positive effect on CEO pay-setting decision-making, i.e.*

1. Excess CEO compensation is inversely related to the outside directors' average quad-qualification score.
2. CEO pay-performance sensitivity is positively related to the outside directors' average quad-qualification score.
3. CEO pay slice is inversely related to the outside directors' average quad-qualification score.

In reference to the previous Chapter 4, a key innovation of this thesis is the development of a methodological approach suitable to test quad-qualification at the individual level. As mentioned before, it is thereby provided for the criticism concerning the level of analysis, which overlooks information about diversity and related group dynamics (e.g. Johnson et al., 2013). In this chapter, the methodological approach and the operationalisation of the quad model exactly resemble the previous Chapter 4 as it seeks to examine how the association between the number of domain-specific quad-qualified directors and CEO compensation monitoring effectiveness.

Hypothesis 2 (H2): *A board's number of quad-qualified directors has a positive effect on CEO pay-setting decision making, i.e.*

1. Excess CEO compensation is inversely related to the board's number of quad-qualified directors

2. CEO pay-performance sensitivity is positively related to the board's number of quad-qualified directors

3. CEO pay slice is inversely related to the board's number of quad-qualified directors.

Following the Sarbanes-Oxley Act and the changes of stock exchange listing requirements, all public companies on the NYSE and Nasdaq are required to have a compensation committee. In general, its primary responsibilities is to set executive compensation, including special compensation arrangements such as severance packages (Hermanson et al., 2012). In that, its goal is often to align the interests of shareholders and management by using incentive pay contracts (Brandes et al., 2016; Hermanson et al., 2012).

Prior studies show that independent (Conyon and Peck, 1998; Chhaochharia and Grinstein, 2009) and qualified (Sun and Cahan, 2009; Sun et al., 2009) directors on the compensation committee can enhance optimal contracting about CEO pay. Accordingly, Hambrick et al. (2015) also ask about the implications of the quad model for the committee composition. A quad-qualified director on the compensation committee should likewise be able to provide effective CEO compensation monitoring. Nevertheless, confining the entire analysis to committee members would fail to capture a board's true monitoring ability, since the compensation committee decisions are subsequently discussed in general board meetings (Lorsch Jay W. et al., 1990; Conyon and Peck, 1998). Accordingly, this chapter only tests the quad model with regard to compensation committee members only in a subordinate analysis.

Hypothesis 3 (H3): *A board's number of quad-qualified directors on the compensation committee has a positive effect on CEO pay-setting decision making, i.e.*

1. Excess CEO compensation is inversely related to the committee's number of quad-qualified directors

2. CEO pay-performance sensitivity is positively related to the committee's number of quad-qualified directors

3. CEO pay slice is inversely related to the committee's number of quad-qualified directors.

The previous chapter shows that a board's monitoring effectiveness regarding CEO turnover decisions is induced when a board has reached a certain critical mass level of

quad-qualified directors. Following the quad model predictions, the expectation is that the presence of more than one quad-qualified director who is versed in the matters of CEO pay decisions correspondingly improves board monitoring effectiveness regarding CEO pay.

Hambrick et al. (2015) predict that a minimum of two quad-qualified directors is needed to influence group think in ways that result in effective CEO pay decisions. However, the assessment of CEO ability/performance precedes both CEO turnover and CEO pay decisions, which are key monitoring tasks that should draw the attention of all board members. Thus, consistent with the previous chapter, it is expected that only the presence of at least three quad-qualified directors can exert minority influence for the benefit of optimal contracting in CEO compensation.

Hypothesis 4 (H4): *A critical mass of quad-qualified directors (three or more) will have a positive effect on CEO pay-setting decision making, i.e.*

1. Excess CEO compensation is significantly reduced in the presence of at least three quad-qualified directors
2. CEO pay-performance sensitivity is significantly improved in the presence of at least three quad-qualified
3. CEO pay slice is significantly reduced in the presence of at least three quad-qualified

5.3 Data & Methodology

5.3.1 Sample

As described in Chapter 3, the initial sample is composed of 59,940 observations for a total of 11,704 directors at 1,231 firms. The sample corresponds to the universe of board members at S&P 1,500 firms between 2009 and 2014, excluding the financial services and utility sectors. Furthermore, a prerequisite for directors to be considered (or not) as quad-qualified is respectively to be outside board members, i.e. those who perform the board's monitoring mandate (Hambrick et al., 2015). Hence, all executive directors are excluded from the sample. On average, 85.3% of all directors covered are outside directors.

5.3.2 Attribute measurement

The measurement of quad-qualification and its underlying attributes strictly follows the concept described in Chapter 4. However, given the domain-specific aim of the expertise

attribute, *Expertise* is remeasured using director-level measures of experience-based human capital. Consistent with Chapter 4, the emphasis is to gauge the generic, industry-specific and firm-specific expertise of each director. Generic expertise is captured by *CEO Experience* and *CC Experience*. The experience that directors gain on compensation committees allows them to understand how to design and negotiate compensation contracts (Hermanson et al., 2012).[3] Additionally, experience as CEO establishes an understanding for the motivation and concerns of the focal CEO. However, such experience cannot be gained at any firm. Therefore, *CEO Experience* only captures the length of outside directors' employment as CEO at private or public firms that have a total revenue of at least 1 billion USD.

Industry Experience is measured as the director's aggregate length of prior employment at private and public companies (N=157,569 firms) in the same industry, identified by the two-digit SIC code. Overlapping employments in the same industry are treated as one.

Finally, *Director Tenure* and *Tenure Overlap* account for the firm-specific portion of director expertise. *Director Tenure* is the length of the focal director's tenure on the board since her initial appointment (Tuggle et al., 2010b; Kor and Sundaramurthy, 2009). *Tenure Overlap* is the total length of overlapping tenures with any other outside director. This relates to the concept that outside directors are more likely to circulate non-public information amongst them when they are familiar with each other (Sauerwald et al., 2016).

Table 5.1 reports the results of the factor analysis employed on the set of the five expertise variables mentioned above. The eigenvalue only exceeds 1 for a single factor (see Panel B), which shows that a single factor can capture director expertise. Therefore, there is no need to rotate the factors, and it can be derived from Panel B that the single factor of director expertise captures 54.2% of the variance. Further, factor loadings are greater than 0.3 throughout the underlying measures, which should be considered sufficient regarding our large sample size (DiStefano et al., 2009). At last, given that all observed variables positively correlate with each other, the economic interpretation of *Expertise* is that larger values represent a higher level of expertise.

The measurement of the other director attributes is strictly consistent with the previous empirical chapter. Any differences in the descriptive statistics of director-related variables are due to the re-measurement of *Expertise*.

[3]The NYSE requires all firms to have audit, compensation and nomination committees

Table 5.1: Factor Analysis: Director Expertise

Panel A reports the Pearson correlation coefficient matrix of all observed variables used in the factor analysis. Panel B reports the results of the factor analysis using the principal factor method without rotation.

A. Correlation Matrix

Observed Variable		1	2	3	4	5
1	CEO Experience	1.000				
2	CC Experience	0.578	1.000			
3	Industry Experience	0.353	0.365	1.000		
4	Tenure Overlap	0.385	0.429	0.599	1.000	
5	Director Tenure	0.446	0.474	0.730	0.833	1.000

B. Factor Analysis using principal-factor method

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalue		2.711	0.384	0.012	-0.125	-0.196
Explained Variance		0.542	0.077	0.002	-0.025	-0.039
Observed Variable						
1	CEO Experience	0.566	0.386			
2	CC Experience	0.595	0.374			
3	Industry Experience	0.724				
4	Tenure Overlap	0.826				
5	Director Tenure	0.911				

5.3.3 Quad-qualification measures

As aforementioned, the research design, described in Chapter 3, is strictly consistent with the chapter on CEO turnovers. Hence, in accordance with the first two hypotheses H1 and H2, quad-qualification measures for the customary board-averages (*QQ Score*) and the individual-level approach (*Nbr. QQ Dirs*) are constructed. Again, each attribute is given the same weight, and percentile normalisation is used to transform the continuous attribute variables to obtain values ranging between 0 and 1 (see equation 5.1). Thus, the individual *QQ Score* takes a maximum value of 4. To be classified as quad-qualified, directors are required to have a *QQ Score* of at least 3.5 (see equation 5.2). This achieves that any quad-qualified director must possess a level of qualification in each attribute on or above the corresponding median level (> 0.5).

$$QQ\ Score_{ijt} = Independence_{ijt} + Expertise_{ijt} + Motivation_{ijt} + Bandwidth_{ijt} \tag{5.1}$$

$$QQ\ Dir_{ijt} = QQ\ Score_{ijt} > 3.5 \tag{5.2}$$

For the purpose of testing all three hypotheses, the individual scores need to be averaged at the board level. In relation to H1, the director-level *QQ Score* is simply

Table 5.2: Descriptive Statistics of Director-Level Quad Attributes and Input Variables

This table reports the casewise correlation matrix for all outside director-level attribute variables, including the underlying input director-level measures.

Variable	Mean	SD	Min	Q1	Median	Q3	Max	N
QQ Score	2.506	0.722	0.122	1.938	2.521	2.960	4.000	47,078
QQ Dir	0.111	0.314	0.000	0.000	0.000	0.000	1.000	47,078
CCM-QQ Dir	0.057	0.231	0.000	0.000	0.000	0.000	1.000	47,078
Independent	0.750	0.325	0.000	0.490	1.000	1.000	1.000	47,078
Turnover Expertise	0.499	0.291	0.000	0.242	0.495	0.747	1.000	47,078
Motivation	0.434	0.381	0.000	0.000	0.535	0.788	1.000	47,078
Bandwidth	0.822	0.382	0.000	1.000	1.000	1.000	1.000	47,078
Non-TW-co-opted	0.885	0.200	0.000	0.834	1.000	1.000	1.000	47,078
No Outside Shared Experience	0.963	0.139	0.000	1.000	1.000	1.000	1.000	47,078
CEO Experience	20.097	18.340	0.000	7.250	15.000	27.583	184.333	47,078
CC Experience	7.895	7.269	0.000	0.750	6.750	12.500	30.000	47,078
Industry Experience	11.279	8.897	0.250	4.833	9.083	15.250	45.000	47,078
Director Tenure	5.227	3.166	0.083	2.813	4.979	7.192	15.500	47,078
Tenure Overlap	8.521	7.017	0.083	3.333	6.917	11.667	38.917	47,078
Stock Ownership	0.001	0.003	0.000	0.000	0.000	0.000	0.052	47,078
Busy Size	0.178	0.382	0.000	0.000	0.000	0.000	1.000	47,078

aggregated at the board-level. As to H2 and the following hypotheses, the number of outside directors is counted who qualify as quad-qualified directors and in the case of H3 are on the compensation committee (see equation 5.3).

$$Nbr.\ QQ\ Dirs_{jt} = \sum_{i=1}^{n} QQ\ Dir_{ijt} \tag{5.3}$$

Table 5.2 shows the descriptive statistics of the director-level quad attributes and their underlying input variables. On average, 11.1% of all sample director-firm-year observations are quad-qualified directors as measured by above-described procedure. 5.7% are quad-qualified directors who are also a member of the compensation committee.

At the board-level[4], the distribution of the quad-qualification measures in Table 5.3 shows that quad-qualification is increasing during the sample period. On average, about 83% of all sample firms have at least one quad-qualified outside director on the board. However, the last column *Perc. QQ Dirs* shows that quad-qualified directors constitute only a minority on corporate boards throughout the sample period.

5.3.4 Dependent variables

As previously discussed in Subsection 5.2.4, the effectiveness of monitoring CEO compensation is measured by three proxies. The main variables of interest about the hypotheses are CEO total compensation, CEO pay-performance sensitivity, and CEO pay slice.

[4]Board-level observations only include firm-year observations for which all variables of the baseline regression are non-missing. This leads to small discrepancies in the measures of central tendency between director-level and board-level variables

Table 5.3: Distribution of Quad-Qualification Measures by Fiscal Year

This table reports the distribution of board-level quad-qualification measures by fiscal year. The right-hand side shows the number of firm-year observations where the board has a minimum of three quad-qualified directors. Variables are as defined in Table 5.15.

	QQ Score	Nbr. QQ Dirs	Nbr. CCM-QQ Dirs	Perc. QQ Dirs	Min. 3 QQ Dirs	
Fiscal Year			*Average*		*Avg.*	*Total*
2009	2.53	0.83	0.42	0.11	0.10	70
2010	2.52	0.84	0.44	0.11	0.11	73
2011	2.53	0.88	0.45	0.12	0.11	87
2012	2.59	1.01	0.53	0.13	0.12	94
2013	2.62	1.12	0.61	0.15	0.14	104
2014	2.64	1.21	0.67	0.15	0.16	92
Average	2.57	0.98	0.52	0.13	0.12	
Total						520

CEO pay and excess CEO pay

The sample of executive compensation data is obtained from Compustat's Execucomp database, which covers executive pay information of mostly S&P 1500 firms in the US. Following previous studies, the main variable of interest is CEO Pay, which is the natural logarithm of Execucomp's *tdc1* (in million USD) measure. The variable comprises the sum of the CEO's salary, bonus, the total value of restricted stock granted, the total value of stock options granted, and long-term incentive payouts.

In principle, prior research examines CEO overpayments by two methods. The first is to directly use *CEO Pay* as a dependent variable in the main model and control for firm performance. The second is to use a two-step procedure that estimates an economic model of CEO compensation first, before using the residual as a measure of excess CEO compensation in the main model (Kim et al., 2014; Faleye et al., 2011; Core et al., 1999). The rationale behind this empirical approach is to mitigate endogeneity concerns. Also, another advantage is that the estimation of excess CEO compensation includes firm-year observations from the entire Excecucomp-Compustat-CRSP universe and is not constraint by data availability limitations of BoardEx and other databases associated with the main director-level sample. Therefore, this chapter employs both approaches, which also enhances its comparability with previous studies.

In order to estimate the economic model, CEO compensation data is complemented by financial and market data from Compustat. The variables used in this model are closely related to the studies of Core et al. (1999) and Faleye et al. (2011). Instead of using the firm's total assets as a control variable, total CEO pay is adjusted by total assets. Thereby, it is accounted for the strong relationship between firm size and CEO pay as documented by prior research (Gabaix and Landier, 2008; Tervio, 2008).

Table 5.4: Economic Model of CEO Compensation

This table reports the firm-fixed effect regression results for the economic model of asset-adjusted CEO total pay. Descriptive sample statistics and variable definitions are reported in Table 5.17 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

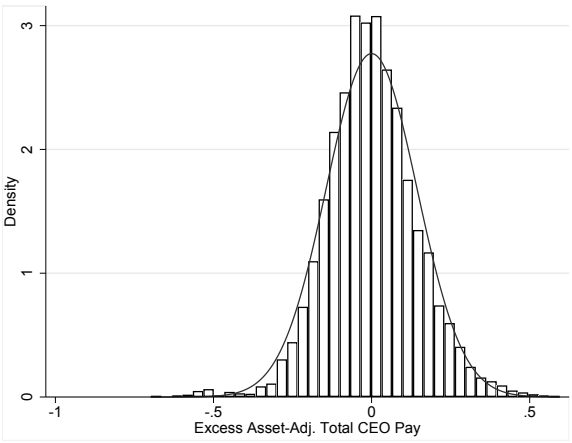
	(1)
Variables	Asset-adj. Total CEO Pay (t)
Stock Return$_t$	0.279***
	(0.09)
Leverage$_t$	-0.992***
	(0.36)
Tobin Q$_t$	0.876***
	(0.12)
ROA$_t$	2.993***
	(0.77)
SD(ROA)$_t$	-2.325*
	(1.23)
SD(Stock Return)$_t$	0.180
	(0.16)
Constant	1.809***
	(0.25)
Observations	6,660
Number of Firms	1,293
Adj. R^2	0.7431
F	15.15
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

The sample corresponds to firms in the S&P 1500 index, excluding firms in the utility and financial services industry as well as firms with fewer than two consecutive observations. All variables are winsorised at the 1% percentile to control for extreme outliers. The final sample consists of 6,660 observations across the fiscal years 2009 to 2014. The sample descriptive statistics are presented in the appendix, see Table 5.17.

The estimation follows the two-step procedure as proposed by Pindado and Requejo (2015). Accordingly, the specification is first analysed using panel data methodology. The results resemble in essence the studies by Core et al. (1999) and Faleye et al. (2011). CEOs tend to be compensated for positive financial (*ROA*) and market (*Annual Stock Return*) performance. Furthermore, firms with relatively greater market valuation tend to pay more. However, it also appears that CEOs are not compensated for greater risk, as illustrated by the negative effect of the level of *Leverage* and the standard deviation of *ROA* on CEO pay. In the second step, the model is estimated cross-sectionally by year, using two-digit SIC industry fixed effects with firm cluster-robust standard errors.

The final step is to predict the residual from the cross-sections for each firm-year combination. The residuals are interpreted as CEO overpayment ($u > 0$) and CEO underpayment ($u < 0$). As illustrated by the histogram in Figure 5.1, it appears that *Exs. CEO Pay* overall tends to follow a normal distribution.

Figure 5.1: Histogram of Excess Total CEO Compensation



CEO delta

A way to align shareholder and manager interests is to pay contingent on performance, which is fundamentally associated with agency theory and the optimal contracting paradigm. To measure whether CEO pay is coupled with firm performance, empirical research generally measures the change in CEO wealth relative to changes in firm stock price (e.g. Jensen and Murphy, 1990). Contrary to the residuals of the economic CEO compensation model, this approach does not allow making inferences about CEO over- and underpayment.

The present analysis uses the pay-performance measure contributed by Coles et al. (2013).[5] *CEO Delta* is the dollar change in wealth associated with a 1% change in the firm's stock price.

CEO pay slice

The final variable to examine the monitoring effectiveness in terms of CEO compensation is *CEO Pay Slice*. This measure goes back to Bebchuk et al. (2011) and measures the proportion of CEO pay relative to the total pay of the top 5 executives, including the CEO. Strictly following the approach by Bebchuk et al. (2011), *CEO Pay Slice* is based on Execucomp's *tdc1*. All firm-fiscal year observations for which the number of reported executives is less than five are dropped.

[5]Data available online: *https://sites.temple.edu/lnaveen/data/* The measure is based on the method and program developed by Core and Guay (2002) and Coles et al. (2006).

5.3.5 Baseline model

As previously outlined, the analysis of the main hypotheses involves testing how quad-qualification influences CEO pay-setting effectiveness, represented by four dependent variables: *Exs. CEO Pay*, *CEO Pay*, *CEO Delta*, and *CEO Pay Slice*. In principle, the baseline model is illustrated by equation 5.4:

$$\begin{aligned} \textit{Dependent Variable} = \beta_0 + \beta_1 \textit{Quad-Qualification Measure}_{j,t} \\ + \phi_1 \textit{Performance Controls}_{j,t} + \gamma_1 \textit{CEO Controls}_{j,t} + \gamma_2 \textit{Firm Controls}_{j,t} + u_{j,t} \end{aligned} \quad (5.4)$$

However, the controls, specifically regarding firm performance, differentiate between the four dependent variables. As for equation 5.4, the variables controlling for the characteristics of the incumbent CEO include *CEO only Insider*, which is a dummy variable that takes a value of 1 if the CEO is the only executive director on the board of directors. The dummy variable *Duality* indicates whether the focal CEO also chairs the board or not. *CEO Age* is the natural logarithm of the CEO's age. *CEO Ownership* is the percentage of the CEO's stock holdings in the focal company at the beginning of the current fiscal year. *CEO Tenure* measures the length of time since the CEO assumed office. Notably, the entire analysis of quad-qualification and CEO compensation only captures CEOs who are on the board for more than 12 months.

As to the firm variables, which account for the board- and firm-specific characteristics, *Board Size* is the natural logarithm of the number of board members, *Avg. Outsider Age* is the natural logarithm of the average age of outside directors, and *Outsider Ratio* is the percentage of outside (non-executive) directors on the board. *Firm Age* is calculated as the natural logarithm of the number of years since the firm's first listing in the CRSP database.

Moreover, the baseline model also controls for the firm's ownership structure. Based on Thomson Reuter's 13-F[6], *Inst. Ownership* reflects the percentage of shares held by active institutional investors. Such investors, i.e. all investors excluding banks and insurance companies, are perceived to take an active role as shareholders and where possible also as directors. Using the same dataset, *Inst. HHI* is the Hirshman-Herfindahl index of institutional ownership, capturing all institutional investors. Further, it is controlled for

[6]Irrespective of the prior issues related to 13-F on WRDS, this chapter uses the adjusted, fixed version provided by WRDS.

the size of the firm (*Firm Size*) by using the natural logarithm of the firm's total assets. Lastly, the proportion of research and development costs divided by the firm's total assets (*R&D Intensity*) is added to capture firm heterogeneity in innovation. Since only about 2/3 of the sample firm-year observations report such costs, *R&D Intensity* is complemented by another dummy variable, indicating whether the observation is missing or not.

Regarding performance controls, the same set of variables is applied to the baseline model as to the economic CEO compensation model. As to market performance, *Stock Return* is the 12-months buy-hold return. Return on Assets (*ROA*) accounts for financial performance and is calculated as the ratio of net income before tax divided by total assets. *Tobin's Q* measures a firm's relative over-/undervaluation and is measured as the ratio of the firm's market valuation divided by its replacement costs. Furthermore, corporate risk is considered by three variables: *Leverage* is the ratio of total debt divided by its total assets, *SD of Stock Return* is the three-year standard deviation of *Stock Return*, and finally, *SD of ROA* is the three-year standard deviation of *ROA*.

Finally, besides the alternating use of these three categories of performance variables, the set of control variables in the analysis of *CEO Pay Slice* is complemented by *Industry Median CPS*. This variable is the median *CEO Pay Slice* within the same 4-digit SIC industry.[7]

5.3.6 Substitution effect: CEO turnover probability

Following Gao et al. (2012) and Bushman et al. (2010), the baseline model is extended by the probability of CEO turnover, because the threat of being replaced as CEO is, in fact, also an incentive for CEOs to perform better. Therefore, one should expect that a higher turnover probability has a positive effect on monitoring effectiveness, i.e. turnover probability is negatively correlated with CEO compensation. The estimation of turnover probability (see equation 5.5) follows, in essence, the insights given by prior literature and the first empirical chapter. First, the model accounts for the peer performance effect on CEO turnover (Bushman et al., 2010; Jenter and Kanaan, 2015). Second, firm performance relates to the two years before the actual turnover date (Jenter and Lewellen, 2019). Third, similar to Chapter 4, CEO turnovers are classified according to whether the turnover was announced at least three months before the CEO's departure or not. In particular, the

[7] Calculation is based on the entire Execucomp sample (2009-2014), excluding firm-year observations reporting less than five executives.

insights by Eisfeldt and Kuhnen (2013) and Fee et al. (2018) suggest that the classification into forced and voluntary turnovers may result in substantial misallocations.

$$\frac{P(CEO\ Turnover_{j,t})}{1 - P(CEO\ Turnover_{j,t})} = \beta_0 + \beta_1 Firm\ Performance_{j,t} + \beta_2 CEO\ Characteristics_{j,t} + \beta_3 Firm\ Characteristics_{j,t} + u_{j,t} \quad (5.5)$$

The summary statistics for the turnover probability estimation are reported in Table 5.18 of the appendix. For the sake of completeness, the estimation includes forced, voluntary, and unplanned CEO turnovers. The classification strictly follows the process described in Chapter 4, Subsection 4.3.4. The risk and return measures are calculated using CRSP daily return data. Peer measures relate to the same 2-digit SIC industry excluding the focal firm. The measures of idiosyncratic/peer return and idiosyncratic/peer risk follow the approach by Bushman et al. (2010) as illustrated by equations 5.6 and 5.7.

$$Firm's\ Annual\ Return = \beta_0 + \beta_1 Industry's\ Annual\ Median\ Return_{j,t} + u_{j,t} \quad (5.6)$$

$$Firm's\ Daily\ Return = \beta_{0,j} + \beta_{1,j} Industry's\ Daily\ Median\ Return_{j,t} + u_{j,t} \quad (5.7)$$

The controls mainly correspond to the main analysis. However, following Jenter and Lewellen (2019), *Blockholder* is added to account for the possibility that shareholders with stock holdings of more than 5% may intervene in turnover decisions. The final sample has 6,442 firm-year observations.

The prediction of turnover probability is based on logistic regression using both fiscal year and 2-digit SIC industry fixed effects. The estimation results in Table 5.5 confirm the common finding that forced turnover decisions are strongly related to negative performance. However, the negative effect of financial performance (*ROA*) on unplanned and forced turnovers appears to be similarly strong. Corresponding to Chapter 4, this supports the narrative that forced turnovers are more likely to be induced by public signals, i.e. firm's market performance, while presently private financial information affects turnover decisions before it becomes publicly available information and hence priced by the market (Chemmanur and Fedaseyeu, 2017). Moreover, contrary to unplanned and voluntary turnovers, forced turnovers appear to be less likely induced by *Duality*. In light of the industry-wide trend of separating the board chair and CEO positions, this seems reasonable for more orderly CEO succession processes as represented by voluntary and in

Table 5.5: Logistic Regressions Estimating Turnover Probability

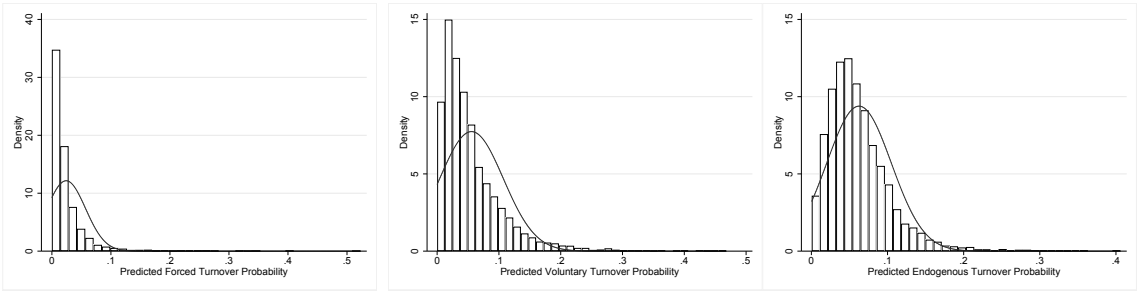
This table reports the results from the logistic regression on forced, unplanned and voluntary CEO turnovers. Each regression includes 2-digit SIC industry dummies and fiscal-year dummies. Descriptive sample statistics and variable definitions are reported in the appendix, Table 5.18 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)
	Forced TO (t)	Unplanned TO (t)	Voluntary TO (t)
Idiosyncratic Return $2yrs_{t-1}$	-1.101***	-0.472***	-0.307**
	(0.29)	(0.13)	(0.13)
Industry Return $2yrs_{t-1}$	-0.264	-0.553**	-0.460*
	(0.44)	(0.23)	(0.25)
Idiosyncratic Risk $2yrs_{t-1}$	3.876	0.317	-1.203
	(2.75)	(1.72)	(1.95)
Industry Risk $2yrs_{t-1}$	-9.217	-5.587	-6.277
	(11.26)	(5.54)	(5.41)
ROA_t	-2.962***	-2.274***	-1.527*
	(1.02)	(0.65)	(0.83)
$SD(ROA)_t$	-0.062	0.454	0.145
	(1.72)	(1.04)	(1.09)
$Duality_t$	-0.151	0.192*	0.334***
	(0.23)	(0.12)	(0.13)
CEO Age_t	-2.013***	3.092***	5.916***
	(0.78)	(0.54)	(0.63)
CEO $Tenure_t$	-0.042*	-0.016*	-0.017*
	(0.02)	(0.01)	(0.01)
CEO $Ownership_t$	-20.854*	-3.763	-2.789
	(11.55)	(2.84)	(2.40)
Firm Age_t	-0.046	0.020	0.005
	(0.16)	(0.09)	(0.10)
Firm $Size_t$	0.042	0.055	0.115**
	(0.08)	(0.04)	(0.05)
Inst. $Ownership_t$	-0.211	0.211	0.854*
	(0.69)	(0.43)	(0.48)
Inst. HHI_t	0.176	0.931	1.370
	(1.13)	(0.81)	(1.31)
$Blockholder_t$	-0.828*	-0.090	0.436
	(0.44)	(0.25)	(0.33)
Constant	4.618	-15.905***	-28.655***
	(3.34)	(2.46)	(2.77)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	4,971	5,962	5,883
Pseudo R^2	0.123	0.0564	0.0951
Wald χ^2	182.8	583.0	628.08

parts unplanned turnovers. Finally, the coefficient of *CEO Age* is significantly negative for forced turnovers, while significantly positive for voluntary and unplanned turnover. This circumstance reflects the strong classification algorithm of the Parrino (1997), which by design codes all fuzzy turnovers where the CEO is younger than 60 as forced turnovers. Yet, in reality, it would be expected that the difference between forced and voluntary turnovers is less pronounced.

Using the estimated coefficients of unplanned turnovers (column 2 in Table 5.5), *Turnover Probability* is predicted for all firm-year observations. The histograms in Figure 5.2 show that unplanned turnover probability is more evenly distributed than forced turnovers but is lower than voluntary turnover probability.

Figure 5.2: Histograms of Predicted Forced, Voluntary & Unplanned CEO Turnover Probabilities



5.3.7 Descriptive Statistics

Table 5.6 reports the descriptive statistics of all variables excluding the model-specific variables for the estimation of excess CEO compensation and the turnover prediction. As a preliminary analysis, Table 5.7 shows the distribution of means in each control variable along with the corresponding quartiles of the number of quad-qualified outside directors. Also, t-tests are conducted on the difference between the highest and lowest quartile. As for the dependent variables, the univariate analysis shows no significant difference in average *Exs. CEO pay* and *CEO Pay Slice* between high and low numbers of quad-qualified directors. However, boards with a high number of quad-qualified directors appear to pay less but have a lower *CEO Delta*. This finding is only partially in confirmation with hypothesis H2, because the expectation is that greater monitoring ability increases the sensitivity of CEO pay to firm performance. Concerning the control variables, the results mostly confirm conventional wisdom. Notably, firms with a high number of quad-qualified directors appear to employ CEOs with greater equity ownership, but those are also younger and have a short tenure since initial appointment.

Similarly, Table 5.8 shows the distribution of the mean values by quartile levels in *Total CEO Pay*. In confirmation with the main hypotheses, boards with high CEO payments have on average a lower *QQ Score* and less quad-qualified directors on the board as well as on the compensation committee. However, larger and older, but also, higher leveraged firms appear to pay CEOs higher compensation. Moreover, the univariate analysis also reveals a positive effect on CEO compensation, when the CEO is also the chairman, older, has lower equity ownership as well as a shorter tenure. Noteworthy is also that institutional ownership and ownership concentration are both negatively related to CEO pay.

Table 5.6: Summary Statistics of Baseline Model

Variables	Mean	SD	Min	Q1	Median	Q3	Max	N
Dependent Variables								
Exs. Total CEO Pay	0.050	0.495	-2.400	-0.210	0.077	0.333	2.317	3427
Total CEO Pay	8.408	0.856	5.758	7.839	8.468	9.003	10.647	3732
CEO Delta	659.102	1442.322	3.171	107.986	260.859	636.123	17194.556	3732
CEO Pay Slice	0.404	0.095	0.008	0.348	0.408	0.465	0.914	3497
Model Variables								
QQ Score	2.650	0.383	1.346	2.398	2.640	2.914	3.843	3732
Nbr. QQ Dirs	0.909	1.303	0.000	0.000	0.000	2.000	7.000	3732
Nbr. CCM-QQ Dirs	0.578	0.860	0.000	0.000	0.000	1.000	5.000	3732
Control Variables								
P(Turnover)	0.062	0.039	0.000	0.035	0.055	0.080	0.406	3732
CEO only Insider	0.754	0.431	0.000	1.000	1.000	1.000	1.000	3732
CEO Age	4.026	0.120	3.466	3.951	4.025	4.111	4.477	3732
CEO Ownership	0.007	0.011	0.000	0.001	0.003	0.009	0.052	3732
Duality	0.517	0.500	0.000	0.000	1.000	1.000	1.000	3732
CEO Tenure	8.407	7.230	0.000	3.417	6.583	11.083	43.917	3732
Board Size	2.201	0.237	1.386	2.079	2.197	2.398	2.890	3732
Avg. Age Outsider	4.142	0.060	3.894	4.104	4.145	4.182	4.367	3732
Outsider Ratio	0.852	0.075	0.429	0.833	0.875	0.900	0.944	3732
Outsider Ownership	0.005	0.013	0.000	0.000	0.001	0.004	0.130	3732
Inst. Ownership	0.715	0.178	0.004	0.637	0.745	0.829	1.055	3732
Inst. HHI	0.053	0.058	0.018	0.032	0.041	0.053	0.605	3732
Firm Age	3.252	0.659	1.386	2.773	3.178	3.829	4.489	3732
Stock Return	0.199	0.383	-0.660	-0.031	0.152	0.361	3.474	3732
ROA	0.063	0.073	-0.329	0.030	0.061	0.099	0.285	3732
Tobin Q	1.988	1.086	0.786	1.279	1.659	2.297	7.914	3732
Leverage	0.204	0.170	0.000	0.058	0.188	0.306	0.817	3732
Firm Size	7.823	1.555	4.476	6.688	7.638	8.814	12.358	3732
SD(Stock Return)	0.097	0.050	0.029	0.063	0.086	0.118	0.461	3732
SD(ROA)	0.041	0.053	0.003	0.012	0.023	0.045	0.387	3732

5.4 Empirical Results

5.4.1 Quad-qualification score

The expectation about the first hypothesis H1 is that the average *QQ Score* of outside directors has a negative effect on *Exs. CEO Pay*, *Total CEO Pay*, and *CEO Pay Slice*, as well as a positive effect on *CEO Delta*. The longitudinal model defined by Equation 5.4 uses firm and fiscal year fixed effects and firm-cluster robust standard errors. In contrast to an ordinary least squares estimation with industry and year fixed effects, the chosen methodology accounts for a common source of endogeneity; the unobservable heterogeneity of firm characteristics.

Table 5.9 reports the results of the fixed effect estimation. *QQ Score* appears to have a significant, but negative effect on the sensitivity of CEO wealth to stock performance, i.e. *CEO Delta*. Also, *QQ Score* has a positive effect on *CEO Pay Slice*, suggesting that firms having a higher degree of quad-qualification among their outside directors have a higher pay gap between the CEO and the other top executives. Both findings are contrary to the main hypothesis H1, as one would expect that effective monitoring is established when *CEO Delta* and *CEO Pay Slice* increase in *QQ Score*. Further, the appendix also reports

Table 5.7: T-test: Control Variables on the Degree of Quad-Qualification

This table reports the results of a t-test by the degree of quad-qualification on dependent and control variables. The t-test corresponds to the comparison between the levels in the highest quartile of *Nbr. QQ Dirs* and the lowest quartile of *Nbr. QQ Dirs*. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	High			*Low*	t-test: *High vs. Low*		
Variables	Q4	Q3	Q2	Q1	Diff. Q4-Q1	Std. Error	Obs.
Exs. CEO Pay	0.0137	-0.0047	-0.0208	-0.0223	-0.0360***	0.0058	2428
Total CEO Pay	8.245	8.326	8.568	8.467	0.222***	0.039	2662
CEO Delta	364.726	537.733	693.017	803.103	438.376***	66.840	2662
CEO Pay Slice	0.408	0.406	0.412	0.405	-0.003	0.004	2662
CEO only Insider	0.807	0.773	0.757	0.750	-0.057***	0.018	2662
CEO Age	3.999	4.019	4.040	4.029	0.029***	0.005	2662
CEO Ownership	0.009	0.008	0.007	0.006	-0.002***	0.000	2662
Duality	0.361	0.432	0.432	0.601	0.240***	0.020	2662
CEO Tenure	5.669	7.093	7.682	9.318	3.649***	0.309	2662
Board Size	2.238	2.200	2.216	2.196	-0.041***	0.010	2662
Avg. Age Outsider	4.158	4.139	4.143	4.130	-0.028***	0.003	2662
Outsider Ratio	0.869	0.858	0.859	0.848	-0.021***	0.003	2662
Outsider Ownership	0.011	0.007	0.005	0.002	-0.009***	0.001	2662
Inst. Ownership	0.741	0.730	0.721	0.693	-0.048***	0.008	2662
Inst. HHI	0.050	0.047	0.046	0.059	0.009***	0.003	2662
Firm Age	3.335	3.302	3.394	3.139	-0.196***	0.030	2662
R&D Intensity	0.023	0.031	0.035	0.034	0.010***	0.002	2662
R&D Missing	0.366	0.311	0.336	0.340	-0.026	0.020	2662
Stock Return	0.201	0.227	0.247	0.206	0.005	0.017	2662
ROA	0.060	0.072	0.066	0.058	-0.001	0.003	2662
Tobin Q	1.866	2.063	2.301	1.978	0.112**	0.045	2662
Leverage	0.208	0.212	0.216	0.208	-0.000	0.007	2662
Firm Size	7.505	7.706	8.013	7.994	0.489***	0.067	2662
SD(Stock Return)	0.103	0.098	0.076	0.100	-0.003	0.002	2662
SD(ROA)	0.037	0.044	0.030	0.044	0.007***	0.002	2662

a more detailed analysis of the fixed effect estimation (see Table 5.21 and Table 5.22).

As for the control variables, it is observed that turnover probability has a significantly negative effect throughout all of the dependent variables. This is consistent with the findings of Bushman et al. (2010) who show that predicted turnover probability has a negative effect on both *CEO Delta* and the annual change of CEO compensation.

Moreover, *CEO Age* has a significantly positive effect on each dependent variable, when it is controlled for turnover probability. This finding suggests that older CEOs have relatively greater CEO pay, also relative to other top executives, and yet more dependent on firm performance. In particular, for CEO pay-for-performance sensitivity (*CEO Delta*), this is consistent with optimal CEO contracting, because explicit incentives should be strongest for CEOs close to retirement because their career concerns are weaker (Gibbons and Murphy, 1992). Also, about *Exs. CEO Pay* and *CEO Pay*, it appears that relatively larger boards have a mitigating effect on excess CEO pay. Finally, consistent with prior research, *CEO Delta* is suggested to increase in the tenure length of the CEO (Bebchuk et al., 2011; Core et al., 1999).

Table 5.8: T-test: Control Variables on the Degree of Total CEO Compensation

This table reports the results of a t-test by the degree of total CEO compensation on all model and control variables. The t-test corresponds to the comparison between the levels in the highest quartile of *Total CEO Pay* and the lowest quartile of *Total CEO Pay*. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	High			*Low*	t-test: *High vs. Low*		
Variables	Q4	Q3	Q2	Q1	Diff. Q4-Q1	Std. Error	Obs.
Nbr. QQ Dirs	0.631	0.969	1.114	1.133	0.502***	0.060	1866
Nbr. CCM-QQ Dirs	0.360	0.545	0.565	0.581	0.221***	0.036	1866
QQ Score	2.360	2.524	2.643	2.692	0.332***	0.019	1866
CEO only Insider	0.765	0.791	0.817	0.708	-0.057***	0.020	1866
CEO Age	4.048	4.032	4.010	4.016	-0.033***	0.006	1866
CEO Ownership	0.004	0.005	0.008	0.012	0.009***	0.001	1866
Duality	0.696	0.528	0.448	0.465	-0.231***	0.022	1866
CEO Tenure	8.394	8.069	7.723	10.407	2.013***	0.357	1866
Board Size	2.364	2.238	2.155	2.053	-0.311***	0.010	1866
Avg. Age Outsider	4.140	4.143	4.133	4.139	-0.001	0.003	1866
Outsider Ratio	0.875	0.863	0.856	0.823	-0.052***	0.004	1866
Outsider Ownership	0.003	0.003	0.005	0.009	0.007***	0.001	1866
Inst. Ownership	0.674	0.730	0.749	0.701	0.027***	0.008	1866
Inst. HHI	0.040	0.050	0.058	0.066	0.026***	0.002	1866
Firm Age	3.507	3.283	3.093	3.003	-0.504***	0.031	1866
R&D Intensity	0.029	0.026	0.031	0.040	0.012***	0.002	1866
R&D Missing	0.324	0.337	0.337	0.340	0.016	0.022	1866
Stock Return	0.231	0.206	0.220	0.192	-0.039**	0.020	1866
ROA	0.076	0.063	0.062	0.052	-0.024***	0.004	1866
Tobin Q	2.130	1.947	1.968	2.018	-0.112**	0.056	1866
Leverage	0.245	0.248	0.206	0.137	-0.108***	0.007	1866
Firm Size	9.543	8.160	7.219	6.329	-3.214***	0.051	1866
SD(Stock Return)	0.080	0.094	0.105	0.114	0.033***	0.002	1866
SD(ROA)	0.031	0.038	0.045	0.050	0.019***	0.002	1866

5.4.2 Number of quad-qualified directors

Having established that average board quad-qualification does not confirm the hypothesis H1, the focus is now on how the number of quad-qualified directors affects monitoring effectiveness about CEO compensation. Again, the analysis follows the baseline model with only *QQ Score* being replaced by *Nbr QQ Dirs*, which corresponds to the number of quad-qualified directors among all outside board members.

In matters of CEO, firm, and performance controls, the results in Table 5.10 resemble the previous results in Table 5.9. However, contrary to *QQ Score*, *Nbr. QQ Dirs* is significantly positive for all dependent variables except *CEO Delta*. While this finding rejects the main hypothesis H2, it suggests that boards with quad-qualified directors are more likely to pay the CEO a higher total compensation and bestow the CEO with a greater share of total executive pay. Further, this shows that the negative relationship between quad-qualification and CEO compensation, as evidenced by the univariate analysis in Table 5.8, is inverted once CEO, board, and firm characteristics are considered. More detailed results are reported in the appendix (Table 5.21 & Table 5.22).

Table 5.9: Quad-Qualification Score

This table reports the results from the fixed effect regression analysis of *QQ Score* on each of the four dependent variables. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exs. CEO Pay$_t$		CEO Pay$_t$		CEO Delta$_t$		CEO Pay Slice$_t$	
QQ Score$_t$	0.010	0.009	0.056	0.044	-159.141***	-167.090***	0.016**	0.014*
	(0.01)	(0.01)	(0.05)	(0.05)	(59.19)	(59.29)	(0.01)	(0.01)
P(Turnover)$_t$		-0.163**		-2.245***		-1,559.366**		-0.375***
		(0.08)		(0.56)		(774.91)		(0.11)
Industry Med. CPS$_t$							0.574***	0.571***
							(0.05)	(0.05)
CEO only Insider$_t$	-0.013	-0.013	-0.033	-0.033	143.682	144.036	0.004	0.004
	(0.01)	(0.01)	(0.06)	(0.06)	(136.23)	(135.22)	(0.02)	(0.02)
CEO Age$_t$	0.072	0.103	0.674	1.055**	884.073*	1,148.644**	0.088	0.152**
	(0.08)	(0.08)	(0.46)	(0.45)	(493.51)	(450.36)	(0.08)	(0.08)
CEO Ownership$_t$	0.669	0.638	1.462	0.976	-101.965	-439.744	0.116	0.034
	(0.43)	(0.43)	(1.91)	(1.91)	(3,300.17)	(3,334.25)	(0.32)	(0.32)
Duality$_t$	0.006	0.009	0.054	0.088*	-40.067	-16.366	0.003	0.009
	(0.01)	(0.01)	(0.04)	(0.05)	(61.00)	(63.57)	(0.01)	(0.01)
CEO Tenure$_t$	-0.000	-0.000	0.005	0.002	39.151**	37.204**	0.001	0.000
	(0.00)	(0.00)	(0.01)	(0.01)	(15.99)	(15.54)	(0.00)	(0.00)
Board Size$_t$	-0.052**	-0.051**	-0.204*	-0.205*	248.182	247.619	-0.043	-0.044
	(0.02)	(0.02)	(0.11)	(0.11)	(219.45)	(219.05)	(0.03)	(0.03)
Avg. Age Outsider$_t$	-0.074	-0.073	-0.187	-0.193	-293.274	-297.139	-0.035	-0.036
	(0.07)	(0.07)	(0.35)	(0.35)	(464.62)	(464.80)	(0.06)	(0.06)
Outsider Ratio$_t$	0.116	0.119	0.493	0.521	-886.128	-866.988	0.119	0.124
	(0.13)	(0.13)	(0.55)	(0.55)	(886.02)	(876.95)	(0.16)	(0.16)
Outsider Ownership$_t$	-0.389*	-0.400*	-1.399	-1.419	-489.987	-503.958	-0.152	-0.155
	(0.22)	(0.22)	(0.88)	(0.90)	(944.05)	(935.07)	(0.14)	(0.14)
Inst. Ownership$_t$	0.017	0.017	0.105	0.104	-161.361	-161.792	0.024	0.024
	(0.02)	(0.02)	(0.09)	(0.09)	(104.59)	(103.52)	(0.02)	(0.02)
Inst. HHI$_t$	-0.022	-0.007	-0.352	-0.202	-236.828	-133.325	-0.019	0.006
	(0.05)	(0.05)	(0.22)	(0.23)	(197.79)	(219.26)	(0.04)	(0.04)
Firm Age$_t$	-0.001	0.001	0.036	0.045	-312.277*	-305.935*	-0.029	-0.027
	(0.03)	(0.03)	(0.16)	(0.16)	(165.60)	(165.75)	(0.02)	(0.02)
R&D Intensity$_t$	0.010	0.048	0.473	0.593	1,659.269	1,742.425	0.038	0.057
	(0.25)	(0.25)	(0.78)	(0.81)	(1,622.87)	(1,614.91)	(0.13)	(0.13)
R&D Missing$_t$	-0.020	-0.019	-0.076	-0.069	552.159	556.985	0.005	0.006
	(0.01)	(0.01)	(0.11)	(0.11)	(357.91)	(360.36)	(0.02)	(0.02)
Stock Return$_t$			0.010	-0.009	12.742	-0.562	-0.000	-0.004
			(0.02)	(0.02)	(31.06)	(28.04)	(0.00)	(0.00)
ROA$_t$			1.123***	0.812***	-18.873	-234.614	0.085***	0.033
			(0.16)	(0.18)	(371.13)	(435.54)	(0.03)	(0.03)
Tobin Q$_t$			0.112***	0.092***	353.949***	339.848***	0.007**	0.004
			(0.02)	(0.02)	(71.86)	(75.77)	(0.00)	(0.00)
Leverage$_t$			-0.253	-0.236	-199.709	-187.893	-0.004	-0.001
			(0.17)	(0.17)	(161.81)	(161.22)	(0.03)	(0.03)
Firm Size$_t$			0.388***	0.376***	470.626***	461.701***	0.003	0.000
			(0.05)	(0.05)	(141.41)	(143.94)	(0.01)	(0.01)
SD(Stock Return)$_t$			-0.204	-0.127	303.729	357.163	-0.033	-0.021
			(0.19)	(0.19)	(294.30)	(292.63)	(0.04)	(0.04)
SD(ROA)$_t$			-0.555**	-0.565**	1,207.079	1,199.982	-0.063	-0.065
			(0.26)	(0.27)	(788.61)	(794.85)	(0.05)	(0.05)
Constant	-0.003	-0.134	2.786	1.506	-5,042.384	-5,930.877*	-0.050	-0.263
	(0.45)	(0.45)	(2.52)	(2.45)	(3,311.90)	(3,084.49)	(0.42)	(0.40)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,732	3,732	3,732	3,732	3,732	3,732
Firms	743	743	809	809	809	809	809	809
$Adj.R^2$	0.0136	0.0161	0.2602	0.2680	0.2294	0.2312	0.1533	0.1616
F	1.251	1.334	27.82	27.05	6.520	6.288	10.79	10.54

Table 5.10: Number of Quad-Qualified Directors

This table reports the results from the fixed effect regression analysis of *Nbr. QQ Dirs* on each of the four dependent variables. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exs. CEO Pay$_t$		CEO Pay$_t$		CEO Delta$_t$		CEO Pay Slice$_t$	
Nbr. QQ Dirs$_t$	0.006***	0.006***	0.027***	0.027***	-24.848	-25.029	0.004***	0.004***
	(0.00)	(0.00)	(0.01)	(0.01)	(16.12)	(16.10)	(0.00)	(0.00)
P(Turnover)$_t$		-0.165**		-2.264***		-1,471.148*		-0.382***
		(0.08)		(0.56)		(777.49)		(0.11)
Industry Med. CPS$_t$							0.573***	0.571***
							(0.05)	(0.05)
CEO only Insider$_t$	-0.012	-0.012	-0.034	-0.033	149.290	149.980	0.004	0.004
	(0.01)	(0.01)	(0.06)	(0.06)	(136.46)	(135.58)	(0.02)	(0.02)
CEO Age$_t$	0.075	0.107	0.694	1.080**	885.135*	1,135.852**	0.090	0.155**
	(0.08)	(0.08)	(0.46)	(0.45)	(500.79)	(457.89)	(0.08)	(0.08)
CEO Ownership$_t$	0.666	0.632	1.467	0.933	-534.329	-881.102	0.142	0.052
	(0.43)	(0.43)	(1.88)	(1.89)	(3,318.58)	(3,353.09)	(0.31)	(0.31)
Duality$_t$	0.006	0.009	0.055	0.089*	-36.851	-14.257	0.003	0.009
	(0.01)	(0.01)	(0.05)	(0.05)	(61.11)	(63.73)	(0.01)	(0.01)
CEO Tenure$_t$	-0.000	-0.000	0.004	0.002	42.393***	40.727***	0.000	-0.000
	(0.00)	(0.00)	(0.01)	(0.01)	(15.96)	(15.56)	(0.00)	(0.00)
Board Size$_t$	-0.057**	-0.056**	-0.232**	-0.230**	297.808	299.053	-0.049*	-0.049*
	(0.02)	(0.02)	(0.11)	(0.11)	(220.24)	(219.99)	(0.03)	(0.03)
Avg. Age Outsider$_t$	-0.095	-0.096	-0.255	-0.283	-466.524	-485.094	-0.032	-0.037
	(0.07)	(0.07)	(0.35)	(0.34)	(461.56)	(462.73)	(0.06)	(0.05)
Outsider Ratio$_t$	0.106	0.109	0.449	0.473	-891.850	-876.469	0.115	0.119
	(0.13)	(0.13)	(0.54)	(0.54)	(882.51)	(874.79)	(0.16)	(0.15)
Outsider Ownership$_t$	-0.434**	-0.446**	-1.486*	-1.527*	-622.280	-648.724	-0.153	-0.160
	(0.22)	(0.22)	(0.88)	(0.90)	(922.57)	(911.90)	(0.14)	(0.14)
Inst. Ownership$_t$	0.016	0.017	0.101	0.100	-156.711	-157.011	0.023	0.023
	(0.02)	(0.02)	(0.09)	(0.09)	(104.09)	(103.11)	(0.02)	(0.02)
Inst. HHI$_t$	-0.021	-0.006	-0.355	-0.203	-216.092	-117.260	-0.020	0.005
	(0.05)	(0.05)	(0.23)	(0.24)	(195.80)	(218.14)	(0.04)	(0.04)
Firm Age$_t$	0.000	0.002	0.053	0.058	-365.898**	-362.543**	-0.024	-0.023
	(0.03)	(0.03)	(0.16)	(0.16)	(164.85)	(164.99)	(0.02)	(0.02)
R&D Intensity$_t$	0.005	0.043	0.494	0.616	1,650.408	1,729.406	0.040	0.061
	(0.25)	(0.25)	(0.77)	(0.80)	(1,634.03)	(1,625.52)	(0.13)	(0.13)
R&D Missing$_t$	-0.021	-0.020	-0.078	-0.071	553.118	557.607	0.005	0.006
	(0.01)	(0.01)	(0.11)	(0.11)	(357.41)	(359.70)	(0.02)	(0.02)
Stock Return$_t$			0.010	-0.010	12.465	-0.134	-0.000	-0.004
			(0.02)	(0.02)	(31.07)	(27.96)	(0.00)	(0.00)
ROA$_t$			1.109***	0.797***	1.808	-201.096	0.082***	0.030
			(0.16)	(0.18)	(370.81)	(435.12)	(0.03)	(0.03)
Tobin Q$_t$			0.113***	0.092***	353.462***	340.166***	0.007**	0.004
			(0.02)	(0.02)	(71.85)	(75.81)	(0.00)	(0.00)
Leverage$_t$			-0.259	-0.242	-201.702	-190.980	-0.004	-0.002
			(0.17)	(0.17)	(162.49)	(162.04)	(0.03)	(0.03)
Firm Size$_t$			0.393***	0.381***	469.691***	461.475***	0.003	0.001
			(0.05)	(0.05)	(141.48)	(144.00)	(0.01)	(0.01)
SD(Stock Return)$_t$			-0.194	-0.117	292.571	342.807	-0.032	-0.019
			(0.19)	(0.19)	(292.02)	(290.10)	(0.04)	(0.04)
SD(ROA)$_t$			-0.560**	-0.568**	1,228.153	1,222.591	-0.065	-0.067
			(0.26)	(0.27)	(791.24)	(797.01)	(0.05)	(0.05)
Constant	0.107	-0.022	3.121	1.895	-4,672.188	-5,468.503*	-0.036	-0.242
	(0.45)	(0.45)	(2.51)	(2.42)	(3,300.91)	(3,090.35)	(0.42)	(0.40)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,732	3,732	3,732	3,732	3,732	3,732
Firms	743	743	809	809	809	809	809	809
$Adj.R^2$	0.0237	0.0305	0.2616	0.2695	0.2281	0.2297	0.1537	0.1623
F	2.065	2.257	28.21	27.33	6.586	6.356	10.67	10.42

Table 5.11: Number of Quad-Qualified Directors on the Compensation Committee

This table reports the results from the fixed effect regression analysis of *Nbr. CCM-QQ Dirs* on each of the four dependent variables. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exs. CEO Pay$_t$		CEO Pay$_t$		CEO Delta$_t$		CEO Pay Slice$_t$	
Nbr. CCM-QQ Dirs$_t$	0.008**	0.008**	0.023	0.022	-44.678*	-45.301*	0.007**	0.006**
	(0.00)	(0.00)	(0.02)	(0.02)	(25.60)	(25.52)	(0.00)	(0.00)
P(Turnover)$_t$		-0.161**		-2.262***		-1,482.498*		-0.381***
		(0.08)		(0.56)		(778.90)		(0.11)
Industry Med. CPS$_t$							0.571***	0.569***
							(0.05)	(0.05)
CEO only Insider$_t$	-0.013	-0.013	-0.036	-0.035	151.316	152.024	0.004	0.004
	(0.01)	(0.01)	(0.06)	(0.06)	(136.93)	(136.04)	(0.02)	(0.02)
CEO Age$_t$	0.071	0.102	0.672	1.058**	896.990*	1,149.630**	0.088	0.153**
	(0.08)	(0.08)	(0.47)	(0.45)	(501.48)	(459.71)	(0.08)	(0.08)
CEO Ownership$_t$	0.676	0.645	1.584	1.053	-539.395	-887.631	0.150	0.060
	(0.43)	(0.43)	(1.87)	(1.88)	(3,297.11)	(3,331.00)	(0.31)	(0.31)
Duality$_t$	0.006	0.009	0.052	0.087*	-34.311	-11.521	0.002	0.008
	(0.01)	-0.01	(0.05)	(0.05)	(60.69)	(63.38)	(0.01)	(0.01)
CEO Tenure$_t$	-0.000	-0.000	0.004	0.001	42.168***	40.483***	0.000	-0.000
	(0.00)	(0.00)	(0.01)	(0.01)	(15.95)	(15.55)	(0.00)	(0.00)
Board Size$_t$	-0.056**	-0.056**	-0.227**	-0.225**	303.334	304.759	-0.050*	-0.049*
	(0.02)	(0.02)	(0.11)	(0.11)	(217.04)	(216.78)	(0.03)	(0.03)
Avg. Age Outsider$_t$	-0.082	-0.082	-0.141	-0.169	-492.231	-510.181	-0.022	-0.027
	(0.07)	(0.07)	(0.34)	(0.34)	(443.30)	(443.94)	(0.05)	(0.05)
Outsider Ratio$_t$	0.115	0.118	0.513	0.536	-945.124	-929.969	0.125	0.128
	(0.13)	(0.13)	(0.54)	(0.55)	(889.01)	(881.26)	(0.16)	(0.16)
Outsider Ownership$_t$	-0.402*	-0.413*	-1.359	-1.398	-667.699	-693.814	-0.141	-0.147
	(0.22)	(0.22)	(0.88)	(0.90)	(923.58)	(913.07)	(0.14)	(0.14)
Inst. Ownership$_t$	0.016	0.016	0.104	0.103	-159.102	-159.418	0.024	0.024
	(0.02)	(0.02)	(0.09)	(0.09)	(104.49)	(103.52)	(0.02)	(0.02)
Inst. HHI$_t$	-0.023	-0.009	-0.353	-0.201	-225.619	-126.192	-0.019	0.006
	(0.05)	(0.05)	(0.23)	(0.24)	(198.19)	(220.00)	(0.04)	(0.04)
Firm Age$_t$	0.000	0.002	0.052	0.057	-361.224**	-357.761**	-0.024	-0.023
	(0.03)	(0.03)	(0.16)	(0.16)	(164.65)	(164.80)	(0.02)	(0.02)
R&D Intensity$_t$	0.009	0.047	0.478	0.600	1,653.732	1,733.225	0.039	0.059
	(0.25)	(0.25)	(0.77)	(0.81)	(1,633.42)	(1,624.97)	(0.13)	(0.13)
R&D Missing$_t$	-0.021	-0.019	-0.077	-0.070	553.949	558.502	0.005	0.006
	(0.01)	(0.01)	(0.11)	(0.11)	(359.08)	(361.39)	(0.02)	(0.02)
Stock Return$_t$			0.010	-0.009	12.570	-0.118	-0.000	-0.004
			(0.02)	(0.02)	(31.22)	(28.10)	(0.00)	(0.00)
ROA$_t$			1.113***	0.801***	4.721	-199.652	0.082***	0.030
			(0.16)	(0.18)	(369.95)	(434.35)	(0.03)	(0.03)
Tobin Q$_t$			0.113***	0.092***	352.534***	339.117***	0.007**	0.004
			(0.02)	(0.02)	(71.76)	(75.75)	(0.00)	(0.00)
Leverage$_t$			-0.256	-0.239	-196.960	-186.033	-0.005	-0.002
			(0.17)	(0.17)	(162.43)	(162.06)	(0.03)	(0.03)
Firm Size$_t$			0.390***	0.377***	469.487***	461.164***	0.003	0.001
			(0.05)	(0.05)	(140.86)	(143.42)	(0.01)	(0.01)
SD(Stock Return)$_t$			-0.201	-0.124	297.220	347.850	-0.033	-0.020
			(0.19)	(0.19)	(292.74)	(290.82)	(0.04)	(0.04)
SD(ROA)$_t$			-0.561**	-0.570**	1,226.768	1,221.121	-0.065	-0.067
			(0.26)	(0.27)	(791.31)	(797.18)	(0.05)	(0.05)
Constant	-1.143	-2.310	2.717	1.488	-4,593.804	-5,399.230*	-0.068	-0.273
	(2.38)	(2.35)	(2.52)	(2.43)	(3,271.59)	(3,064.26)	(0.42)	(0.40)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,732	3,732	3,732	3,732	3,732	3,732
Firms	743	743	809	809	809	809	809	809
$Adj.R^2$	0.0167	0.0191	0.2604	0.2683	0.2286	0.2302	0.1539	0.1624
F	1.599	1.668	28.02	27.22	6.612	6.405	10.81	10.55

5.4.3 Quad-qualified directors on the compensation committee

The next test relates to hypothesis H3, which argues that boards with quad-qualified directors on the compensation committee have greater monitoring effectiveness with regard to CEO compensation. Overall the results in Table 5.11 resemble the previous tests on the number of quad-qualified directors among the entire board. When quad-qualified directors are on the compensation committee, firms appear to have higher excess CEO pay levels (*Exs. CEO Pay*). However, the effect on total CEO pay is insignificant and lacks support for the prior findings. Further, contrary to the previous test, it appears that quad-qualified directors on the compensation committee have a negative effect on CEO pay-performance sensitivity. These results altogether contradict the corresponding hypothesis H3.

5.4.4 Quad-qualification at high/low levels of excess CEO pay

The previous tests analyse the effect of quad-qualification on the entire distribution of *Exs. CEO Pay*, including relatively minor deviations from the expected level of CEO pay. To explore the robustness of the prior findings, the following examines how quad-qualification affects extreme outcomes of excess CEO pay using multinominal regression analysis.

Therefore, the residuals of the economic CEO compensation model (see Table 5.4) are classified into quartiles, which form three groups. Firm-year observations in the bottom quartile are classified as *underpaid* and observations in the top quartile are classified as *overpaid*. Observations which fall into the middle two quartiles are classified as the benchmark group. Thus, the multinomial regression analysis predicts the likelihood that a CEO is over- or underpaid as opposed to the middle quartiles.

The regression results in Table 5.12 consistently show for each quad-qualification variable, i.e. *QQ Score*, *Nbr. QQ Dirs*, and *NBr. CM-QQ Dirs*, that firms with quad-qualified boards frequently compensate the CEO more generously than firms that fall into the benchmark group regarding their level of *Exs. CEO Pay*. Conversely, a CEO at a firm with a less quad-qualified board appears to be underpaid. The effects are likewise highly significant.

Notably, the results illustrate that the CEO's job risk, reflected by *P(Turnover)*, has a significant impact on CEO over- and underpayment. CEOs who face a higher (lower) job risk are relatively less (more) likely to be overpaid (underpaid). Moreover, preexisting *CEO Ownership* has a strong positive effect on the likelihood of having overpaid CEOs. Also, *Firm Age* has a negative effect and *R&D Intensity* has a positive effect on the

Table 5.12: Multinominal Logit: High vs. Low Excess CEO Pay

This table reports the results from the multinominal logistic regression analysis on high and low levels of *Exs. CEO Pay*. The dependent variable is based on the level of unexplained CEO pay (see Table 5.4). Firm-year observations in the bottom quartile of residual CEO pay are classified as 'Under', observations in the top quartile are classified as 'Over', and observations in the middle two quartiles are classified as the benchmark group and are unreported. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)
CEO pay relative to benchmark group	Under	Over	Under	Over	Under	Over
QQ Score$_t$	-0.725***	0.670***				
	(0.19)	(0.20)				
Nbr. QQ Dirs$_t$			-0.196***	0.201***		
			(0.07)	(0.06)		
Nbr. CCM-QQ Dirs$_t$					-0.188**	0.196**
					(0.09)	(0.09)
P(Turnover)$_t$	5.482**	-4.658**	5.783**	-4.740**	5.613**	-4.473**
	(2.36)	(2.24)	(2.39)	(2.30)	(2.38)	(2.27)
CEO only Insider$_t$	-0.196	0.121	-0.200	0.059	-0.169	0.086
	(0.30)	(0.65)	(0.31)	(0.68)	(0.31)	(0.67)
CEO Age$_t$	-0.956	0.194	-1.109	0.264	-1.003	0.148
	(0.84)	(0.78)	(0.84)	(0.78)	(0.84)	(0.78)
CEO Ownership$_t$	-3.361	30.840***	-3.213	31.415***	-4.597	32.039***
	(9.54)	(7.81)	(9.74)	(7.74)	(9.97)	(7.77)
Duality$_t$	0.022	-0.086	0.031	-0.096	0.068	-0.131
	(0.15)	(0.17)	(0.15)	(0.17)	(0.15)	(0.17)
CEO Tenure$_t$	-0.026*	0.005	-0.015	-0.000	-0.014	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Board Size$_t$	1.944***	-2.218**	2.176***	-2.621**	2.163***	-2.490**
	(0.40)	(0.99)	(0.40)	(1.04)	(0.40)	(1.01)
Avg. Age Outsiders$_t$	0.166	-0.394	-0.112	-0.517	-0.405	-0.173
	(1.24)	(1.27)	(1.22)	(1.26)	(1.22)	(1.27)
Outsider Ratio$_t$	0.680	2.410	1.026	2.574	0.692	2.670
	(1.78)	(4.75)	(1.81)	(4.95)	(1.81)	(4.88)
Outsider Ownership$_t$	-0.641	-8.503*	-0.811	-9.155*	-3.746	-6.301
	(6.95)	(5.10)	(7.27)	(4.87)	(8.02)	(4.75)
Inst. Ownership$_t$	-1.870***	0.153	-1.918***	0.083	-2.033***	0.168
	(0.62)	(0.53)	(0.62)	(0.54)	(0.62)	(0.54)
Inst. HHI$_t$	-8.555***	1.178	-8.827***	0.968	-8.938***	1.017
	(3.11)	(1.14)	(3.19)	(1.15)	(3.19)	(1.13)
Firm Age$_t$	0.189	-0.419***	0.219*	-0.448***	0.204*	-0.405***
	(0.12)	(0.14)	(0.12)	(0.14)	(0.12)	(0.14)
R&D Intensity$_t$	6.906***	3.258**	6.800***	3.018*	6.975***	2.950*
	(1.48)	(1.58)	(1.47)	(1.57)	(1.47)	(1.57)
R&D Missing$_t$	0.115	-0.097	0.106	-0.122	0.116	-0.137
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)
Constant	0.364	1.790	-0.486	4.549	0.656	3.101
	(5.56)	(5.46)	(5.56)	(5.48)	(5.59)	(5.53)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,427	3,427	3,427	3,427
Firms	743	743	743	743	743	743
Pseudo R^2	0.136	0.136	0.134	0.134	0.129	0.129
χ^2	280.3	280.3	265.5	265.5	259.3	259.3

outcome of overpaid CEOs, suggesting that particularly young and R&D intensive firms overpay their CEOs.

5.4.5 Critical mass number of quad-qualified directors

Having established a positive association between board quad-qualification and CEO compensation monitoring effectiveness, the final tests examine this relationship in the context of a certain critical mass level, corresponding to Chapter 4. As stated in hypothesis H4, the expectation is that boards with at least a critical mass of three quad-qualified directors induce effective monitoring.

Table 5.13 shows the condensed results for each of the four measures of monitoring effectiveness. In unreported results, the coefficients and standard errors of the control variables are very similar to the previous results concerning *Nbr. QQ Dirs* and stable across critical mass levels.

Besides using dummy variables representing critical mass levels, where at least 1, 2, or 3 quad-qualified directors are on the board, another dummy variable indicates whether a board has no such director at all. Panel A in Table 5.13 shows that there is no unequivocal pattern when comparing both CEO pay approaches, but having no quad-qualified director reduces CEO overpayment. The results in Panel B similarly hold that the pay-performance sensitivity is higher and CEO pay slice is lower when boards have no quad-qualified director.

Essentially, Table 5.13 illustrates that effective CEO compensation monitoring under the traditional optimal contracting perspective is induced when a board has no quad-qualified director. By comparison, the opposite is true for boards which have one, two or more such directors. The presented results reject hypothesis H4, although they confirm what had already been established in the prior analyses. What is more, is that a CEO at a firm with no quad-qualified director receives less excessive and more incentive-aligned compensation. Also, she would receive a lower proportion of pay relative to other top executives.

Subsection 5.2.2 briefly introduced an explanation for this negative association between quad-qualification and the effectiveness in CEO compensation monitoring. Accordingly, the Hermalin model argues that CEOs who are exposed to greater board monitoring propensity have a greater employment risk, which improves their stance to negotiate higher pay as compensation. Given that the previous tests controlled for a CEO's structural power, her power should, in theory, rest on her proven track record of firm performance. Thus, Table 5.14 examines the difference in the firm's stock market performance between boards which have at least one quad-qualified director and those which have none at all.

In addition, *Annual Stock Return* is separated into a firm- and a peer-specific portion using the same approach as in Subsection 5.3.6. Moreover, the t-tests are adjusted for the incumbent CEO's tenure length. For instance, the t-test for *Annual Stock Return (t-2)* only includes firms where the incumbent CEO has been appointed at least three years before the current financial reporting date.

Table 5.14 shows that there is indeed a significant difference in both *Annual Stock Return* and *Idiosyncratic Return*. Further, the fact that the idiosyncratic return regardless of the time period (1,2, and 3 years of past stock performance) is significantly larger at firms with a quad-qualified director on the board illustrates that board's greater ability and motivation might induce effective decision control. In reference to the relative performance evaluation (RPE) literature (Holmström, 1982; Gibbons and Murphy, 1990; Albuquerque, 2009; Bushman et al., 2010), the results substantiate the argument that boards with quad-qualified directors compensate the CEO relatively higher, but that this is based on CEO's proven ability relative to peer firms respectively CEOs.

5.4.6 Summary of the empirical results

Overall, the analysis of the relationship between quad-qualification and the four proxies of monitoring effectiveness cannot confirm any of the four hypotheses. In fact, the presented results collectively suggest a negative association between quad-qualification and CEO compensation monitoring. In detail, this relationship is substantiated by the following observations.

First, the effect is stable across various tests and choices of monitoring proxies. However, the board-averages approach appears to be weaker in modelling this positive effect. Second, the findings are robust when controlling for the threat of CEO turnover and examining extreme outcomes of residual CEO pay. Third, adding to the robustness of the overall analysis, both econometric approaches to model CEO overpayments (*Exs. CEO Pay* vs *CEO Pay*) yield very similar results.

Besides, the results suggest that CEOs in firms with at least one quad-qualified director have a significantly greater past market performance than others. Effectively, this suggests that boards with quad-qualified directors accommodate successful CEOs with greater pay in response to the CEO's greater overall employment risk. At last, this shows how endogenous CEO compensation decisions are. In this respect, the next section discusses the interpretation of the results and how they relate to the extant literature.

Table 5.13: Number of Quad-Qualified Directors

This table reports the results from the fixed effect regression analysis using critical mass levels. The four critical mass levels, *No QQ Dir*, *Min 1. QQ Dir*, *Min. 2 QQ Dirs*, and *Min. 3 QQ Dirs*, are tested on each of the four dependent variables. Results are truncated, but coefficients and significance of control variables are largely consistent with Table 5.10. Robust standard errors, clustered by firm, are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exs. Total CEO Pay (t)				Total CEO Pay (t)			
No QQ Dir_t	-0.014***				-0.037*			
	(0.00)				(0.02)			
Min. 1 QQ Dirs_t		0.014***				0.037*		
		(0.00)				(0.02)		
Min. 2 QQ Dirs_t			0.005				0.043*	
			(0.00)				(0.02)	
Min. 3 QQ Dirs_t				0.010				0.048
				(0.01)				(0.03)
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Observations	3,427	3,427	3,427	3,427	3,732	3,732	3,732	3,732
Number of Firms	743	743	743	743	809	809	809	809
$Adj.R^2$	0.0296	0.0296	0.0278	0.0290	0.2684	0.2684	0.2685	0.2683
F	2.272	2.272	2.117	2.209	27.10	27.10	27.14	27.05

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CEO Delta (t)				CEO Pay Slice (t)			
No QQ Dir_t	78.505*				-0.008**			
	(42.35)				(0.00)			
Min. 1 QQ Dirs_t		-78.505*				0.008**		
		(42.35)				(0.00)		
Min. 2 QQ Dirs_t			-20.991				0.008**	
			(39.67)				(0.00)	
Min. 3 QQ Dirs_t				-52.017				0.008
				(34.09)				(0.00)
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Observations	3,732	3,732	3,732	3,732	3,732	3,732	3,732	3,732
Number of Firms	809	809	809	809	809	809	809	809
$Adj.R^2$	0.2306	0.2306	0.2290	0.2293	0.1616	0.1616	0.1614	0.1610
F	6.317	6.317	6.458	6.250	10.41	10.41	10.45	10.59

Table 5.14: T-test: Board's Quad-Qualification and Firm's Past Performance

This table reports the results of a t-test on the difference in stock market performance by whether the board has at least 1 quad-qualified director (*Min. 1 QQ Dir*) or not (*No QQ Dir*). *Annual Stock Return* is the firm's actual stock return excluding dividends, *Idiosyncratic Return* and *Peer Return* are the firm-specific respectively peer return as calculated using the regression model defined by Equation 5.6. The peers are all firms excluding the focal firm in the same 2-Digit SIC industry. Each t-test is adjusted for the incumbent CEO's tenure length. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

Variable	Min. 1 QQ Dir	No QQ Dir	Diff.	Std. Error	Obs.
Annual Stock $\text{Return}_{t,0}$	0.219	0.205	-0.014	0.013	3732
Annual Stock $\text{Return}_{t-1,0}$	0.417	0.357	-0.0603**	0.024	3389
Annual Stock $\text{Return}_{t-2,0}$	0.565	0.451	-0.1148***	0.032	3020
Idiosyncratic $\text{Return}_{t,0}$	0.006	-0.022	-0.0276**	0.012	3732
Idiosyncratic $\text{Return}_{t-1,0}$	0.054	0.005	-0.0490**	0.021	3389
Idiosyncratic $\text{Return}_{t-2,0}$	0.170	0.091	-0.0785***	0.029	3020
Peer $\text{Return}_{t,0}$	0.213	0.227	0.014	0.010	3732
Peer $\text{Return}_{t-1,0}$	0.363	0.351	-0.012	0.017	3389
Peer $\text{Return}_{t-2,0}$	0.394	0.358	-0.0362**	0.018	3026

5.5 Discussion

This chapter aims to empirically test the relevance of the quad model concerning CEO pay-setting decision making. Overall, an in-depth analysis using several tests and benchmarks consistently exhibit that the presence of quad-qualified directors raises the level of CEO pay and weakens the CEO pay-for-performance relationship. While this contradicts the traditional perspective on CEO pay monitoring effectiveness (Holmström, 1979), there are several takeaways from this chapter, which when put into context with the existing literature, underpin its relevance.

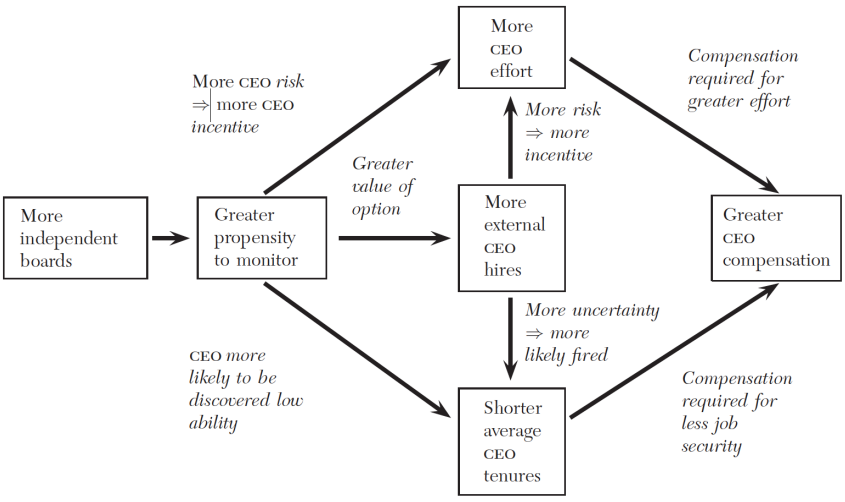
First, in the context of the CEO labour market, the results suggest that the higher monitoring ability and motivation of quad-qualified boards has to be compensated by higher pay, which corresponds to the Hermalin model. Accordingly, a board's greater monitoring propensity increases the chances that the board discovers the CEO's true ability, which then leads to a greater probability of the CEO's contract to be terminated. Thus, the CEO requires more pay as compensation for facing this greater job risk.

Second, a board's quad-qualification should be observed by the individual, since the addition of a single quad-qualified outside director substantiates greater monitoring ability and motivation of the board, leading to the described effect as in Hermalin (2005). Moreover, while the customary board-averages approach yields similar results as the individual-level based approach, it inhibits research which aims to study the group dynamics.

Third, the addition of a quad-qualified director to the compensation committee does not improve CEO compensation monitoring in the traditional agency perspective. The results confirm the conclusion drawn on the relationship considering the entire board, which is reasonable when recognising that board monitoring propensity is signalled through the entire board.

Fourth, irrespective of how quad-qualification is measured or whether quad-qualified directors are on the compensation committee, board quad-qualification has a positive effect on the likelihood of overpaying the CEO. Conversely, quad-qualified boards are more likely not to underpay the CEO. This validates the robustness of the positive relationship between quad-qualification and CEO pay.

Figure 5.3: Illustration of the Hermalin (2005) Model by Adams et al. (2010, p. 70)



5.5.1 Theoretical contribution

Overall, the positive association between outside directors' quad-qualification and CEO compensation monitoring effectiveness underpins the relevance of the Hermalin model (see Figure 5.3). Yet, it is important to note that this does not contradict agency theory as well as the managerial power theory.

The quad model's main prediction is that quad-qualified directors induce effective decision control. Hence, as predicted by the Hermalin model, the addition of such a director is an incentive for the CEO to work eagerly, but yet also signals that the board can properly assess the CEO's true ability and act accordingly. As shown in the previous chapter, the increased ability × motivation of the board directly affects the probability to dismiss the CEO when performance is deteriorating. Consequently, in response to this greater risk of dismissal, the CEO bargains for higher compensation or less monitoring propensity.

The outcome of this bargaining process then depends on CEO power (Graham et al., 2017), which is a function of CEO ability, i.e. proven track record of firm performance, as well as sociopolitical and structural characteristics in the CEO-board relationship (Westphal and Zajac, 2013, 1995; Lynall et al., 2003). Since the findings of this chapter are robust to a broad set of structural CEO power proxies including the threat of CEO turnover, the results allow concluding that greater CEO pay is not a function of the CEO exploiting her power, but rather that the CEO's bargaining power in the presence of quad-qualified directors rests upon proven ability/performance. Thus, CEOs with a proven track record of superior past performance can request greater and less performance-based

compensation in the presence of quad-qualified directors. Accordingly, firms which have boards with at least one quad-qualified director exhibit greater past stock performance during the tenure of the incumbent CEO.

If board quad-qualification induces higher CEO pay, will effective decision control of the board still be present? Assuming that quad-qualified directors are indeed more prone to effective monitoring, the answer is yes. Boards with quad-qualified directors seem to consider the CEO's performance and accommodate successful CEOs with more favourable pay contracts as compensation for the CEO's higher employment risk due to the board's greater monitoring propensity. Hence, from the agency perspective, the results exhibit that the 'optimal contracting' approach to CEO pay is still in place. The alternative would be to replace the incumbent CEO. When potential severance packages are costly and talented candidates are rare, agreeing to higher CEO pay might well be the shareholder value-maximising strategy. Altogether, this chapter finds great support for the Hermalin model.

Another argument in favour of a positive relationship between board monitoring capability and CEO pay is that boards without quad-qualified directors are naturally more reliant on stock market information as a benchmark for CEO ability, because of less qualified and informed directors (Nanda and Onal, 2016). However, if a board can directly monitor the CEO's actions, strong performance-based incentives will be less necessary (Prendergast, 2000; Core and Guay, 2010). Certainly, one could expect such a scenario when quad-qualified directors are present. By design, a quad-qualified director has access to industry-related information, which is assumingly of higher quality and more timely available. Moreover, he has sufficient ability and motivation to obtain, process, and introduce this information into CEO pay contracts. Thus, similar to Chapter 4, this chapter shows how quad-qualified directors can bridge information gaps and provide effective monitoring, which fundamentally supports calls for an integration of both agency and resource-dependence perspectives.

5.5.2 Remarks on endogeneity concerns

The presented results underpin the relevance of the Hermalin model (see Figure 5.3 and its statement concerning the endogenous relationship between CEO pay decisions and board monitoring. This chapter principally addresses endogeneity concerns in two ways.

First, given the endogenous nature of CEO succession and compensation decisions,

adding turnover probability to the baseline model controls for the CEO's job risk. Ideally, this job risk relates only to turnovers that would happen if firms had experienced poor performance, which is why the estimation of turnover probability follows the findings of Jenter and Lewellen (2019) and their concept of performance-induced CEO turnovers. Additionally, the estimation accounts for both firm-specific and peer performance, including risk. Thus, a rise in the probability of CEO turnover signals that the directors should update their beliefs about CEO ability, which is fundamentally linked to the optimal contracting approach.

Second, endogeneity is said to particularly arise from the dynamic and simultaneous relationship between the CEO's bargaining power and the board's propensity to monitor (Hermalin, 2005). The model controls for many board characteristics (i.e. size, tenure, age, ownership) and CEO characteristics (i.e. age, tenure, duality, ownership), which prior literature identifies as important determinants, not only with CEO pay decisions but also in general regarding board monitoring outcomes. The selection of these variables is conditioned by the quad model, in that multicollinearity could become an issue when adding certain board variables which explain the variance already captured by the quad model variables.

Nonetheless, the analysis lacks to control for the endogeneity arising from the intertemporal decision-making regarding CEO appointment, CEO pay, and CEO turnover. It would deem helpful to understand how boards in general and quad-qualified boards in specific change compensate the CEO over time. For instance, Quigley et al. (2020) show that initial CEO overpayment in U.S. public firms often results in subsequently high firm performance, inferring that CEO overpayment reflects CEO ability. This corresponds to studies indicating that outsized CEO pay is an equilibrium outcome of large firms seeking top talent (Gabaix and Landier, 2008; Tervio, 2008; Eisfeldt and Kuhnen, 2013). Accordingly, the argument that arises in the context of this thesis is whether quad-qualified directors compensate CEOs better under the prediction that these CEOs perform relatively better subsequently. In order to examine this relationship, a dynamic model is needed capable of explaining the relationship between board quad-qualification, CEO career performance, and CEO compensation. However, the comparable short sample period, arising from data availability limitation concerning BoardEx and Execucomp, constrain the scope for further analysis.

5.5.3 Concluding remarks

Much of the extant literature, though confronted with largely ambiguous empirical evidence, predicts greater monitoring propensity translates into CEO compensation to be less excessive and closely aligned with performance. The presented results contradict this association and instead provide evidence that CEO pay-setting decisions arise from a process in which endogenously-chosen boards bargain with CEOs about their pay. While the Hermalin (2005) model and associated literature convincingly explain this antithesis, other studies claim that such findings arise from an inappropriate identification of director's monitoring capability, which does not capture the qualities necessary to perform well in their monitoring task (Forbes and Milliken, 1999; Payne et al., 2009; Hambrick et al., 2015; Boivie et al., 2016a). On the contrary, this chapter rejects such claims and shows that even when directors possess all the attributes associated with greater monitoring performance, qualified boards still accommodate CEOs with more favourable compensation contracts. Nevertheless, this observation is likely to arise from the CEO's greater job risk due to greater board monitoring capabilities (Hermalin, 2005) and the fact that well-qualified and -informed directors depend less on publicly-available information (Nanda and Onal, 2016).

Ultimately, despite the challenging nature of the findings, the presence of quad-qualified directors may still induce effective monitoring control of CEO compensation.

5.A Appendix

Table 5.15: Variables Descriptions

Variables	Description	Source
Dependent Variables		
Total CEO Pay	Natural log of CEO's total pay	Execucomp
Exs. CEO Pay	Residual from cross-sectional regressions of economic CEO pay model	See Subsection 5.3.4
CEO Delta	Pay-performance sensitivity (kUSD change in wealth associated with a 1% change in the firm's stock price).	See Subsection 5.3.4
CEO Pay Slice	Ratio of CEO total pay to the sum of total pay of top5 executives	Execucomp
Main Model		
QQ Score	Outside directors avg. Quad-Qualification Score	See Subsection 5.3.3
Nbr. QQ Dirs	Number of quad-qualified outside directors on the board	See Subsection 5.3.3
Nbr. CCM-QQ Dirs	Number of quad-qualified outside directors on the compensation committee	See Subsection 5.3.3
Independence	Scaled score of director's independence	See Subsection 5.3.2
Expertise	Scaled score of director's expertise	See Subsection 5.3.2
Bandwidth	:=1 if outside director is not busy $Busy\ Size = 0$	See Chapter 3
Motivation	Scaled score of director's percentage stock ownership in focal firm	See Chapter 3
Control Variables		
P(Turnover)	Predicted probability of an unplanned turnover	See Subsection 5.3.6
CEO only Insider	CEO is the only inside director on the board	BoardEx
CEO Tenure	Time in years since CEO's appointment	BoardEx
CEO Age	Natural log of CEO's age	BoardEx
CEO Ownership	Percentage stock ownership of CEO in the focal firm at the beginning of the current fiscal year	Thomson Reuters
Duality	CEO is also board chair	BoardEx
Board Size	Natural log of firm's total number of board members	BoardEx
Avg. Outsider Age	Natural log of the avg. age of outside directors	BoardEx
Outsider Ratio	Ratio of outside directors to all board members	BoardEx
Outsider Ownership	Percentage of company stock held by all outside directors	Thomson Reuters
Firm Age	Natural log of firm's age	CRSP
Inst. Ownership	Percentage of company stock held by active institutional investors	Thomson Reuters
Inst. HHI	Hirschman-Herfindahl index of institutional ownership	Thomson Reuters
R&D Intensity	Ratio of research & development costs to total assets	Compustat
R&D Missing	:=1 if R&D Intensity is missing	Compustat
Firm Size	Natural log of firm's total assets	Compustat
Industry Med. CPS	Median CEO pay slice within the firm's 4-digit SIC industry	Execucomp
Compensation Model		
Stock Return	Firm's annual stock return	CRSP
ROA	Return on assets	Compustat
Tobin Q	Firm's Tobin's Q	Compustat
Leverage	Firm's ratio of total liabilities to total assets	Compustat
SD of Stock Return	Standard deviation of annual stock return in the past 3 years	CRSP
SD of ROA	Standard deviation of ROA in the past 3 years	Compustat
Turnover Model		
Forced TO	Forced Turnover	See Chapter 4
Unplanned TO	Unplanned Turnover	See Chapter 4
Voluntary TO	Voluntary Turnover	See Chapter 4
Idiosyncratic Return 2yrs	Firm-specific return of the firm in the past 2 years	CRSP, see Subsection 5.3.6
Peer Return 2yrs	Return of firm's peers in the past 2 years	CRSP, see Subsection 5.3.6
Idiosyncratic Risk 2yrs	Firm-specific risk during the past 2 years	CRSP, see Subsection 5.3.6
Peer Risk 2yrs	Risk of firm's peers in the past 2 years	CRSP, see Subsection 5.3.6
Blockholder	One or more shareholders hold at least 5% of company stock	Thomson Reuters

Table 5.16: Correlation Matrix - Director-level Variables

This table reports the correlation matrix after list-wise deletion for all director-level attribute variables including the underlying input director-level measures.

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Independent	1.000												
2	Turnover Expertise	0.029	1.000											
3	Motivation	-0.024	0.190	1.000										
4	Bandwidth	-0.015	-0.063	0.055	1.000									
5	Non-TW-coopted	0.823	-0.090	-0.033	-0.040	1.000								
6	No Outside Shared Experience	0.457	-0.030	-0.019	0.027	0.006	1.000							
7	CEO Experience	0.031	0.591	0.049	-0.408	0.025	-0.102	1.000						
8	CC Experience	0.035	0.620	0.068	-0.151	-0.010	-0.048	0.590	1.000					
9	Industry Experience	0.033	0.704	0.130	0.062	-0.017	-0.082	0.344	0.357	1.000				
10	Director Tenure	-0.010	0.883	0.197	0.044	-0.140	-0.006	0.379	0.415	0.589	1.000			
11	Tenure Overlap	0.088	0.883	0.176	0.056	-0.037	-0.006	0.440	0.463	0.718	0.832	1.000		
12	Stock Ownership	0.022	0.153	0.266	0.048	0.026	-0.043	0.049	0.010	0.182	0.162	0.219	1.000	
13	Busy Size	0.015	0.063	-0.055	-1.000	0.040	-0.027	0.408	0.151	-0.062	-0.044	-0.056	-0.048	1.000

N (list-wise) = 47,078

Table 5.17: Summary Statistics of Economic Model of CEO Compensation

Variables	Mean	SD	Min	Q1	Median	Q3	Max	N
Total CEO Pay	8.221	0.956	5.511	7.588	8.288	8.896	10.240	6660
Total Asset-Adj. CEO Pay	3.622	4.178	0.020	1.079	2.272	4.445	25.621	6660
Stock Return	0.237	0.472	-0.592	-0.042	0.160	0.406	2.263	6660
Leverage	0.201	0.204	0.000	0.010	0.166	0.300	1.001	6660
Tobin Q	1.946	1.097	0.790	1.235	1.615	2.239	6.994	6660
Firm Size	7.517	1.614	4.255	6.380	7.406	8.556	12.535	6660
ROA	0.052	0.089	-0.300	0.020	0.055	0.094	0.282	6660
SD(ROA)	0.050	0.066	0.001	0.012	0.025	0.057	0.347	6660
SD(Stock Return)	0.450	0.390	0.034	0.197	0.338	0.563	2.206	6660

Table 5.18: Summary Statistics of Turnover Prediction

This table reports the summary statistics of the turnover prediction sample. Turnover definitions and methodological approach are the same as in Chapter 4

Variables	Mean	SD	Min	Q1	Median	Q3	Max	N
Forced TO	0.020	0.138	0.000	0.000	0.000	0.000	1.000	7619
Unplanned TO	0.066	0.249	0.000	0.000	0.000	0.000	1.000	7619
Voluntary TO	0.057	0.232	0.000	0.000	0.000	0.000	1.000	7619
Idiosyncratic Return 2yrs	0.041	0.603	-1.946	-0.264	-0.014	0.273	4.185	7463
Peer Return 2yrs	0.231	0.550	-0.651	-0.196	0.130	0.554	2.333	7593
Idiosyncratic Risk 2yrs	0.092	0.045	0.026	0.061	0.082	0.112	0.337	7593
Peer Risk 2yrs	0.072	0.027	0.027	0.049	0.068	0.089	0.165	7593
ROA	0.053	0.091	-0.561	0.023	0.058	0.096	0.323	7618
SD of ROA	0.042	0.055	0.001	0.011	0.022	0.049	0.391	7469
CEO Age	4.020	0.131	3.332	3.932	4.025	4.111	4.554	7538
CEO Tenure	7.979	7.680	0.000	2.667	5.875	10.542	62.917	7560
CEO Ownership	0.020	0.816	0.000	0.000	0.001	0.005	70.970	7619
Duality	0.503	0.500	0.000	0.000	1.000	1.000	1.000	7619
Firm Age	3.112	0.752	0.000	2.639	3.091	3.738	4.489	7611
Firm Size	7.587	1.589	4.368	6.447	7.447	8.606	12.088	7619
Inst. Ownership	0.706	0.190	0.000	0.622	0.737	0.827	1.538	6644
Inst. HHI	0.058	0.074	0.014	0.033	0.043	0.056	0.998	6642
Blockholder	0.934	0.248	0.000	1.000	1.000	1.000	1.000	6642

Table 5.19: Baseline Model: Exs. Total CEO Pay & Total CEO Pay

This table reports the results from the fixed effect regression analysis of *QQ Score* on *Exs. CEO Pay* and *CEO Pay*. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Exs. CEO Pay$_t$				Total CEO Pay$_t$	
QQ Score$_t$	0.007	0.010	0.010	0.009	0.055	0.063	0.056	0.044
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.05)	(0.05)	(0.05)
P(Turnover)$_t$				-0.163**				-2.245***
				(0.08)				(0.56)
CEO only Insider$_t$	0.002	-0.012	-0.013	-0.013	0.025	-0.030	-0.033	-0.033
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.06)	(0.06)	(0.06)
CEO Age$_t$	0.073	0.074	0.072	0.103	0.677	0.677	0.674	1.055**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.48)	(0.47)	(0.46)	(0.45)
CEO Ownership$_t$	0.332	0.645	0.669	0.638	0.094	1.243	1.462	0.976
	(0.43)	(0.43)	(0.43)	(0.43)	(1.69)	(1.87)	(1.91)	(1.91)
Duality$_t$	0.007	0.006	0.006	0.009	0.057	0.055	0.054	0.088*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.04)	(0.05)
CEO Tenure$_t$	-0.000	-0.000	-0.000	-0.000	0.005	0.005	0.005	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Board Size$_t$		-0.052**	-0.052**	-0.051**		-0.204*	-0.204*	-0.205*
		(0.02)	(0.02)	(0.02)		(0.11)	(0.11)	(0.11)
Avg. Age Outsider$_t$		-0.074	-0.074	-0.073		-0.176	-0.187	-0.193
		(0.07)	(0.07)	(0.07)		(0.36)	(0.35)	(0.35)
Outsider Ratio$_t$		0.110	0.116	0.119		0.437	0.493	0.521
		(0.13)	(0.13)	(0.13)		(0.56)	(0.55)	(0.55)
Outsider Ownership$_t$		-0.378*	-0.389*	-0.400*		-1.336	-1.399	-1.419
		(0.22)	(0.22)	(0.22)		(0.88)	(0.88)	(0.90)
Inst. Ownership$_t$			0.017	0.017			0.105	0.104
			(0.02)	(0.02)			(0.09)	(0.09)
Inst. HHI$_t$			-0.022	-0.007			-0.352	-0.202
			(0.05)	(0.05)			(0.22)	(0.23)
Firm Age$_t$			-0.001	0.001			0.036	0.045
			(0.03)	(0.03)			(0.16)	(0.16)
R&D Intensity$_t$			0.010	0.048			0.473	0.593
			(0.25)	(0.25)			(0.78)	(0.81)
R&D Missing$_t$			-0.020	-0.019			-0.076	-0.069
			(0.01)	(0.01)			(0.11)	(0.11)
Stock Return$_t$					0.008	0.010	0.010	-0.009
					(0.02)	(0.02)	(0.02)	(0.02)
ROA$_t$					1.133***	1.124***	1.123***	0.812***
					(0.16)	(0.16)	(0.16)	(0.18)
Tobin Q$_t$					0.115***	0.115***	0.112***	0.092***
					(0.02)	(0.02)	(0.02)	(0.02)
Leverage$_t$					-0.270	-0.262	-0.253	-0.236
					(0.17)	(0.17)	(0.17)	(0.17)
Firm Size$_t$					0.378***	0.388***	0.388***	0.376***
					(0.05)	(0.05)	(0.05)	(0.05)
SD of Stock Return$_t$					-0.208	-0.221	-0.204	-0.127
					(0.19)	(0.19)	(0.19)	(0.19)
SD of ROA$_t$					-0.595**	-0.574**	-0.555**	-0.565**
					(0.25)	(0.25)	(0.26)	(0.27)
Constant	-2.459	-1.247	-1.276	-2.468	2.173	2.914	2.786	1.506
	(1.78)	(2.44)	(2.37)	(2.35)	(1.92)	(2.59)	(2.52)	(2.45)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,427	3,427	3,732	3,732	3,732	3,732
Firms	743	743	743	743	809	809	809	809
$Adj.R^2$	0.0056	0.0115	0.0136	0.0161	0.2542	0.2563	0.2602	0.2680
F	0.597	1.313	1.251	1.334	37.33	30.80	27.82	27.05

Table 5.20: Baseline Model: CEO Delta & CEO Pay Slice

This table reports the results from the fixed effect regression analysis of *QQ Score* on *CEO Delta* and *CEO Pay Slice*. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CEO Delta$_t$				CEO Pay Slice$_t$			
QQ Score$_t$	-202.757***	-173.662***	-159.141***	-167.090***	0.014*	0.015**	0.016**	0.014*
	(56.83)	(58.36)	(59.19)	(59.29)	(0.01)	(0.01)	(0.01)	(0.01)
P(Turnover)$_t$				-1,559.366**				-0.375***
				(774.91)				(0.11)
Industry Med. CPS$_t$					0.572***	0.573***	0.574***	0.571***
					(0.05)	(0.05)	(0.05)	(0.05)
CEO only Insider$_t$	37.202	139.466	143.682	144.036	0.018***	0.004	0.004	0.004
	(78.49)	(136.62)	(136.23)	(135.22)	(0.01)	(0.02)	(0.02)	(0.02)
CEO Age$_t$	740.889	776.729	884.073*	1,148.644**	0.087	0.087	0.088	0.152**
	(489.63)	(485.54)	(493.51)	(450.36)	(0.08)	(0.08)	(0.08)	(0.08)
CEO Ownership$_t$	129.619	314.615	-101.965	-439.744	-0.035	0.110	0.116	0.034
	(3,036.60)	(3,330.08)	(3,300.17)	(3,334.25)	(0.28)	(0.31)	(0.32)	(0.32)
Duality$_t$	-39.977	-35.930	-40.067	-16.366	0.004	0.003	0.003	0.009
	(60.13)	(60.15)	(61.00)	(63.57)	(0.01)	(0.01)	(0.01)	(0.01)
CEO Tenure$_t$	37.912**	38.727**	39.151**	37.204**	0.001	0.001	0.001	0.000
	(15.73)	(15.80)	(15.99)	(15.54)	(0.00)	(0.00)	(0.00)	(0.00)
Board Size$_t$		230.836	248.182	247.619		-0.045*	-0.043	-0.044
		(218.54)	(219.45)	(219.05)		(0.03)	(0.03)	(0.03)
Avg. Age Outsider$_t$		-474.127	-293.274	-297.139		-0.047	-0.035	-0.036
		(470.43)	(464.62)	(464.80)		(0.06)	(0.06)	(0.06)
Outsider Ratio$_t$		-866.521	-886.128	-866.988		0.112	0.119	0.124
		(878.61)	(886.02)	(876.95)		(0.16)	(0.16)	(0.16)
Outsider Ownership$_t$		-512.852	-489.987	-503.958		-0.135	-0.152	-0.155
		(929.01)	(944.05)	(935.07)		(0.14)	(0.14)	(0.14)
Inst. Ownership$_t$			-161.361	-161.792			0.024	0.024
			(104.59)	(103.52)			(0.02)	(0.02)
Inst. HHI$_t$			-236.828	-133.325			-0.019	0.006
			(197.79)	(219.26)			(0.04)	(0.04)
Firm Age$_t$			-312.277*	-305.935*			-0.029	-0.027
			(165.60)	(165.75)			(0.02)	(0.02)
R&D Intensity$_t$			1,659.269	1,742.425			0.038	0.057
			(1,622.87)	(1,614.91)			(0.13)	(0.13)
R&D Missing$_t$			552.159	556.985			0.005	0.006
			(357.91)	(360.36)			(0.02)	(0.02)
Stock Return$_t$	13.906	13.485	12.742	-0.562	-0.000	-0.000	-0.000	-0.004
	(33.59)	(33.33)	(31.06)	(28.04)	(0.00)	(0.00)	(0.00)	(0.00)
ROA$_t$	-91.272	-89.997	-18.873	-234.614	0.090***	0.087***	0.085***	0.033
	(328.45)	(332.38)	(371.13)	(435.54)	(0.03)	(0.03)	(0.03)	(0.03)
Tobin Q$_t$	356.713***	357.033***	353.949***	339.848***	0.008**	0.008**	0.007**	0.004
	(74.71)	(74.70)	(71.86)	(75.77)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage$_t$	-216.124	-222.376	-199.709	-187.893	-0.004	-0.004	-0.004	-0.001
	(157.33)	(158.53)	(161.81)	(161.22)	(0.03)	(0.03)	(0.03)	(0.03)
Firm Size$_t$	438.994***	434.031***	470.626***	461.701***	-0.001	0.001	0.003	0.000
	(122.96)	(124.98)	(141.41)	(143.94)	(0.01)	(0.01)	(0.01)	(0.01)
SD of Stock Return$_t$	310.393	319.979	303.729	357.163	-0.033	-0.034	-0.033	-0.021
	(290.20)	(291.55)	(294.30)	(292.63)	(0.04)	(0.04)	(0.04)	(0.04)
SD of ROA$_t$	1,271.842	1,248.183	1,207.079	1,199.982	-0.068	-0.064	-0.063	-0.065
	(792.73)	(791.97)	(788.61)	(794.85)	(0.05)	(0.05)	(0.05)	(0.05)
Constant	-6,309.982***	-4,386.735	-5,042.384	-5,930.877*	-0.229	-0.042	-0.050	-0.263
	(2,292.43)	(3,113.02)	(3,311.90)	(3,084.49)	(0.33)	(0.43)	(0.42)	(0.40)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,732	3,732	3,732	3,732	3,732	3,732	3,732	3,732
Firms	809	809	809	809	809	809	809	809
$Adj.R^2$	0.2212	0.2223	0.2294	0.2312	0.1477	0.1504	0.1533	0.1616
F	9.049	7.553	6.520	6.288	14.52	12.65	10.79	10.54

Table 5.21: Baseline Model: Exs. Total CEO Pay & Total CEO Pay

This table reports the results from the fixed effect regression analysis of *Nbr. QQ Dirs* on *Exs. CEO Pay* and *CEO Pay*. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exs. CEO Pay$_t$				Total CEO Pay$_t$			
Nbr. QQ Dirs$_t$	0.005**	0.006***	0.006***	0.006***	0.023**	0.028***	0.027***	0.027***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
P(Turnover)$_t$				-0.165**				-2.264***
				(0.08)				(0.56)
CEO only Insider$_t$	0.001	-0.012	-0.012	-0.012	0.023	-0.030	-0.034	-0.033
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.06)	(0.06)	(0.06)
CEO Age$_t$	0.075	0.078	0.075	0.107	0.691	0.698	0.694	1.080**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.48)	(0.47)	(0.46)	(0.45)
CEO Ownership$_t$	0.296	0.643	0.666	0.632	0.055	1.259	1.467	0.933
	(0.44)	(0.43)	(0.43)	(0.43)	(1.68)	(1.85)	(1.88)	(1.89)
Duality$_t$	0.007	0.006	0.006	0.009	0.057	0.055	0.055	0.089*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.04)	(0.05)	(0.05)
CEO Tenure$_t$	-0.000	-0.000	-0.000	-0.000	0.004	0.004	0.004	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Board Size$_t$		-0.057**	-0.057**	-0.056**		-0.234**	-0.232**	-0.230**
		(0.02)	(0.02)	(0.02)		(0.11)	(0.11)	(0.11)
Avg. Age Outsider$_t$		-0.094	-0.095	-0.096		-0.226	-0.255	-0.283
		(0.07)	(0.07)	(0.07)		(0.35)	(0.35)	(0.34)
Outsider Ratio$_t$		0.100	0.106	0.109		0.395	0.449	0.473
		(0.13)	(0.13)	(0.13)		(0.55)	(0.54)	(0.54)
Outsider Ownership$_t$		-0.422*	-0.434**	-0.446**		-1.421	-1.486*	-1.527*
		(0.22)	(0.22)	(0.22)		(0.88)	(0.88)	(0.90)
Inst. Ownership$_t$			0.016	0.017			0.101	0.100
			(0.02)	(0.02)			(0.09)	(0.09)
Inst. HHI$_t$			-0.021	-0.006			-0.355	-0.203
			(0.05)	(0.05)			(0.23)	(0.24)
Firm Age$_t$			0.000	0.002			0.053	0.058
			(0.03)	(0.03)			(0.16)	(0.16)
R&D Intensity$_t$			0.005	0.043			0.494	0.616
			(0.25)	(0.25)			(0.77)	(0.80)
R&D Missing$_t$			-0.021	-0.020			-0.078	-0.071
Stock Return$_t$					0.008	0.009	0.010	-0.010
					(0.02)	(0.02)	(0.02)	(0.02)
ROA$_t$					1.122***	1.107***	1.109***	0.797***
					(0.16)	(0.16)	(0.16)	(0.18)
Tobin Q$_t$					0.116***	0.115***	0.113***	0.092***
					(0.02)	(0.02)	(0.02)	(0.02)
Leverage$_t$					-0.274	-0.269	-0.259	-0.242
					(0.17)	(0.17)	(0.17)	(0.17)
Firm Size$_t$					0.380***	0.394***	0.393***	0.381***
					(0.05)	(0.05)	(0.05)	(0.05)
SD of Stock Return$_t$					-0.199	-0.210	-0.194	-0.117
					(0.19)	(0.19)	(0.19)	(0.19)
SD of ROA$_t$					-0.603**	-0.580**	-0.560**	-0.568**
					(0.25)	(0.26)	(0.26)	(0.27)
Constant	-2.481	-0.708	-0.743	-1.910	2.228	3.236	3.121	1.895
	(1.76)	(2.45)	(2.38)	(2.35)	(1.91)	(2.58)	(2.51)	(2.42)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,427	3,427	3,427	3,427	3,732	3,732	3,732	3,732
Firms	743	743	743	743	809	809	809	809
$Adj.R^2$	0.0076	0.0152	0.0172	0.0198	0.2550	0.2577	0.2616	0.2695
F	1.003	1.976	1.712	1.756	37.83	31.33	28.21	27.33

Table 5.22: Baseline Model: CEO Delta & CEO Pay Slice

This table reports the results from the fixed effect regression analysis of *Nbr. QQ Dirs* on *CEO Delta* and *CEO Pay Slice*. Descriptive sample statistics and variable definitions are reported in Table 5.6 and Table 5.15. Robust, firm-clustered standard errors are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			CEO Delta$_t$				CEO Pay Slice$_t$	
Nbr. QQ Dirs$_t$	-30.869*	-25.161	-24.848	-25.029	0.004**	0.005***	0.004***	0.004***
	(16.60)	(16.14)	(16.12)	(16.10)	(0.00)	(0.00)	(0.00)	(0.00)
P(Turnover)$_t$				-1,471.148*				-0.382***
				(777.49)				(0.11)
Industry Med. CPS$_t$					0.572***	0.573***	0.573***	0.571***
					(0.05)	(0.05)	(0.05)	(0.05)
CEO only Insider$_t$	38.481	145.056	149.290	149.980	0.018**	0.004	0.004	0.004
	(79.43)	(136.87)	(136.46)	(135.58)	(0.01)	(0.02)	(0.02)	(0.02)
CEO Age$_t$	726.522	776.431	885.135*	1,135.852**	0.089	0.090	0.090	0.155**
	(498.63)	(492.94)	(500.79)	(457.89)	(0.08)	(0.08)	(0.08)	(0.08)
CEO Ownership$_t$	-545.249	-135.547	-534.329	-881.102	-0.014	0.131	0.142	0.052
	(3,074.59)	(3,351.46)	(3,318.58)	(3,353.09)	(0.27)	(0.31)	(0.31)	(0.31)
Duality$_t$	-36.283	-31.591	-36.851	-14.257	0.004	0.003	0.003	0.009
	(60.33)	(60.14)	(61.11)	(63.73)	(0.01)	(0.01)	(0.01)	(0.01)
CEO Tenure$_t$	41.849***	42.206***	42.393***	40.727***	0.000	0.000	0.000	-0.000
	(15.87)	(15.81)	(15.96)	(15.56)	(0.00)	(0.00)	(0.00)	(0.00)
Board Size$_t$		281.991	297.808	299.053		-0.051*	-0.049*	-0.049*
		(219.36)	(220.24)	(219.99)		(0.03)	(0.03)	(0.03)
Avg. Age Outsider$_t$		-705.686	-466.524	-485.094		-0.044	-0.032	-0.037
		(468.61)	(461.56)	(462.73)		(0.06)	(0.06)	(0.05)
Outsider Ratio$_t$		-879.566	-891.850	-876.469		0.108	0.115	0.119
		(875.91)	(882.51)	(874.79)		(0.16)	(0.16)	(0.15)
Outsider Ownership$_t$		-662.594	-622.280	-648.724		-0.140	-0.153	-0.160
		(907.52)	(922.57)	(911.90)		(0.14)	(0.14)	(0.14)
Inst. Ownership$_t$			-156.711	-157.011			0.023	0.023
			(104.09)	(103.11)			(0.02)	(0.02)
Inst. HHI$_t$			-216.092	-117.260			-0.020	0.005
			(195.80)	(218.14)			(0.04)	(0.04)
Firm Age$_t$			-365.898**	-362.543**			-0.024	-0.023
			(164.85)	(164.99)			(0.02)	(0.02)
R&D Intensity$_t$			1,650.408	1,729.406			0.040	0.061
			(1,634.03)	(1,625.52)			(0.13)	(0.13)
R&D Missing$_t$			553.118	557.607			0.005	0.006
			(357.41)	(359.70)			(0.02)	(0.02)
Stock Return$_t$	14.324	13.527	12.465	-0.134	-0.000	-0.000	-0.000	-0.004
	(33.61)	(33.34)	(31.07)	(27.96)	(0.00)	(0.00)	(0.00)	(0.00)
ROA$_t$	-59.849	-64.461	1.808	-201.096	0.088***	0.084***	0.082***	0.030
	(328.68)	(331.95)	(370.81)	(435.12)	(0.03)	(0.03)	(0.03)	(0.03)
Tobin Q$_t$	356.243***	356.789***	353.462***	340.166***	0.008**	0.008**	0.007**	0.004
	(74.75)	(74.70)	(71.85)	(75.81)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage$_t$	-216.658	-224.212	-201.702	-190.980	-0.005	-0.004	-0.004	-0.002
	(157.72)	(159.62)	(162.49)	(162.04)	(0.03)	(0.03)	(0.03)	(0.03)
Firm Size$_t$	437.456***	430.625***	469.691***	461.475***	-0.001	0.002	0.003	0.001
	(123.02)	(124.83)	(141.48)	(144.00)	(0.01)	(0.01)	(0.01)	(0.01)
SD of Stock Return$_t$	294.586	307.937	292.571	342.807	-0.031	-0.033	-0.032	-0.019
	(287.09)	(289.08)	(292.02)	(290.10)	(0.04)	(0.04)	(0.04)	(0.04)
SD of ROA$_t$	1,311.257	1,273.530	1,228.153	1,222.591	-0.070	-0.066	-0.065	-0.067
	(796.68)	(794.87)	(791.24)	(797.01)	(0.05)	(0.05)	(0.05)	(0.05)
Constant	-6,753.115***	-3,950.267	-4,672.188	-5,468.503*	-0.206	-0.019	-0.036	-0.242
	(2,340.13)	(3,124.73)	(3,300.91)	(3,090.35)	(0.33)	(0.42)	(0.42)	(0.40)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,732	3,732	3,732	3,732	3,732	3,732	3,732	3,732
Firms	809	809	809	809	809	809	809	809
$Adj.R^2$	0.2186	0.2206	0.2281	0.2297	0.1477	0.1510	0.1537	0.1623
F	9.191	7.706	6.586	6.356	14.44	12.51	10.67	10.42

Chapter 6

Who Appoints Quad-Qualified Directors?

6.1 Introduction

In the context of the quad model, studying board composition and its effect on board decision-making contributes primarily to the question of why quad-qualified directors are needed. However, a quad-qualified director cannot obtain all quad attributes while being a member of the focal firm's board. In fact, the decision to form a board with quad-qualified directors results first of all in the selection respectively appointment of such directors, which is a two-sided process (Adams, 2017). This especially matters in the case of outside directors, because being an outsider is a prerequisite of quad-qualified directors.

This chapter focuses on the demand side of the director selection process. From the firm's perspective, this process involves the identification and screening of potential candidates, their nomination and election (Withers et al., 2012). The number of previous studies on the relationship between director selection, board composition, and board monitoring effectiveness documents the importance of a careful director selection process (Adams, 2017, p. 340).

Selecting directors suitable to provide effective monitoring of the firm is itself a monitoring-related decision. It essentially explains whether boards are capable of retaining or even strengthening their position within the principal-agent conflict with the firm's management. Quad-qualified directors possess the ability and motivation to provide effective monitoring. Thus, the central proposition of this chapter is that in the presence of such directors, boards should be inclined to appoint another quad-qualified director.

This chapter involves an appointment model, which is based on cross-sectional data of all outside director appointments within the calendar years 2009 to 2014. As a consequence, a new sample is compiled using monthly-based director attribute measures for both the appointees and the appointing boards' directors.

First, the findings clearly show a significantly positive relationship between the presence of quad-qualified directors and its choice to appoint further quad-qualified directors. This corroborates the conception that quad-qualified directors seek to provide effective board monitoring in the pursuit to establish an effective governance system.

Second, only a single quad-qualified director has to be present to induce the appointment of a quad-qualified director. It, therefore, fundamentally supports Hambrick and colleagues' argument that quad-qualified directors voice their opinions compellingly and with authority. Consequently, it is not surprising that a single quad-qualified director can exert the influence to sway the director selection in his favour.

Third, the results further show that the marginal probability effect is largest when the appointing board has two incumbent quad-qualified directors. In light of prior findings, this substantiates the argument that monitoring is more effective when there is a critical mass in place. On this account, it extends prior research on minority influence that minority opinions gain validity when at least another person substantiates them.

The remainder of the chapter is organised as follows. First, the subsequent section discusses the quad model and its attributes in the context of the director selection process, before formulating the research hypotheses. Then, Section 6.3 describes the sample selection process for the director-level dataset, the composition and construction of the attribute measures for both appointees and appointing board members. It further reports the baseline methodology and the corresponding descriptive statistics. The empirical results are reported in Section 6.4. Finally, the chapter concludes with a discussion of the theoretical implications of the findings.

6.2 Literature Review and Hypothesis Development

6.2.1 Director selection in the context of the quad model

The director selection process generally begins either when a vacancy arises or when the firm decides to expand the board. At large public firms, the nomination committee first identifies and screens potential candidates – sometimes assisted by an executive search

firm (Akyol and Cohen, 2013). While the board, the CEO, other executives or major shareholders may already participate in these steps, the board and the CEO will in principle join the nomination process at a later stage, conducting interviews and selecting a suitable candidate (Akyol and Cohen, 2013). Rationally, a board which is determined to exercise effective monitoring will nominate only the most suitable individual for a shareholder proxy vote. Therefore, the selection of suitable board members is itself a type of decision, where the quad model is relevant.

6.2.2 Demand side director selection criteria

By far, the most attention regarding director selection has been given to the CEO's influence on the nomination process. It has often been argued that the choice of new directors follows a bargaining process between the board and the CEO (Hermalin and Weisbach, 1998). While structural characteristics may apply, CEOs particularly strengthen their bargaining position by demonstrating managerial ability. Thus, powerful CEOs can choose candidates suitable to their personal characteristics and leadership style (Zhu and Chen, 2015; Fracassi and Tate, 2012; Shivdasani and Yermack, 1999; Westphal and Zajac, 1995).

Shivdasani and Yermack (1999) present evidence that CEO involvement in the director selection process is received negatively by investors. Conversely, empirical findings also suggest that board and nominating committee independence strengthen the odds to appoint a new director who is actively interested in exercising monitoring and control over managers (Eminet and Guedri, 2010). Thus, whether the outcome of the director selection process is the appointment of a monitoring inclined director or a CEO-friendly director is eventually a question of bargaining power (Zajac and Westphal, 1996). Conveying this to the quad model results in the proposition that quad-qualified boards are likely to appoint quad-qualified directors.

Nonetheless, even a CEO-friendly director may ultimately adhere to the responsibilities of effective monitoring, because poorly performing firms pose a threat to her own reputation (Fama, 1980; Fama and Jensen, 1983). Several studies find that directors are reluctant to serve on boards of troubled firms and may dissociate themselves before it is too late (Harrison et al., 2018; Boivie et al., 2012b; Fahlenbrach et al., 2017).

From the firm's perspective and despite that it is an equivocal trait, director reputation appears to be an essential part of a candidate's attractiveness to gain additional board

seats. On the one hand, boards may seek directors with a reputation for monitoring efficacy (Fich and Shivdasani, 2007). On the other hand, they may also be interested in bolstering their own prestige (Deutsch and Ross, 2003; Acharya and Pollock, 2013). While the quad model aims at finding suitable directors for a board's monitoring function, firms' efforts to appoint prestigious directors are well in line with the resource provision function of the board (Hambrick et al., 2015; Acharya and Pollock, 2013). Also, prestige and monitoring effectiveness are not mutually exclusive; any quad-qualified director might as well have the credentials to bolster a firm's standing.

From a rational perspective, the board is generally seen to have two major complementary functions: monitoring and advice/resource provision (Hillman and Dalziel, 2003). Apart from status and prestige, do firms appoint directors who are functionally suitable to obtain and process the information necessary to make informed decisions? For instance, von Meyerinck et al. (2016) and Drobetz et al. (2018) find that the appointment of industry experienced directors is valued by investors and adds firm value. Dass et al. (2014) support these findings and further show that directors from related industries are equipped with the skills and knowledge that are critical in serving the principle functions of boards. Yet, they also point out that the appointment of industry-related directors may result in conflicts of interests and, given the constraints set out by the board's size[1], comes with the opportunity cost of not having another valuable director.

Further, the literature generally argues that CEO experience is a valuable resource for capable board members (Fich, 2005). However, the evidence in favour of this argument is scarce. Fahlenbrach et al. (2010) find that the appointment of CEO directors can neither be associated with board monitoring effectiveness nor enhanced firm performance. Faleye (2011) further shows that firms with CEO directors have no effect on corporate innovation, but together with Kroll et al. (2008), there is evidence that their presence generates higher acquisition returns.

Finally, several studies suggest the appointment of financial experts. Davidson et al. (2004) observe a significant positive association between the addition of financial experts to a board's audit committee and announcement returns. Kim et al. (2014) show that outside director financial expertise is associated with enhanced financial reporting monitoring. Although Burak Güner et al. (2008) also attest financial expert directors a considerable

[1]Prior research suggests that optimal board size is a function of director and firm characteristics (Raheja, 2005; Coles et al., 2008).

influence on corporate decision-making, they cannot determine whether these directors necessarily act in the best interest of shareholders.

Adams et al. (2018) argue that the reason for these conflicting findings is grounded in the multifaceted skill set of directors. Rather than being one-dimensional, directors have multiple attributes, which all may add value to the firm but are difficult to observe by outsiders. Altogether, their study shows that boards, first of all, vary in the diversity of skills on their board, but it is the commonality of skills rather than the diversity that enhances firm performance. While other studies support this notion (van der Walt and Ingley, 2003; Westphal and Bednar, 2005), diverse director skillsets are not per se constraining monitoring effectiveness (Lungeanu and Zajac, 2019; Tasheva and Hillman, 2019; Boivie et al., 2016a). Hambrick et al. (2015) set out their model so that directors have the knowledge, skills, and experience to be effective monitors, but also provide for the intraboard group dynamics. Their proposition that the presence of more than one quad-qualified director further enhances monitoring effectiveness accounts for both commonality and diversity within the board.

Quad-qualified directors are rare in the director labour market. Thus, unlike proposed by Hambrick and colleagues, this chapter ignores the domain-specific expertise of director candidates and instead focuses on the generalists with board and industry experience. Recent research emphasises the importance of directors' personal range and their ability to enhance board tasks (Tasheva and Hillman, 2019). Lungeanu and Zajac (2019, p. 493) argue that profound personal range in expertise allows directors "to recognise problems and offer informed but differing viewpoints" and "to propose viable solutions that add richness to discussions". Accordingly, a board that has incumbent quad-qualified directors would seek to appoint such directors to provide effective monitoring.

6.2.3 Appointing firm characteristics

In light of the quad model, this brief literature review suggests that the firm perspective on whom to appoint as a board member is conditional on the current board composition, the CEO-board relationship, and the firm's current needs in the context of the board's main functions: monitoring and advisory. The following elaborates further on the importance of organisational characteristics.

Seminal to research about a board's resource provision function, Pfeffer (1972) find that firms alter board size to the needs arising from a changing environment. Similarly,

Finkelstein et al. (2009) propose that the involvement of boards in strategic decision making depends on the uncertainty of the environment, the firm's life cycle stage, and its size. With Coles et al. (2008) showing that the number of outside directors drives the relationship between firm performance and firm complexity, Do et al. (2015) find that firm size, firm risk, stock performance, firm age, and institutional ownership are the most important factors determining the match between outside directors and firms.

Besides the strictly organisational factors, board characteristics add to the heterogeneity of director appointments. Similar to the CEO's involvement in the selection process, both inside and outside directors may bring forward candidates from their personal social network. While this may, later on, pose problems to the board's group dynamics, these ties are initially an asset to the firm. Appointing directors through the board's social network reduces uncertainty and coordination costs (Kim and Cannella, 2008). Still, it may also have detrimental long-term consequences. When appointing connected directors, boards may miss the opportunity to bring in fresh perspectives, ideas, and skills (Cai et al., 2017). Also, when the connection originates from incumbent directors who are already socially close to the CEO, this could later result in cronyism at the cost of shareholders (Coles et al., 2014). In the context of the quad model, this concerns the independence attribute of the appointees particularly.

6.2.4 Main hypotheses

The underlying assumption in this chapter picks up on the previous chapters, which argue that both the board and CEO are continuously bargaining over the intensity in which monitoring is carried out. As proposed by the Hermalin model, the propensity to monitor depends on a board's independence. In recognition of the quad model, this proposition can well be extended to argue that the propensity to monitor does, in addition, depend on a board's motivation as well as bandwidth. Accordingly, the presence of a quad-qualified director shall enhance a board's monitoring propensity even further. Therefore, following the insights of the previous chapters, the presence of quad-qualified directors depicts a scenario in which the board has considerable influence. The literature suggests that there could be two notions driving the appointment of a quad-qualified director when the intraboard power is leaning towards its outside directors.

First, following Eminet and Guedri (2010), the monitoring-inclined directors would wish to select an equally qualified director candidate. On the one hand, such an

appointment would further strengthen their position in the agency conflict between board and management, specifically the CEO. And, on the other hand, it maintains or extents board's monitoring capabilities.

Second, their appointment may also be driven by similarity-attraction. In reference to the quad model design in previous chapters, quad-qualified directors are a rare commodity, given that they possess a high level of expertise but do not capitalise on it to gain too many board seats. Hence, to minimise 'social uncertainty', incumbent quad-qualified directors may have the desire to associate with similar candidates (Kanter, 1977a; Westphal and Zajac, 1995; Withers et al., 2012). Yet, it is empirically challenging to examine a board's true motivations.

Having shown in the previous chapters that the presence of quad-qualified directors increases a board's monitoring effectiveness, it remains that whatever the motivations are, the appointment of quad-qualified director increases a board's ex-post monitoring effectiveness. In contrast, a CEO who finds herself not surrounded by quad-qualified directors is assumed to have more bargaining power over the director selection process. Based on existing research (Finkelstein et al., 2009; Zajac and Westphal, 1996), she would naturally seek to appoint candidates suitable to serve her own purposes.

Hypothesis 1 (H1): *Quad-qualified boards are more likely to appoint quad-qualified directors, i.e. the likelihood of appointing a quad-qualified outside director is positively related to the number of incumbent quad-qualified outside directors.*

In recognition of the contribution of the previous chapters as well as the propositions made by Hambrick et al. (2015), it is self-evident to test how the appointment of quad-qualified directors is related to certain critical mass levels. The critical mass relates to the state at which a certain minimum number of quad-qualified directors are members of the board. Hence, adjacent to hypothesis H1, this critical mass may constitute a state at which the board has assumed enough bargaining power over the director selection process that it appoints another quad-qualified director.

The prior results regarding turnover decisions, and minority-oriented governance research in general, suggest that a group of three quad-qualified directors would significantly enhance board task performance. Accordingly, the hypothesis states whether a board with two quad-qualified directors would appoint a third quad-qualified director and thus reach the critical mass level for effective task performance.

Hypothesis 2 (H2): *A critical mass level of incumbent quad-qualified directors (two or more) will have a significantly positive effect on the likelihood of appointing another quad-qualified director.*

6.3 Data & Methodology

6.3.1 Sample

The analysis of director appointments requires substantial adjustments to the main sample (see Chapter 3), because the accuracy of a director-firm-fiscal year sample cannot satisfactorily map a director's quad-qualification onto a director appointment model. First, certain attributes are susceptible to changes in board composition and the individual circumstances of directors. For instance, the independence of an appointee to incumbent board members can change substantially over the course of a fiscal year. A director might be appointed shortly after another director joined, whom she has strong social ties to and had not been on the focal board at the end of the previous fiscal year. A further example is in which a director resigns from another board membership just before assuming the focal board position. If this is her third directorship, the busyness measure (busy if holding three concurrent board memberships) would falsely identify her as a busy director. Consequently, it is necessary to measure the quad model attributes per month rather than per fiscal year.

Aside from the change to monthly director-level, the sample selection and data management procedures are not changed. The analysis focuses on the announcement date rather than the effective date, since both dates can differ by several months (on average about a month). This ensures that the model identifies board members associated with the director appointment decision. Table 6.1 gives an overview of the sampling process and the distribution of director appointment announcements. The comprehensive director-level information compiled from various databases reduces the sample of director appointment announcements substantially.

Concerning the sampling process and the distribution of director announcements, Panel B in Table 6.1 indicates that the number of sample announcements substantially decreases in later years. Despite best efforts, the author was unable to establish the reasons. As illustrated by Figure 6.3 in the appendix, the issue must lie within the BoardEx dataset.

Table 6.1: Sampling Process for Director Appointment Model

Panel A: Sampling Process

Step		Directors	Firms	Observations
1	Original BoardEx announcements (calendar years 2009-2014)	64,095	18,922	111,335
2	Merge with BoardEx-CS-CSRP-link from previous chapters	(53,827)	(16,292)	(99,201)
3	Keep only appointment announcements	(5,093)	(370)	(6,441)
4	Keep only outside director announcements	(729)	(151)	(822)
5	Merge with firm-level data	(822)	(283)	(942)
6	Reduce to sample firms (S&P 1500)	(1,220)	(716)	(1,353)
7	Exclude financial services and utility sectors	(658)	(274)	(720)
8	Drop observations with missing values	(696)	(316)	(759)
Final Sample		*1,050*	*520*	*1,097*

Panel B: Sample Distribution by Industry Sector and Calendar Year

Industry	2009	2010	2011	2012	2013	2014	Directors	Firms	Observations
Construction	1	2	3	3			9	4	9
Manufacturing	154	147	155	75	50	24	591	288	605
Mining	15	12	16	6	1	2	51	26	52
Retail Trade	27	25	40	16	6	3	114	57	117
Services	50	41	41	44	12	15	201	94	203
Transportation & Public Utilities	6	23	22	13	2		66	31	66
Wholesale Trade	9	17	12	5	1	1	45	28	45
Total	*262*	*267*	*289*	*162*	*72*	*45*			*1,097*

6.3.2 Attributes measurement

The measurement of quad-qualification and its underlying attributes follows strictly the concept described in the previous empirical chapters. However, appointees and incumbent board members have inherently different characteristics. For instance, while an appointee's independence to the incumbent CEO is only dependent on the current and past social ties, an incumbent director may be co-opted by the CEO as described in several previous studies (Shivdasani and Yermack, 1999; Coles et al., 2014). Moreover, while it is possible to measure the motivation of an incumbent director in relation to his monetary interest in the focal firm, an appointee may have no such interest at first. And even if she does, this would rather reflect a certain affiliation/dependency and possible reservations about the current state of the firm. Accordingly, a new measurement approach is needed to grasp the appointee director's quad-qualification at appointment.

Appointee's quad-qualification

In principle, the approach to measure an appointee's quad-qualification is very similar to the previous chapters, when only an entire board's quad-qualification was measured. The fact that the measurement of quad model attributes should not rely on the director's previous relationship with the firm itself leads to substantial changes within the attributes.

As for *Independence*, a director's relationship to the CEO is therefore solely measured based on prior employment ties before the month before the announcement (*Outside Shared Experience*). A director's co-option with the incumbent CEO does not apply since the variable is derived from prior shared board service. Hence, *Independence* relates to a director's independence to the CEO, but not to other outside directors. Concerning the possibility that the CEO has already co-opted incumbent board members, any social ties between these co-opted directors and the appointee would also impede board independence. In recognition of this circumstance, the empirical model controls for the social ties between the incumbent board and the appointee.

In the previous chapters, *Expertise* attempts to gauge the generic, industry-specific and firm-specific expertise of each director. But, provided that an appointee director can also be quad-qualified yet has no prior relationship to the focal firm, firm-specific expertise is omitted. Moreover, since this chapter does not relate the director appointments to specific board tasks but focuses on generalists, *Expertise* is measured in a domain-neutral context. Rather, the focus is on directors suitability to serve on the three main committees: audit

Table 6.2: Summary Statistics of Director-Level Data

This table reports the summary statistics of director-level variables for the monthly-measured sample from January 2009 to December 2014 at announcement dates. Panel A refers to the director-month observations, lagged by one month, including winsorising at 1%, which are used to calculate the appointee *QQ Score*. Panel B refers to the director-firm-month observations including winsorising at 1%, which are used to calculate the incumbent board member *QQ Score*. Observations are matched by firm and announcement date with the director appointee sample in Panel A.

Variables	Mean	SD	Min	Q1	Med	Q3	Max	N
Panel A: *Appointees*								
QQ Score	2.951	0.506	0.965	2.823	3.040	3.222	3.980	1,856
QQ Dir	0.088	0.284	0.000	0.000	0.000	0.000	1.000	1,856
Independence	0.957	0.156	0.026	1.000	1.000	1.000	1.000	1,856
Expertise	0.294	0.277	0.000	0.040	0.202	0.485	1.000	1,856
Bandwidth	0.857	0.351	0.000	1.000	1.000	1.000	1.000	1,856
Motivation	0.852	0.355	0.000	1.000	1.000	1.000	1.000	1,807
Outside Shared Experience	6.091	26.775	0.000	0.000	0.000	0.000	333.000	1,856
Industry Experience	33.175	64.982	0.000	0.000	0.000	39.000	456.000	1,856
Public Board Experience	111.250	173.065	0.000	0.000	47.000	150.000	2,599.000	1,856
AC Experience	38.766	80.084	0.000	0.000	0.000	47.000	684.000	1,856
NC Experience	33.555	78.697	0.000	0.000	0.000	36.000	1,592.000	1,856
CC Experience	41.097	88.380	0.000	0.000	0.000	52.000	1,730.000	1,856
Busy Size	0.143	0.351	0.000	0.000	0.000	0.000	1.000	1,856
Additional Outside Directorships	0.420	0.736	0.000	0.000	0.000	1.000	4.917	1,856
App. Firm MV	8,107.336	14,607.539	18.622	709.143	2,001.092	7,020.801	113,434.203	1,807
Min. MV of Outside Directorships	3,210.871	15,232.030	0.000	0.000	0.000	690.000	217,776.000	1,856
Panel B: *Incumbent Board Members*								
QQ Score	2.106	0.852	0.101	1.354	2.081	2.747	4.000	12,887
QQ Dir	0.067	0.250	0.000	0.000	0.000	0.000	1.000	12,887
Independence	0.470	0.339	0.000	0.131	0.545	0.798	1.000	12,887
Expertise	0.474	0.305	0.000	0.202	0.475	0.737	1.000	12,887
Bandwidth	0.835	0.371	0.000	1.000	1.000	1.000	1.000	12,887
Motivation	0.326	0.373	0.000	0.000	0.000	0.697	1.000	12,887
Outside Shared Experience	0.976	0.100	0.007	1.000	1.000	1.000	1.000	12,887
TW-Co-opted	0.231	0.273	0.000	0.000	0.124	0.409	0.997	12,887
Public Board Experience	24.289	21.738	0.250	8.083	18.167	34.250	117.833	12,887
Industry Experience	9.138	7.149	0.000	3.667	7.833	13.083	34.250	12,887
Tenure Overlap	4.270	2.965	0.000	1.938	4.019	6.146	14.083	12,887
Director Tenure	7.394	6.098	0.000	2.417	6.000	11.000	24.750	12,887
Busy Size	0.165	0.371	0.000	0.000	0.000	0.000	1.000	12,887
Perc. Ownership	0.000	0.002	0.000	0.000	0.000	0.000	0.035	12,887

committee (AC), compensation committee (CC), and nomination committee (NC). By regulatory requirements, all sample firms have these three committees. Correspondingly, in addition to a director's public board experience as well as industry expertise, *Expertise* also captures a director's overall committee service in each of the three committees, which perform principal board functions in specialised subgroups. Prior major committee membership equips directors with expert board service skills and knowledge (Kolev et al., 2019). Altogether, the proposition is that such board-experienced generalists are sought-after candidates who can improve board monitoring effectiveness (Lungeanu and Zajac, 2019; Tasheva and Hillman, 2019).

Table 6.3: Factor Analysis: Appointee Expertise

Panel A reports the Pearson correlation coefficient matrix of all observed variables used in the factor analysis. Panel B reports the results of the factor analysis using the principal factor method without rotation.

A. Correlation Matrix

Observed Variable		1	2	3	4	5
1	Industry Experience	1.000				
2	Public Board Experience	0.394	1.000			
3	AC Experience	0.302	0.698	1.000		
4	NC Experience	0.339	0.732	0.672	1.000	
5	CC Experience	0.327	0.744	0.668	0.739	1.000

B. Factor Analysis using principal-factor method

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalue		2.929	0.017	-0.057	-0.088	-0.114
Explained Variance		0.586	0.003	-0.011	-0.018	-0.023
Observed Variable						
1	Industry Experience	0.409				
2	Public Board Experience	0.862				
3	AC Experience	0.781				
4	NC Experience	0.838				
5	CC Experience	0.841				

Thus, the five expertise variables are *Public Board Experience*, *Industry Expertise*, *AC Experience*, *CC Experience*, and *NC Experience*. Consistent with the previous empirical chapters, factor analysis is employed on all five of them. Table 6.3 reports its results. The eigenvalue only exceeds 1 for a single factor (see Panel B), which shows that an appointee's expertise can be captured by a single factor. Therefore, there is no need to rotate the factors, and it can be derived from Panel B that the single factor of director expertise captures 58.6% of the variance. Further, the factor loadings that correspond to the underlying variables all exceed a level of 0.3, which is considered to be sufficient regarding the large sample size (DiStefano et al., 2009). At last, given that all observed variables are positively correlated with each other, the economic interpretation of *Expertise* is that larger values represent a higher level of expertise.

In terms of a director's motivation to serve on the appointing firm's board, the measurement borrows from Masulis and Mobbs (2014). Since prior research shows that boards with directors who hold too many contemporaneous directorships are less effective, they show that directors put more effort towards the more prestigious firms. Accordingly, *Motivation* is a binary variable that takes the value of 1 if the appointing firm is relatively high ranked measured by a firm's market value. Directorships that are relatively high

ranked are those which are at least 10% larger in market value than the smallest of the focal director's board memberships.

Finally, to account for a director's relative *Bandwidth*, the measurement follows the logic of previous chapters. Consequently, a director is defined to be not busy if she serves in the month following the announcement on less than three corporate boards with annual revenue larger than 1 billion USD revenue.

The summary statistics of the appointee quad-qualification variables and their inputs are presented in Panel A of Table 6.2, which refers exclusively to the director appointment announcements used in the main analysis[2]. However, quad attributes are normalised within the full sample of monthly director data. This ensures that the feature of quad-qualification is derived from the universe of directors for which input data is available.

Panel A shows that selected directors are overall strongly independent, i.e. the average parameter value of *Independence* is 0.957%. 85.7% of appointees are defined as non-busy using the firm size constraint. And for 85.2%, the new directorship is more prestigious in terms of market value than their current directorships. Interestingly, the average director appointee has only a level of 0.294% in the expertise criteria. In reference to the summary statistics of the full monthly panel of director-level variables (see appendix, Table 6.14), appointees overfulfil independence, bandwidth, and motivation criteria, but have on average a lower parameter value in expertise.

Appointing board's quad-qualification

In contrast to the appointee's quad-qualification, the quad model approach to the appointing board resembles the previous chapters. There is no change to the measurement of *Independence*, *Bandwidth*, and *Motivation*.

Yet, given the change from a domain-specific to a more general measurement of director expertise, *Expertise* is based on a slightly different configuration of human capital related variables. Generic expertise is represented only by *Public Board Experience*, which accounts for the skill, knowledge, and expertise attached to the responsibilities of listed firms. The other variables adopted from the previous chapters are *Industry Expertise* and – accounting for firm-specific expertise – *Tenure Overlap* and *Director Tenure*.

The results of the factor analysis are reported in Table 6.4. Again, the eigenvalue

[2]The deviations of sample size are due to missing observations among the control variables of the baseline regression (cf. Step 8 in Table 6.1)

Table 6.4: Factor Analysis: Incumbent Board Member's Expertise

Panel A reports the Pearson correlation coefficient matrix of all observed variables used in the factor analysis. Panel B reports the results of the factor analysis using the principal factor method without rotation.

A. Correlation Matrix

Observed Variable		1	2	3	4
1	Public Board Experience	1.000			
2	Industry Expertience	0.376	1.000		
3	Tenure Overlap	0.339	0.615	1.000	
4	Director Tenure	0.414	0.714	0.870	1.000

B. Factor Analysis using principal-factor method

		Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue		2.379	0.074	-0.070	-0.109
Explained Variance		0.595	0.019	-0.018	-0.027
Observed Variable					
1	Public Board Experience	0.439		0.778	
2	Industry Expertience	0.738		0.439	
3	Tenure Overlap	0.874		0.210	
4	Director Tenure	0.938		0.120	

only exceeds 1 for a single factor (see Panel B), which shows that a single factor can capture director expertise. Therefore, there is no need to rotate the factors and it can be derived from Panel B that the single factor of director expertise captures 59.5% of the variance. Further, the factor loadings corresponding to the underlying variables all exceed 0.3. Finally, since all observed variables are positively correlated with each other, the economic interpretation of the incumbent director's *Expertise* is that larger values represent a higher level of expertise.

Panel B in Table 6.2 reports the summary statistics of director-level variables among the incumbent board members. Parameter values in *Independence* and *Expertise* are balanced and comparably close to the median director in the two given attributes.[3] Similar to the appointees, the *Bandwidth* attribute is satisfied by a large majority of incumbent directors, 83.5%. By comparison, these directors show only a parameter value of 0.326 in *Motivation*, which there constitutes the greatest barrier for incumbent directors to be termed as quad-qualified. Overall, 44.2% of appointees satisfy *Motivation* above a parameter value of 0.5 and 17.8% above 0.75.

[3]Given the applied percentage normalisation on the full sample of monthly director data, a parameter value of 0.5 (for *Independence*, *Expertise*, *Motivation* only) refers to the median parameter value within the reference group of directors.

6.3.3 Quad-qualification measures

Aside from the different composition of quad attributes, the research design is strictly consistent with the previous empirical chapters (see Chapter 3). However, the subsequent analysis refers only to directors who can individually be defined as quad-qualified directors.

The quad-qualification score (*QQ Score*) is calculated for both appointees and incumbent board directors by aggregating the individual scores of each attribute. Notably, each attribute is still given the same weight, and percentile normalisation is applied to transform the continuous attribute variables to obtain values ranging between 0 and 1 (see Table 6.2). Thus, the individual $QQ\ Score_{ijt}$ takes a maximum value of 4.

$$QQ\ Score_{ijt} = Independence_{ijt} + Expertise_{ijt} + Motivation_{ijt} + Bandwidth_{ijt} \tag{6.1}$$

To be classified as quad-qualified, directors are required to have a *QQ Score* of at least 3.5. This achieves that any quad-qualified director possesses a level of qualification in each attribute above the corresponding median-level (> 0.5).

$$QQ\ Dir_{ijt} = QQ\ Score_{ijt} > 3.5 \tag{6.2}$$

To measure the incumbent board's quad-qualification, the number of quad-qualified directors (*Nbr. QQ Dirs*) is calculated. Appointee's quad-qualification (*App. Dir is QQ*) is simply a discrete variable that takes the value of 1, if the appointed director has a *QQ Score* greater than 3.5.

$$Nbr.\ QQ\ Dirs_{jt} = \sum_{i=1}^{n} QQ\ Dir_{ijt} \tag{6.3}$$

6.3.4 Examples of quad-qualified appointees

Table 6.2 reports that 8.8% of appointees and 6.7% of incumbent board members are quad-qualified. Overall, quad-qualified directors represent only a small share of the director labour market – a circumstance that is also documented in Chapter 4 and Chapter 5. Consequently, the question arises who these directors are.

The primary research question of this chapter is whether quad-qualified boards appoint quad-qualified directors. This perspective on the quad model necessitates a further review of the data to describe and verify the sample. Accordingly, Table 6.5 gives an overview of all appointments of quad-qualified directors where the incumbent board constituted of at

least two quad-qualified directors (cf. hypothesis H2). First of all, it appears that there is no clear pattern in terms of firm size, because the number of appointing firms is similar for every relative firm size category. Secondly, it is notable that almost all appointees are fully equipped with Independence, Bandwidth, and Motivation. This instance requires that appointees are at least equipped with the median level of expertise.

In general, a principal limitation of the quad model is the lack of an explicit formal definition of quad-qualification and the fact that 'quad-qualification' is not a board characteristic known to practitioners. Consequently, the appointment of a quad-qualified director cannot be linked to the explicit board decision in favour of appointing a quad-qualified director. Nonetheless, all four quad attributes and their underlying inputs are readily observable characteristics. The incumbent board could have unknowingly appointed a quad-qualified director because its characteristics and qualifications fit the common customs about effective board members. Accordingly, the following examples of quad-qualified directors (see Table 6.6) intend to shed some light on this matter. In order to verify the precision and completeness of BoardEx employment data, each of the three examples is cross-checked with Bloomberg, Thomson Reuters, and the press releases about the particular appointment.

Janet Clark was 48 years old at her appointment to the board of EOG Resources, a company engaged in hydrocarbon exploration. She had previously been with Marathon Oil Corporation, where she had been the CFO for nearly ten years. Marathon Oil is in the same two-digit SIC industry group as EOG Resources, which equipped her with extensive industry experience. Additionally, she gained eight years of public board experience at Exterran Corporation and Universal Compression Holdings as an outside director. She had also been an outside director at DELL for two years but left one month before her appointment to EOG Resources. For the time of the appointment announcement, there are no records of any other employment responsibility. Thus, Ms. Clark is found to have both the time and motivation to engage fully in her role as a board member of EOG Resources. Finally, there is also no record of any prior employments connections with the incumbent CEO of EOG Resources. Overall, the fact that she had no direct affiliation to the focal firm as well as its CEO, extensive industry and public board experience, and no other board memberships, make her suitable choice in terms of the quad-qualification requirements as described above.

Table 6.5: The Appointment of Quad-Qualified Directors by Quad-Qualified Boards

This table reports all appointments of quad-qualified directors where the incumbent board constituted of at least two quad-qualified directors. The table is sorted by the firm's total market value in million USD. *Rel. MV Group* reflects the firm's quartile rank in terms of total market value within the baseline sample (see Table 6.7). All director and board characteristics refer to the month prior to the appointment announcement. Firm characteristics refer to the latest annual statement prior to the appointment announcement.

Appointing Firm Characteristics						*Appointed Director Characteristics*						
Company Name	Industry	Year	Nbr. QQ Dirs	Total MV (t-1)	Rel. MV Group	Director Name	Age	QQ Score	Independent	Expertise	Bandwidth	Motivation
Company Name	Industry	Year	Nbr. QQ Dirs	Total MV (t-1)	Rel. MV Group	Director Name	Age	QQ Score	Independent	Expertise	Bandwidth	Motivation
EOG Resources	Mining	2013	2	32,810	4	Janet Clark	48	3.535	1.000	0.535	1	1
Boston Scientific	Manufacturing	2010	2	14,752	4	Kristina Johnson	60	3.611	0.803	0.808	1	1
Corning Inc.	Manufacturing	2009	2	13,597	4	Mark Wrighton	65	3.949	1.000	0.949	1	1
Juniper Networks	Manufacturing	2014	2	11,177	4	Gary Daichendt	60	3.707	1.000	0.707	1	1
Juniper Networks	Manufacturing	2014	2	11,177	4	Kevin DeNuccio	62	3.606	1.000	0.606	1	1
Avnet	Wholesale Trade	2012	2	4,794	3	Michael Bradley	58	3.505	1.000	0.505	1	1
Wendy's	Manufacturing	2010	2	4,399	3	Peter Rothschild	70	3.545	1.000	0.545	1	1
Oshkosh Corporation	Manufacturing	2012	3	3,960	3	Steve Newlin	58	3.636	1.000	0.636	1	1
PerkinElmer	Manufacturing	2012	3	2,655	3	Peter Barrett	51	3.758	1.000	0.758	1	1
CoreLogic	Services	2012	2	2,511	3	Jaynie Studenmund	60	3.768	1.000	0.768	1	1
Bio-Rad Laboratories	Services	2010	2	2,263	3	Ted Love	58	3.606	1.000	0.606	1	1
Lam Research	Manufacturing	2011	2	2,124	2	Mike Cannon	54	3.667	1.000	0.667	1	1
DeVry Education Group	Services	2012	2	2,004	2	Alan Merten	59	3.545	1.000	0.545	1	1
Owens & Minor	Wholesale Trade	2010	2	1,799	2	John Gerdelman	63	3.949	1.000	0.949	1	1
Tetra Technologies	Mining	2011	3	1,378	2	Tom Bates Jr	55	3.808	1.000	0.808	1	1
FactSet	Services	2011	2	906	1	Robin Abrams	63	3.879	1.000	0.879	1	1
Superior Industries International	Manufacturing	2011	2	819	2	Tim McQuay	60	3.929	1.000	0.929	1	1
Oxford Industries	Manufacturing	2013	3	570	1	Tom Gallagher	53	3.657	1.000	0.657	1	1
Tollgrade Communications	Manufacturing	2009	4	61	1	Scott Chandler	59	3.535	1.000	0.535	1	1

Tom Gallagher, 53, was appointed as an outside director of Oxford Industries, which specialises in high-end clothing and apparel, in June 2013. He had previously served on the firm's board between 1991 and 2007. At the time of appointment, Mr. Gallagher had been a board member of Genuine Parts Company, an automotive service company, since 1990. He first was its President and COO, and in 2005 he was appointed Chairman and CEO. Besides his chairmanship at Genuine Parts, Mr. Gallagher had no other concurrent board responsibilities. Between 1997 and 2002, he also was an outside board member at National Service Industries, a textile company. Altogether, his prior board membership at Oxford Industries and, in general, his extensive public board experience equip him with profound expertise in the focal firm's industry as well as board processes. Moreover, there is no record of any employment-related connection between Mr. Gallagher and the current CEO, which leads to the conclusion that Tom Gallagher is a suitable candidate.

Tim McQuay, 60, was appointed as an independent director of Superior Industries International in late 2011. The company is a leading manufacturer of cast aluminium wheels for the automobile industry. When appointed to the board, Mr. McQuay was a managing director at an investment management firm. He had previously gained extensive board experience in various public companies. At the appointment announcement, Mr. McQuay held outside directorships at BSD Medical Corporation (since 2008) and Meade Instruments Corporation (since 2007). Between 1996 and 2007, he was also an independent director and later the lead independent director at Keystone Automotive Industries, a distributor of new and recycled automotive parts. During all three appointments, Mr. McQuay was a member of the audit, compensation, and nominating committees. In total, he had gained more than 28 years of committee experience and 30 years of board experience at publicly listed firms. Like with the other two directors, the BoardEx network data does not record an employment-related connection to the CEO of Superior Industries International before the announcement month. His other outside board memberships relate to publicly listed companies; however, the data collection procedure could only retrieve financial information for Meade Instruments. A cross-check with Bloomberg and Refinitiv Eikon showed that BSD Medical Corporation was larger in market value than Meade Instruments but substantially smaller than Superior Industries International (137m USD vs. 819m USD). (when Mr. McQuay was appointed to the board of Superior Industries International. Thus, given that the focal firm's market value is at least 10% larger in market value than Meade Instruments, the new appointment is found to be

Table 6.6: Examples of Appointed Quad-Qualified Directors

This table gives three examples of quad-qualified directors who were appointed by a board with at least 2 quad-qualified incumbent directors. The parameter values of each attribute input variable refer to the month prior to the appointment announcement.

Janet Clark, 48	*EOG Resources*	
Independence	Prior Shared Time (in years)	0
Expertise	Industry Experience (in years)	11.833
	Public Board Experience (in years)	11.000
	AC Experience (in years)	10.917
	CC Experience (in years)	0.000
	NC Experience (in years)	4.583
Bandwith	Additional Board Memberships at large firms	0
Motivation	Total Outside Directorships	0
	Smallest Board MV (in mUSD)	-
Tom Gallagher, 53	*Oxford Industries*	
Independence	Prior Shared Time (in years)	0
Expertise	Industry Experience (in years)	16.000
	Public Board Experience (in years)	44.583
	AC Experience (in years)	0
	CC Experience (in years)	0
	NC Experience (in years)	0
Bandwith	Additional Board Memberships at large firms	1
Motivation	Total Outside Directorships	0
	Smallest Board MV (in mUSD)	-
Tim McQuay, 60	*Superior Industries International*	
Independence	Prior Shared Time (in years)	0
Expertise	Industry Experience (in years)	0
	Public Board Experience (in years)	30
	AC Experience (in years)	28.583
	CC Experience (in years)	28.583
	NC Experience (in years)	28.583
Bandwith	Additional Board Memberships at large firms	0
Motivation	Total Outside Directorships	1
	Smallest Board MV (in mUSD)	4.913

more prestigious, suggesting to motivate Mr. McQuay to engage in active monitoring fully. Thus, given the requirements for quad-qualification set out above, Tim McQuay is a suitable director candidate.

In reference to the quad model and associated literature on expertise and bandwidth (cf. Chapter 2), all three directors are public board experienced and can devote time and attention. Additionally, Ms. Clark and Mr. Gallagher have extensive industry experience, strengthening their ability to understand firm- and industry-related issues. The fact that the appointing firms are relatively more prestigious than their current outside board

memberships allows the assumption that all three directors have a greater motivation to engage in board monitoring at the appointing firms. Finally, none of the appointees has any prior shared employment experience with the incumbent CEO, supporting the claim that they are independent board members with a greater ability to withstand CEO interests.

These attributes of director qualification are readily observable by all board decision-makers. Although one could not claim that the board decisions are directly related to the quad model, all directors satisfy commonly perceived conventions of 'ideal' directors. Therefore, each of the boards would have been able to decide on appointing a quad-qualified director - with intention. The fact that the quad model rests upon widespread convictions of needed director qualifications supports the assumption that boards with quad-qualified directors and their appointment decisions reflect a good judgement for suitable directors.

6.3.5 Baseline model

The analysis of the main hypotheses involves testing how board quad-qualification influences the appointment of further quad-qualified directors (*App. Dir is QQ*). The baseline model in equation 6.4 is slightly altered to accommodate testing all hypotheses:

$$\frac{P(App.\ Director\ is\ QQ_{j,t})}{1 - P(App.\ Director\ is\ QQ_{j,t})} = \beta_0 + \beta_1 Nbr.\ QQ\ Dirs_{j,t} + \beta_2 Appointee\ Controls_{j,t} + \beta_3 Board\ Controls_{j,t} + \beta_4 Firm\ Controls_{j,t} + \beta_5 Performance\ Controls_{j,t} + u_{j,t} \quad (6.4)$$

The control variables are structured into appointed director-, board/TMT-, firm-, and performance-related variables.

Director-, board/TMT-, and firm-specific controls

The dependent variable captures the director's quad-qualification without regard to her age. However, the age substantially determines the degree to which she had been able to make, for instance, social connections to other board members or gain board experience. Thus, *App. Director Age* controls for this circumstance. The other appointee-specific controls relate to the social connection between incumbent board members and the appointed director. Following the approach by Fracassi and Tate (2012)), it is differentiated between current and prior employment relationships. *Cur. Employ-Rel.*

and *Prior Employ-Rel.* are both measured in the month before the appointment and are expected to increase the probability of a director's appointment.

It is also controlled for several board-related specifications. *Outsider Ratio* is the percentage of outside directors on the board, *Duality* indicates whether the focal CEO also chairs the board or not, *Avg. Director Age* is the natural logarithm of the average age of all directors, and *Avg. Director Tenure* refers to the natural logarithm of the average tenure of all incumbent board members. Additionally, *Board Size* is the natural logarithm of the number of incumbent board members at the end of the prior fiscal year. *Board Expansion* is a dummy variable that takes the value one if the board size at the end of the current fiscal year is greater than at the end of the prior fiscal year. *Board Ownership* is the percentage of stock ownership in the focal firm by all board members. The variable is based on stock ownership information by Thomson Insiders database and refers to the latest available information within the past 12 months. Finally, *CEO Turnover* controls for the circumstance of a change in executive leadership. This binary variable is set to 1 for any change in CEO in the 12 months prior to the director appointment announcement. CEO turnover data corresponds to Chapter 4.

In addition, it is controlled for the following firm-specific characteristics. *Inst. Ownership* is the percentage of ownership of active institutional owners. *Inst. HHI* is the Hirshman-Herfindahl index of institutional ownership, capturing all institutional investors. *Business Segments* is the number of a firm's business segments reported in Compustat's Segment dataset. Finally, *Firm Age* is the natural logarithm of the difference between the current year and the first year the firm occurred in the CRSP dataset.

Performance controls

The extant literature (e.g. Fahlenbrach et al., 2017; Do et al., 2015) suggests that performance often stimulates the frequency of director appointments (and exits). Thus, a comprehensive set of firm performance controls is added. Since the measurement is time-sensitive, each performance variable is measured twice as a robustness check: once using annual data, and once using quarterly data. Nevertheless, all variables refer to the most recent period-end before the director appointment announcement.

In terms of the annual performance measures, *Firm Size* is the natural logarithm of the firm's total assets in million USD. For instance, if the director announcement was in January 2012 and the firm's fiscal year period-end is December, *Firm Size* refers to the

fiscal year that ended in December 2011. Other annual performance measures include *MTB*, which is the market to book value of equity. *ROA* is the ratio of the firm's income before extraordinary items and total assets. *Sales Growth* is the ratio of the firm's total sales to total sales in the prior fiscal year. *LT-Leverage* is the firm's long-term leverage divided by total assets. *SD of ROA* is the standard deviation of the firm's *ROA* in the past 5 years (minimum 3 years).

As for the quarterly performance measures, *Firm Size* is the natural logarithm of the firm's total assets at the end of the most recent fiscal quarter. So, for instance, if the director announcement was in January 2012 and the firm's fiscal year period-end is December, *Firm Size* refers to the final fiscal quarter that ended in December 2011. *MTB* and *LT-Leverage* are measured similarly. As to variables using income statement items, the value in use is the sum of the most recent four fiscal quarters (across fiscal years). *ROA*, therefore is the ratio of the firm's total income in the most recent fiscal quarters divided by the firm's total assets. *SD of ROA* is the standard deviation of *ROA* in the past 18 (min. 12) fiscal quarters. *Sales Growth* is the sum of sales during the previous most recent four fiscal quarters divided by the corresponding sum of sales one year earlier. Moreover, it is also controlled for stock performance, which is independent of whether the annual or quarterly measurement is performed. *BHR 90 days* is the firm's buy-hold return in the 90 days before the day of the director appointment announcement (t-1).

Peer controls

All performance measures, whether annually or quarterly measured, are complemented by its peer firm derivatives to control for a potential relationship between the appointment announcement and the state of the firm's peer firms. For instance, the modelling of director quad-qualification requires directors to have expertise in a certain industry (defined by the focal firm's 2-digit SIC code). If the focal firm's performance is weaker than other firms within the industry, then it is likely that the highly-skilled director is less tempted to join the focal firm's board. Its relatively weak performance foreshadows greater monitoring needs (Faleye et al., 2011) and potentially lower personal reputation (Yermack, 2004).

The standard approach in empirical studies on director appointments is to use industry fixed effects, which, however, only account for the mean effect within the same industry across the whole sample period. This neglects changes in both peer effect and peer group composition. The latter refers to two main problems with the standard empirical approach.

First, the common peer group identifier is the firm's industry classification, which is in the case of the Standard Industry Classification (SIC) a four-digit code.[4] Any firm can have one or more of such codes because each four-digit code might only correspond to a product market niche. Therefore, it is especially difficult to identify a common SIC code for large firms, especially conglomerates, and hence the main SIC code only refers to the firm's principal product market. Second, SIC codes are relatively static, so that the peer group does not change very often. For example, the primary SIC code of Apple Computers changed only once from 3571 ('Electronic Computers') to 3663 ('Radio and Television Broadcasting and Communications Equipment') in 2012.[5] Neither Microsoft nor Alphabet (Google's parent company) are part of this SIC group.

A solution to all three problems is the Text-based Network Industry Classifications (TNIC) by Hoberg and Phillips (2010, 2016). Rather than assigning specific classification codes, the authors compute a measure of product similarity among pairs of firms within the Compustat universe. First, the score of each pair changes annually, which allows recomposing peer groups annually. Second, the score is a continuous measure that permits to analyse peers by the degree of similarity. This analysis uses the TNIC measures to compute the average value of each of the performance variables among the ten closest peers, excluding the focal firm.[6] Unlike the main sample, the measurement is employed on the entire universe of Compustat and CRSP firms.

Table 6.7: Summary Statistics of Baseline Model

Variables	Mean	SD	Min	Q1	Med	Q3	Max	N
Model								
App. Director is QQ (0/1)	0.089	0.285	0.000	0.000	0.000	0.000	1.000	1097
Nbr. QQ Dirs$_t$	0.588	0.932	0.000	0.000	0.000	1.000	6.000	1097
Appointed Director Controls								
Cur. Employ.-Rel.$_t$	0.029	0.126	0.000	0.000	0.000	0.000	1.000	1097
Prior Employ.-Rel.$_t$	0.048	0.155	0.000	0.000	0.000	0.000	1.000	1097
App. Director Age$_t$	4.025	0.133	3.466	3.951	4.043	4.127	4.331	1097
Board Controls								
NED Ratio$_{t-1}$	0.857	0.067	0.556	0.833	0.875	0.900	1.000	1097
Duality$_{t-1}$	0.036	0.188	0.000	0.000	0.000	0.000	1.000	1097

...continued

[4] In the US, the North American Industry Classification System (NAICS code) generally replaced the SIC code in 1997. However, some US government departments and agencies, such as the US Securities and Exchange Commission (SEC), continue to use SIC codes.

[5] As reported in the Compustat Fundamental NA Annual database, November 2019.

[6] Using TNICs to measure director industry expertise could be problematic. Under Section 8 of the Clayton Antitrust Act, a director cannot serve on the board of two or more competing corporations.

Variables	Mean	SD	Min	Q1	Med	Q3	Max	N
Boardsize$_{t-1}$	9.317	2.124	4.000	8.000	9.000	11.000	18.000	1097
Board Expansion$_t$	0.579	0.494	0.000	0.000	1.000	1.000	1.000	1097
Board Ownership$_{t-1}$	0.011	0.028	0.000	0.001	0.003	0.009	0.350	1097
Avg. Director Age$_t$	61.722	3.522	48.143	59.364	62.000	64.111	75.333	1097
Avg. Director Tenure$_t$	8.879	3.527	1.456	6.593	8.420	10.580	21.525	1097
CEO Turnover$_t$	0.122	0.328	0.000	0.000	0.000	0.000	1.000	1097
Firm Controls								
Inst. Ownership$_{t-1}$	0.703	0.158	0.003	0.616	0.720	0.806	1.047	1097
Inst. HHI$_{t-1}$	0.049	0.045	0.020	0.032	0.041	0.052	0.673	1097
Business Segments$_{t-1}$	2.801	1.705	1.000	1.000	3.000	4.000	7.000	1097
Firm Age$_{t-1}$	3.142	0.730	1.099	2.708	3.135	3.689	4.466	1097
Firm Performance Annually								
Firm Size$_{t-1}$	7.950	1.607	3.980	6.806	7.856	9.048	11.801	1097
MTB Ratio$_{t-1}$	2.814	2.825	0.154	1.275	1.973	3.220	23.153	1097
ROA$_{t-1}$	0.048	0.096	-0.571	0.021	0.053	0.090	0.349	1097
Sales Growth$_{t-1}$	1.013	0.066	0.681	0.988	1.011	1.037	1.570	1097
LT-Leverage$_{t-1}$	0.188	0.161	0.000	0.057	0.176	0.272	0.913	1097
SD of ROA$_{t-1}$	0.052	0.067	0.003	0.013	0.027	0.063	0.531	1097
BHR 90 days$_t$	0.055	0.204	-0.603	-0.066	0.050	0.155	0.850	1097
Peer Firm Size$_{t-1}$	6.975	1.234	1.422	6.148	6.993	7.780	11.013	1097
Peer MTB-Ratio$_{t-1}$	3.424	3.354	0.173	1.903	2.526	3.741	46.926	1097
Peer ROA$_{t-1}$	-0.009	0.152	-1.264	-0.018	0.034	0.063	0.267	1097
Peer Sales Growth$_{t-1}$	1.021	0.051	0.792	0.999	1.019	1.042	1.372	1097
Peer LT-Leverage$_{t-1}$	0.185	0.114	0.000	0.098	0.169	0.254	0.732	1097
Peer SD of ROA$_{t-1}$	0.081	0.086	0.004	0.030	0.056	0.095	1.011	1097
Peer Stock Return$_t$	0.071	0.257	-0.797	-0.052	0.052	0.154	3.750	1097
Firm Performance Quarterly								
Firm Size$_{t-1}$	7.912	1.623	3.280	6.724	7.819	8.984	11.784	1097
MTB$_{t-1}$	2.790	2.865	0.199	1.222	1.950	3.109	20.366	1097
ROA$_{t-1}$	0.049	0.100	-0.581	0.020	0.055	0.093	0.357	1097
Sales Growth$_{t-1}$	1.075	0.272	0.309	0.954	1.055	1.149	4.274	1097
LT-Leverage$_{t-1}$	0.194	0.177	0.000	0.046	0.179	0.280	1.237	1097
SD of ROA$_{t-1}$	0.049	0.066	0.001	0.011	0.024	0.059	0.542	1097
BHR 90 days$_t$	0.055	0.204	-0.603	-0.066	0.050	0.155	0.850	1097
Peer Firm Size$_{t-1}$	6.928	1.222	1.033	6.106	6.930	7.719	10.941	1097
Peer MTB-Ratio$_{t-1}$	3.170	2.880	0.118	1.805	2.447	3.571	35.571	1097
Peer ROA$_{t-1}$	-0.005	0.153	-1.300	-0.019	0.034	0.066	0.207	1097
Peer Sales Growth$_{t-1}$	1.130	0.252	0.506	1.012	1.095	1.216	3.143	1097
Peer LT-Leverage$_{t-1}$	0.202	0.132	0.000	0.100	0.183	0.277	0.797	1097
Peer SD of ROA$_{t-1}$	0.068	0.067	0.002	0.027	0.050	0.088	0.856	1097
Peer Stock Return$_t$	0.071	0.257	-0.797	-0.052	0.052	0.154	3.750	1097

6.3.6 Descriptive statistics

Table 6.7 reports the descriptive statistics of the final sample, which covers 1,097 appointment announcements between 1st January 2009 and 31st December 2014. In only 8.9% of all announcements, the focal board appointed a quad-qualified director. While

Table 6.8: Univariate Test of Appointment Model

This table reports the sample means for appointments of quad-qualified, i.e. *App. Dir is QQ* = 1, and other appointments, i.e. *App. Dir is QQ* = 0. t-tests are used to test the significant difference in means. Variables are as defined in Table 6.13. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	App. Dir is QQ = 1 (n=98)		*App. Dir is QQ* = 0 (n=999)		*Difference* (n=1,097)	
Variables	Mean	Median	Mean	Median	Mean	Median
Nbr. QQ Dirs$_t$	0.704	0.000	0.577	0.000	0.127	0.000*
Cur. Employ.-Rel.$_t$	0.032	0.000	0.029	0.000	0.003	0.000
Prior Employ.-Rel.$_t$	0.077	0.000	0.045	0.000	0.032*	0.000***
App. Director Age$_t$	4.081	4.078	4.020	4.025	0.061***	0.053***
Outsider Ratio$_{t-1}$	0.859	0.875	0.856	0.875	0.003	0.000
Duality$_{t-1}$	0.041	0.000	0.036	0.000	0.005	0.000
Boardsize$_{t-1}$	9.449	9.000	9.304	9.000	0.145	0.000
Board Expansion$_t$	0.531	1.000	0.584	1.000	-0.053	0.000
Board Ownership$_{t-1}$	0.009	0.003	0.011	0.004	-0.002	-0.001
Avg. Director Age$_t$	62.058	62.150	61.689	61.900	0.369	0.250
Avg. Director Tenure$_t$	9.092	8.729	8.858	8.413	0.234	0.316
CEO Turnover$_t$	0.153	0.000	0.119	0.000	0.034	0.000
Inst. Ownership$_{t-1}$	0.702	0.729	0.703	0.718	-0.001	0.011
Inst. HHI$_{t-1}$	0.050	0.037	0.049	0.041	0.001	-0.004
Nbr. Business Segments$_{t-1}$	2.684	2.000	2.813	3.000	-0.129	-1.000
Firm Age$_{t-1}$	3.158	3.113	3.141	3.135	0.017	-0.022
Firm Size$_{t-1}$	8.214	8.115	7.882	7.788	0.332*	0.327**
MTB$_{t-1}$	2.892	1.863	2.780	1.952	0.112	-0.089
ROA$_{t-1}$	0.064	0.054	0.048	0.055	0.016	-0.001
Sales Growth$_{t-1}$	1.085	1.042	1.074	1.056	0.011	-0.014
LT-Leverage$_{t-1}$	0.171	0.140	0.196	0.180	-0.025	-0.040
SD of ROA$_{t-1}$	0.058	0.027	0.048	0.024	0.010	0.003
BHR 90 days$_t$	0.072	0.052	0.054	0.050	0.018	0.002
Peer Firm Size$_{t-1}$	6.724	6.746	6.948	6.979	-0.224*	-0.233*
Peer MTB-Ratio$_{t-1}$	3.143	2.678	3.172	2.434	-0.029	0.244
Peer ROA$_{t-1}$	-0.028	0.029	-0.002	0.034	-0.026	-0.005
Peer Sales Growth$_{t-1}$	1.170	1.102	1.126	1.095	0.044	0.007
Peer LT-Leverage$_{t-1}$	0.175	0.138	0.205	0.187	-0.030**	-0.049**
Peer SD of ROA$_{t-1}$	0.075	0.058	0.067	0.048	0.008	0.010
Peer Stock Return$_t$	0.040	0.049	0.074	0.053	-0.034	-0.004

the maximum number of quad-qualified directors who already sit on the board at the time of the announcement is six, the average across all announcements is 0.588 directors. The median firm has no quad-qualified director. As a preliminary test, a univariate analysis is conducted on all baseline model variables, including annually measured performance and peer controls.

Table 6.8 reports t-tests for the difference in means and median by whether the board appointed a quad-qualified director or not. In reference to hypothesis H1, a

weakly significant difference is observed on about the median number of quad-qualified directors on the appointing board (*Nbr. QQ Dirs*). Also, opposing the concept of director independence, quad-qualified directors with prior employment ties to the board are more likely to be appointed. Further, as aforementioned, the close association between age and experience is evidenced by a strongly significant difference. The appointed quad-qualified directors are about 3.5 years older than others. About firm-specific characteristics, the firms that appoint quad-qualified directors appear to be larger. When firms' peers are large and leveraged, it may be less likely that the focal firm appoints a quad-qualified director.

6.4 Empirical Results

6.4.1 Baseline model

With regard to Hypothesis 1, the analysis involves testing the full model as outlined in equation 6.4. It is expected that *Nbr. QQ Dirs* has a significant positive effect on the binary dependent variable *App. Dir is QQ*. The model is analysed throughout using logistic regression methodology with industry and calendar year fixed effects. The baseline model in Table 6.9 uses the two-digit SIC code as industry classification and firm-clustered standard errors. In checking for the stability of the relationship, the relationship is analysed with various configurations of control variables, using both annual and quarterly firm performance data as well as peer effects. The focal variable *Nbr. QQ Dirs* is only considered with its first-order effect. Additional results presented in the appendix (see Table 6.15) suggest that there is no curvilinear effect of *Nbr. QQ Dirs*.

In terms of the baseline model in Table 6.9, the results give evidence as to the expected relationship; *Nbr. QQ Dirs* is positive at 5% significance level. Notably, the table only reports the coefficients of estimators and their standard errors, which does not allow for inferences regarding the economic effect. Furthermore, *App. Dir. Age* is strongly significantly positive, which is not surprising, given that director expertise is generally age-related and experience-related human capital is an integral part of the quad model. No other director-, TMT-, and board-specific controls are significant throughout the various specifications.

The results further suggest that *Firm Size* has a strong positive effect on whether a quad-qualified director is appointed. Contrary, the corresponding peer effect is significantly

negative. The same applies to a firm's buy-hold return. While *BHR 90 days* is only weakly positively significant at the 10% level, its peer effect is significant and negative. This suggests that quad-qualified directors are more likely to join larger and well-performing firms, which confirms common predictions.

Table 6.9: Logistic Regression Results: Baseline Model

This table reports the results from the logistic regression of the main model with *App. Director is QQ (0/1)* as the dependent variable and *Nbr. QQ Dirs* as the main model variable of interest. Variables are as defined in Table 6.13. Robust standard errors, clustered by firm, are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Performance Measurement			Annually			Quarterly	
Dependent Variable			App. Director is QQ (0/1)				
Nbr. QQ Dirs$_t$	0.219**	0.250**	0.258**	0.313**	0.307**	0.318**	0.342**
	(0.106)	(0.123)	(0.123)	(0.130)	(0.139)	(0.131)	(0.140)
Cur. Employ.-Rel.$_t$	-0.515	-0.544	-0.529	-0.562	-0.597	-0.560	-0.643
	(0.805)	(0.806)	(0.796)	(0.781)	(0.765)	(0.782)	(0.785)
Prior Employ.-Rel.$_t$	0.850	0.857	0.801	0.659	0.445	0.669	0.635
	(0.584)	(0.581)	(0.573)	(0.591)	(0.611)	(0.579)	(0.611)
App. Director Age$_t$	4.305***	4.374***	4.420***	4.422***	4.560***	4.572***	4.682***
	(0.823)	(0.877)	(0.890)	(0.898)	(0.896)	(0.923)	(0.904)
Outsider Ratio$_{t-1}$		0.837	1.030	0.674	2.171	0.956	2.052
		(1.966)	(1.983)	(2.095)	(2.247)	(2.117)	(2.282)
Duality$_{t-1}$		0.344	0.330	0.291	0.174	0.160	0.072
		(0.661)	(0.685)	(0.658)	(0.698)	(0.673)	(0.681)
Boardsize$_{t-1}$		-0.000	0.023	-0.069	-0.097	-0.065	-0.108
		(0.061)	(0.062)	(0.070)	(0.074)	(0.070)	(0.074)
Board Expansion$_t$		-0.285	-0.286	-0.390	-0.370	-0.394	-0.411
		(0.246)	(0.249)	(0.253)	(0.256)	(0.251)	(0.254)
Board Ownership$_{t-1}$		-6.735	-6.788	-5.140	-5.457	-4.869	-5.805
		(8.205)	(8.964)	(8.574)	(9.045)	(8.173)	(8.783)
Avg. Director Age$_t$		0.011	0.016	0.021	0.015	0.020	0.018
		(0.043)	(0.043)	(0.044)	(0.046)	(0.046)	(0.046)
Avg. Director Tenure$_t$		-0.006	-0.007	-0.008	0.008	-0.007	0.003
		(0.040)	(0.042)	(0.044)	(0.046)	(0.044)	(0.047)
CEO Turnover$_t$		0.287	0.234	0.256	0.176	0.245	0.150
		(0.340)	(0.345)	(0.354)	(0.356)	(0.357)	(0.361)
Inst. Ownership$_{t-1}$			-0.069	0.385	0.122	0.382	0.237
			(0.821)	(0.881)	(0.921)	(0.865)	(0.912)
Inst. HHI$_{t-1}$			0.080	1.709	0.669	1.871	1.285
			(3.057)	(3.026)	(3.156)	(3.023)	(3.088)
Nbr. Business Segments$_{t-1}$			-0.084	-0.077	-0.045	-0.078	-0.074
			(0.088)	(0.092)	(0.100)	(0.089)	(0.093)
Firm Age$_{t-1}$			-0.083	-0.182	-0.195	-0.163	-0.129
			(0.214)	(0.217)	(0.228)	(0.217)	(0.232)
Firm Size$_{t-1}$				0.256***	0.388***	0.256***	0.408***
				(0.098)	(0.121)	(0.098)	(0.111)
MTB$_{t-1}$				0.026	0.015	0.037	0.031
				(0.051)	(0.053)	(0.043)	(0.043)
ROA$_{t-1}$				1.424	1.881	0.548	0.826
				(1.509)	(1.530)	(1.479)	(1.458)
Sales Growth$_{t-1}$				-0.226	-0.395	1.395	1.577
				(0.537)	(0.520)	(1.970)	(2.268)
LT-Leverage$_{t-1}$				-0.934	-0.849	-1.479	-1.638*
				...continued			
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	2SIC	2SIC	2SIC	2SIC	2SIC	2SIC	2SIC
Peer Effect	No	No	No	No	Yes	No	Yes
Observations	923	923	923	923	923	923	923
Firm Clusters	432	432	432	432	432	432	432
Pseudo R^2	0.0642	0.0717	0.0746	0.0899	0.121	0.0895	0.121
Wald χ^2	54.12	61.26	64.60	82.64	120.2	79.76	116.2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Performance Measurement			Annually			Quarterly	
Dependent Variable				App. Director is QQ (0/1)			
				(1.065)	(1.189)	(0.913)	(0.963)
SD of ROA_{t-1}				1.836	1.333	0.905	0.438
				(1.694)	(1.803)	(1.612)	(1.749)
BHR 90 $days_t$				0.449	1.102*	0.363	0.964
				(0.641)	(0.648)	(0.626)	(0.649)
Peer Firm $Size_{t-1}$					-0.409**		-0.398***
					(0.162)		(0.152)
Peer MTB-$Ratio_{t-1}$					-0.046		-0.067
					(0.054)		(0.057)
Peer ROA_{t-1}					-0.848		-1.266
					(0.898)		(0.995)
Peer Sales $Growth_{t-1}$					-0.026		-1.300
					(0.468)		(2.454)
Peer LT-$Leverage_{t-1}$					0.205		2.138
					(1.388)		(1.517)
Peer SD of ROA_{t-1}					0.001		-0.783
					(1.748)		(1.672)
Peer Stock $Return_t$					-1.707**		-1.421**
					(0.705)		(0.664)
Constant	-19.897***	-21.238***	-21.584***	-22.651***	-21.551***	-25.065***	-23.256***
	(3.494)	(4.181)	(4.264)	(4.459)	(4.520)	(4.943)	(5.870)
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	2SIC	2SIC	2SIC	2SIC	2SIC	2SIC	2SIC
Peer Effect	No	No	No	No	Yes	No	Yes
Observations	923	923	923	923	923	923	923
Firm Clusters	432	432	432	432	432	432	432
Pseudo R^2	0.0642	0.0717	0.0746	0.0899	0.121	0.0895	0.121
Wald χ^2	54.12	61.26	64.60	82.64	120.2	79.76	116.2

6.4.2 Specification and robustness checks

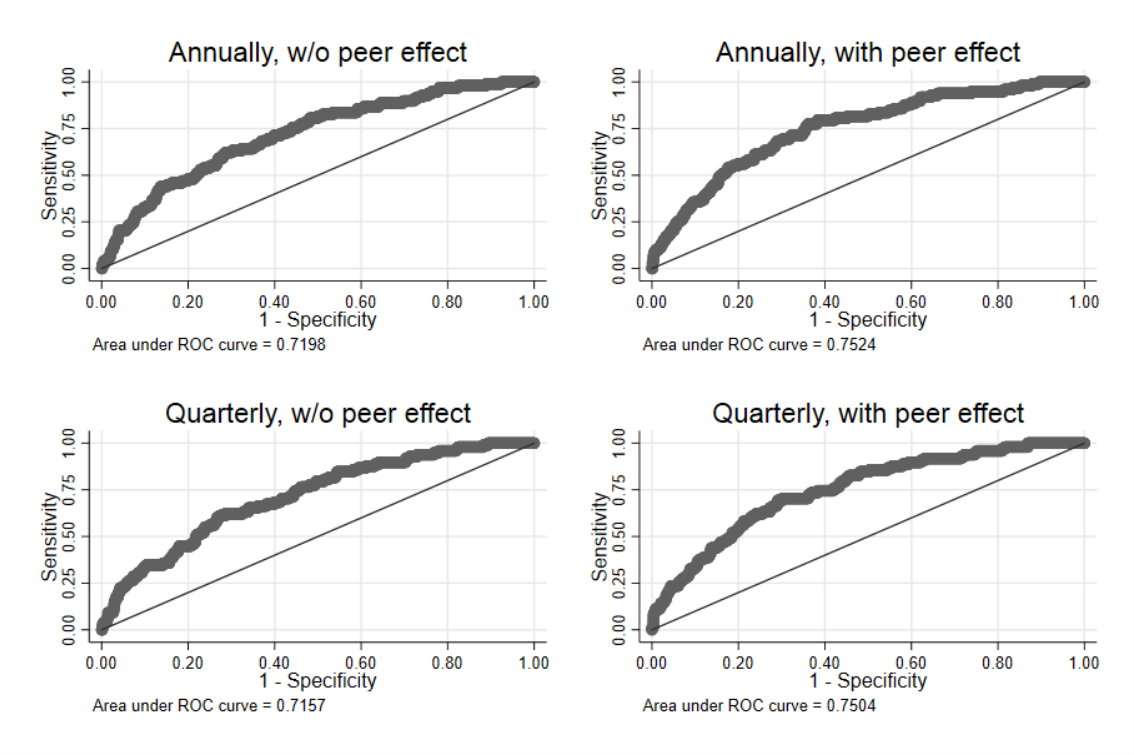
To test the robustness of the model, the main model uses both quarterly and annual data for the firm and peer performance controls. Both χ^2 and Pseudo R^2 in Table 6.9 suggest that the predictive ability is higher when using annual performance data. In contrast to linear regression models, R^2 is not suitable for the logistic regression model. Instead, for each model, the corresponding receiver operating characteristic (ROC) curves are plotted, and the area under the curves (AUCs) are compared. Figure 6.1 shows the four ROC curves that correspond to the baseline models (4)-(7). While the difference in the area under the ROC curve is only marginal, the highest value is achieved when using annual performance variables and peer effects. Therefore, this configuration is selected for the remainder of the empirical analysis.

As further robustness tests, models (4) and (5) in Table 6.9 are re-estimated using different industry classifications and standard error clustering adjustments. These results are illustrated in Table 6.10.

The baseline regression model uses 2-digit SIC codes to account for industry fixed

Figure 6.1: ROC-Curves of Baseline Model

This figure shows the receiver operating characteristic (ROC) curves for each model in Table 6.10. ROC curves plot the true positives (sensitivity) against the false negative (1-specificity) of the prediction. The greater the area under the curve (AUC) is, the more accurate the prediction of the model.



effects. However, regarding the comparably small sample size and the use of a binary dependent variable, observations are likely to be dropped from the analysis if there is no variation of the dependent variable within the same industry group. Moreover, SIC-related industry effects have faced criticism over the composition of appropriate peer groups (Hoberg and Phillips, 2016). Accordingly, the model is re-estimated using the Fama-French 30 Industry Classification. Model 3 in Table 6.10 corresponds to the baseline regression results in Table 6.9. The results are qualitatively the same.

Standard errors of estimators determine the accuracy of a regression model. As the denominator of the t-test, they are crucial for hypothesis testing. For the validity of regression analysis, standard errors are required to be independent of each other. However, in most cases, data are grouped into clusters, i.e. firms or industries, so that standard errors of estimators are only independent across clusters but correlated within clusters. Failing to account for the clustering of standard errors leads to downward biased standard errors, and hence to inflated statistics of t-test and Wald-test (Cameron and Miller, 2015). To investigate this case, Table 6.10 illustrates this effect when the standard errors are cluster-robust only at the industry-level (see model (1) and (3)). Particularly striking to

Table 6.10: Logistic Regression Results: Robustness of Baseline Model

This table reports the logistic regression results of the baseline model with *App. Director is QQ (0/1)* as the dependent variable and *Nbr. QQ Dirs* as the variable of interest. Variable definitions are presented in Table 6.13. Industry fixed effects and standard error clustering vary, as described at the bottom of the table. Significance levels are illustrated by *** p<1%, ** p<5%, * p<10%.

	(1)	(2)	(3)	(4)
Dependent Variable	App. Director is QQ (0/1)			
Nbr. QQ Dirs (t)	0.307***	0.307**	0.258**	0.258**
	(0.099)	(0.139)	(0.125)	(0.130)
Cur. Employ.-Rel. (t)	-0.597	-0.597	-0.527	-0.527
	(0.632)	(0.765)	(0.665)	(0.742)
Prior Employ.-Rel. (t)	0.445	0.445	0.465	0.465
	(0.640)	(0.611)	(0.632)	(0.598)
App. Director Age (t)	4.560***	4.560***	4.311***	4.311***
	(0.709)	(0.896)	(0.828)	(0.899)
NED Ratio (t-1)	2.171	2.171	2.059	2.059
	(2.489)	(2.247)	(2.473)	(2.116)
Duality (t-1)	0.174	0.174	-0.139	-0.139
	(0.666)	(0.698)	(0.692)	(0.803)
Boardsize (t-1)	-0.097	-0.097	-0.076	-0.076
	(0.101)	(0.074)	(0.092)	(0.072)
Board Expansion (t)	-0.370*	-0.370	-0.361	-0.361
	(0.196)	(0.256)	(0.233)	(0.258)
Board Ownership (t-1)	-5.457	-5.457	-4.428	-4.428
	(7.365)	(9.045)	(8.496)	(8.521)
Avg. Director Age (t)	0.015	0.015	0.007	0.007
	(0.035)	(0.046)	(0.034)	(0.045)
Avg. Director Tenure (t)	0.008	0.008	-0.003	-0.003
	(0.044)	(0.046)	(0.056)	(0.046)
CEO Turnover (t)	0.176	0.176	0.130	0.130
	(0.337)	(0.356)	(0.303)	(0.340)
	⋮	⋮	⋮	⋮
Constant	-21.551***	-21.551***	-20.688***	-20.688***
	(3.101)	(4.520)	(3.989)	(4.582)
Year Effect	Yes	Yes	Yes	Yes
Industry Effect	2SIC	2SIC	FF30	FF30
Peer Effect	Yes	Yes	Yes	Yes
Observations	923	923	973	973
Level Cluster-robust SE	2SIC	Firm	FF30	Firm
Number of Clusters	25	432	17	459
Pseudo R^2	0.121	0.121	0.112	0.112
χ^2	17632.08	120.2	7216.84	99.50

this effect is a large increase in the Wald χ^2 statistic (cf. model 1+3 with 2+4).

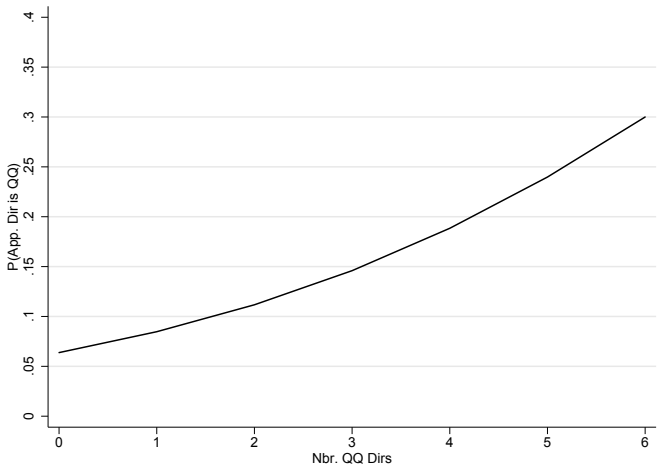
In conclusion, the choice of industry classification does not affect the regression results, but choosing cluster-robust standard errors at the firm-level is highly preferred. Having selected the appropriate baseline regression model (annual performance variables, peer effects, 2-digit SIC industry effects, and firm cluster-robust standard errors), the final step of the main analysis is the interpretation of the economic effects.

Therefore, the marginal effects at the mean (MEM) of the main variable of interest, *Nbr. QQ Dirs*, is calculated. When holding all other variables at their mean value, the percentage change in the conditional expected probability of appointing a quad-qualified director (*App. Dir is QQ*) for a 1% change of *Nbr. QQ Dirs* is 2.164% with a p-value of 2.8%. In Figure 6.2, the adjusted probability of *App. Dir is QQ* is plotted against *Nbr.*

QQ Dirs. For example, when there are already two quad-qualified directors on the board, the total adjusted probability of appointing another quad-qualified director as compared to appointing a non-quad-qualified director is about 11%.

Figure 6.2: Adjusted Probability of Appointing a Quad-Qualified Director

This figure shows the adjusted prediction of *Nbr. QQ Directors* on P(*App. Dir is QQ*), holding all other covariates constant. The gray shade is its 95% confidence interval.



6.4.3 Critical mass hypothesis

Hypothesis 2 predicts that there is a critical mass level of two quad-qualified directors at which there is a positive effect on the likelihood of appointing a quad-qualified director. Accordingly, critical mass levels are analysed when there is none, one, or two quad-qualified directors on the board. Table 6.11 shows that the distribution of critical mass levels is very right-hand skewed with more than 60% of all boards having no quad-qualified director.

The regression analysis strictly follows the baseline model with the corresponding critical mass variable replacing *Nbr. QQ Dirs*. Based on previous results, the industry groups are based on the 2-digit SIC code, and standard errors are cluster-robust at the firm-level. Performance is measured annually and peer performance effects are included.

The results in Table 6.12 exhibit a significant effect for boards with a minimum of 1 or 2 quad-qualified directors, whereas no significance can be observed for boards with no quad-qualified director. The corresponding marginal effects, when holding all other variables constant at their respective means, are reported in brackets in Table 6.12. The percentage change in the conditional expected probability of appointing a quad-qualified director is 4% larger when the board has at least 1 quad-qualified director (*t-statistic* = 1.8181) and 5.7% larger when the board has at least 2 such directors (*t-statistic* = 1.7813).

Table 6.11: Distribution of Critical Mass Levels

This table reports the distribution of critical mass levels in *Nbr. QQ Dirs*. The upper value reflects the percentage of all observations within the calendar year specified in the first column. The lower value reflects its total frequency.

Calendar Year	No QQ Dir	Min. 1 QQ Dir	Min. 2 QQ Dirs	Min. 3 QQ Dirs	Min. 4 QQ Dirs	N
2009	0.695	0.305	0.141	0.046	0.027	262
	182	80	37	12	7	
2010	0.640	0.360	0.157	0.045	0.015	267
	171	96	42	12	4	
2011	0.654	0.346	0.159	0.045	0.014	289
	189	100	46	13	4	
2012	0.543	0.457	0.130	0.056	0.019	162
	88	74	21	9	3	
2013	0.472	0.528	0.111	0.042	0.014	72
	34	38	8	3	1	
2014	0.600	0.400	0.222	0.044	0.022	45
	27	18	10	2	1	
Total	0.629	0.370	0.150	0.046	0.018	1,097
	691	406	164	51	20	

Table 6.12: Logistic Regression Results: Critical Mass Levels

This table reports the results from the logistic regression in the context of the critical mass hypothesis. *App. Director is QQ (0/1)* is the dependent variable, *No QQ Dir* is a dummy variable equal to 1 if the board has no incumbent quad-qualified director and *Min. X QQ Dir* relates to the critical mass levels with X minimum number of quad-qualified directors. Variables are as defined in Table 6.13. Robust standard errors, clustered by firm, are reported in parentheses. Significance levels are denoted *** p<1%, ** p<5%, * p<10%.

Model	(1)	(2)	(3)
Performance Measurement		Annually	
Dependent Variable		App. Director is QQ (0/1)	
No QQ Dir$_t$	-0.544**		
	(0.251)		
	[-0.040]		
Min. 1 QQ Dir$_t$		0.544**	
		(0.251)	
		[0.040]	
Min. 2 QQ Dir$_t$			0.638***
			(0.202)
			[0.057]
	⋮	⋮	⋮
Peer Performance Controls	Yes	Yes	Yes
Industry (2-digit SIC) Fixed Effect	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Level Cluster-robust SE	Firm	Firm	Firm
Observations	923	923	923
Firms	432	432	432
Pseudo R^2	0.120	0.120	0.120
Wald χ^2	115.7	115.7	111.1

6.5 Discussion

This chapter tests the relationship between the presence of quad-qualified directors and monitoring effectiveness in the context of director appointments. The principal proposition is that a monitoring inclined board is more likely to appoint a quad-qualified director.

The findings clearly show a significantly positive relationship between the presence of quad-qualified directors and its choice to appoint further quad-qualified directors. Further, only a single quad-qualified director has to be present to induce the appointment of a quad-qualified director. Yet, the marginal effect is highest when the appointing board has two incumbent quad-qualified directors.

6.5.1 Theoretical contribution

Extant literature widely emphasises the governance problems arising from a board which neglects its monitoring responsibilities. Prerequisite to an effective governance system is the selection of qualified directors.

While the selection and appointment of directors are not directly related to governance problems, it has long-term consequences for the board and its monitoring effectiveness. The previous chapters document that boards with quad-qualified directors possess effective monitoring capabilities. Therefore, analysing director appointments helps to understand whether quad-qualified boards can retain or even strengthen their monitoring capabilities. The results support this notion, and thereby add to the literature in several ways.

First, the positive effect of board quad-qualification on the prediction of appointing another quad-qualified director shows that a quad-qualified board can withstand executive interests. This relationship strengthens the idea of the quad model to identify directors who have the qualities to challenge possible interference in board decisions. Also, this finding underpins the resource-providing nature of directors to bridge information gaps as means to make effective decisions (see prior empirical chapter and e.g. Dass et al., 2014; Nanda and Onal, 2016; Drobetz et al., 2018). Apart from that, this chapter fundamentally substantiates the argument that directors prefer like-minded (Westphal and Zajac, 1995; Withers et al., 2012) and equally qualified candidates (Eminet and Guedri, 2010). Altogether, the central insight of this chapter is that quad-qualified directors induce effective decision control through the appointment of qualified directors.

Second, the choice to appoint a quad-qualified director is consistent with the considerations of Hermalin (2005) regarding the bargaining process between the board and the CEO.

A board with quad-qualified directors would be prone to exercise effective monitoring of the CEO. Thus, appointing another quad-qualified director should automatically constrain future attempts of the CEO to capture the board. While it is practically feasible for the CEO to co-opt even quad-qualified directors, the social independence, established expertise, bandwidth and motivation should sufficiently equip the quad-qualified director to countervail any social influence behaviour, e.g. ingratiation by the CEO (e.g. Westphal and Zajac, 2013). Ultimately, this strengthens outside directors' bargaining position within the board and contains CEO power.

Third, the results confirm that quad-qualified boards select seemingly like-minded director candidates. Further, the analysis of critical mass levels suggests that this is the case in the presence of at least one and two quad-qualified directors – with the latter having a higher marginal effect. On the one hand, this is consistent with the quad model authors' proposition that even the addition of a single quad-qualified director affects board monitoring effectiveness. On the other hand, the effect is larger when there is a group of quad-qualified directors in place. Quad-qualified directors will appoint like-minded and motivated directors up to a threshold-level of three, after which no more quad-qualified directors are appointed. As observed in Chapter 4, group dynamics and minority influence accordingly take an important part in a board's monitoring effectiveness. The results strengthen the proposition regarding group dynamics by Hambrick and colleagues. While prior literature mostly examines group dynamics concerning demographic characteristics, also the formation of a group based on holding similar views influences board functioning. Given that this is not the case because these group members possess adequate levels in both ability and motivation, the results still confirm recent findings by Adams et al. (2018) that effective boards need a certain level of commonality. On the other hand, since this chapter considers quad-qualified directors' expertise more broadly and not domain-specific, the findings provide evidence that quad-qualified boards seek to appoint generalists. This corresponds with recent literature highlighting the benefits of directors with diversity in experience, skills, and knowledge (Tasheva and Hillman, 2019).

6.5.2 Concluding remarks

This chapter shows that quad-qualified directors appoint quad-qualified directors, which substantially strengthens the notion that directors seek to appoint like-minded and equally qualified candidates. Seeing that various agents, including the CEO, often sway

the director selection process, the appointment of a quad-qualified director by a board with quad-qualified directors present, in fact, demonstrates monitoring effectiveness. Correspondingly, the results suggest that quad-qualified directors can contain executive power over the director selection process, indicate how the formation of a quad-qualified board can contribute to a sustainable functioning of the board, and highlights the effect of similarity-attraction (e.g. views, status) on the board's decision-making process.

6.A Appendix

Table 6.13: Variable Description

Indicators for variable timing are defined as: LD = trading day prior announcement day, LM = latest month prior announcement month, LCQ = latest calendar quarter-end prior announcement month, LFQ = latest fiscal quarter-end prior announcement month, LCY = latest calendar year-end prior announcement month, LFY = latest fiscal year-end prior announcement month.

Variables	Timing	Description	Source
Director & Board Characteristics			
App. Director is QQ (0/1)	LM	Dummy indicating whether appointee is a quad-qualified outside director	See Subsection 6.3.2
Nbr. QQ Dirs$_t$	LM	Sum of incumbent quad-qualified outside directors	See Subsection 6.3.2
Cur. Employ.-Rel.$_t$	LM	Current employment relationship of appointee with incumbent directors	See Chapter 3
Prior Employ.-Rel.$_t$	LM	Prior employment relationship of appointee with incumbent directors	See Chapter 3
App. Director Age$_t$	LM	Natural log of appointee's age	BoardEx
Outsider Ratio$_{t-1}$	LFY	Ratio of non-executive (outside) directors	BoardEx
Duality$_{t-1}$	LFY	CEO-Chairman duality	BoardEx
Boardsize$_{t-1}$	LFY	Natural log of total number of board members	BoardEx
Board Expansion$_t$	LFY	Dummy indicating whether board size has increased at fiscal year-end	BoardEx
Board Ownership$_{t-1}$	LFY	Percentage ownership of firm's stock held by all board members	BoardEx
Avg. Director Age$_t$	LM	Avg. age of board members	BoardEx
Avg. Director Tenure$_t$	LM	Avg. tenure of incumbent board members	BoardEx
CEO Turnover$_t$	LM	CEO turnover during the last 12 months	See Chapter 4
Firm Characteristics			
Inst. Ownership$_{t-1}$	LFY	Percentage ownership held by active institutional investors	Thomson Reuters 13-F
Inst. HHI$_{t-1}$	LFY	HHI of institutional ownership	Thomson Reuters 13-F
Nbr. Business Segments$_{t-1}$	LFY	Number of business segments	Compustat
Firm Age$_{t-1}$	LFY	Natural log of firm's age	Compustat, CRSP
Firm Performance			
Firm Size$_{t-1}$	LFQ/LFY	Natural log of total assets	Compustat
MTB$_{t-1}$	LFQ/LFY	Market to book value of equity	Compustat
ROA$_{t-1}$	LFQ/LFY	Return on assets	Compustat
Sales Growth$_{t-1}$	LFQ/LFY	Growth in firm sales during last fiscal year (equiv. 4 fiscal quarters)	Compustat
LT-Leverage$_{t-1}$	LFQ/LFY	Ratio of long-term leverage to total assets	Compustat
SD of ROA$_{t-1}$	LFQ/LFY	Standard deviation of ROA in the past 5 (min. 3) fiscal years (equiv. 20 (min. 12) fiscal quarters)	Compustat
BHR 90 days$_t$	LD	Firm stock's buy-hold return during the 90 days prior to announcement	CRSP

Table 6.14: Summary Statistics of Director-Level Data

This table reports the summary statistics of director-level variables for the monthly-measured sample for every month within the sample period from January 2009 to December 2014. Panel A refers to the director-month observations, lagged by one month, including winsorising at 1%, which are used to calculate the appointee *QQ Score*. Panel B refers to the director-firm-month observations including winsorising at 1%, which are used to calculate the incumbent board member *QQ Score*. Observations are matched by firm and announcement date with the director appointee sample in Panel A.

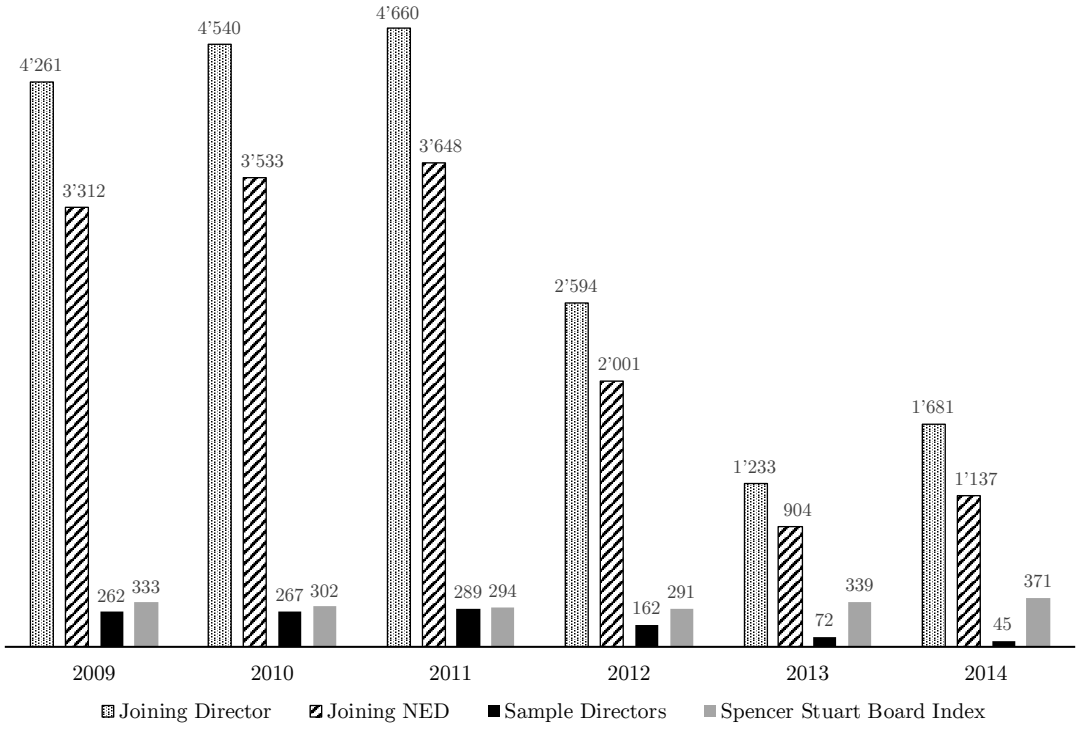
Variables	Mean	SD	Min	Q1	Med	Q3	Max	N
Panel A: *Appointees*								
QQ Score	2.490	0.734	0.000	1.970	2.521	3.054	4.000	1,471,350
QQ Dir	0.069	0.253	0.000	0.000	0.000	0.000	1.000	1,471,350
Independence	0.610	0.331	0.000	0.316	0.645	0.974	1.000	1,442,137
Expertise	0.501	0.292	0.000	0.253	0.505	0.758	1.000	1,442,137
Bandwidth	0.815	0.389	0.000	1.000	1.000	1.000	1.000	1,471,350
Motivation	0.608	0.488	0.000	0.000	1.000	1.000	1.000	1,417,489
Outside Shared Experience	65.406	88.487	0.000	3.000	37.000	86.000	3,067.000	1,471,350
Industry Experience	106.992	92.976	0.000	36.000	85.000	156.000	875.000	1,471,350
Public Board Experience	219.545	260.997	0.000	48.000	134.000	295.000	3,625.000	1,471,350
AC Experience	89.585	134.477	0.000	0.000	34.000	130.000	1,706.000	1,471,350
NC Experience	84.031	131.516	0.000	0.000	27.000	120.000	1,612.000	1,471,350
CC Experience	90.693	137.907	0.000	0.000	35.000	129.000	1,750.000	1,471,350
Busy Size	0.185	0.389	0.000	0.000	0.000	0.000	1.000	1,471,350
Additional Outside Directorships	0.570	0.860	0.000	0.000	0.000	1.000	6.083	1,471,350
App. Firm MV	5,917.952	13,380.696	0.481	219.621	977.687	4,037.618	187,577.281	1,417,489
Min. MV of Outside Directorships	3,317.911	15,808.107	0.000	0.000	75.107	1,129.642	626,550.313	1,471,350
Panel B: *Incumbent Board Members*								
QQ Score	2.175	0.804	0.040	1.525	2.141	2.747	4.000	1,632,646
QQ Dir	0.071	0.257	0.000	0.000	0.000	0.000	1.000	1,632,646
Independence	0.445	0.332	0.000	0.131	0.495	0.747	1.000	1,632,646
Expertise	0.499	0.291	0.000	0.242	0.495	0.747	1.000	1,632,646
Bandwidth	0.900	0.300	0.000	1.000	1.000	1.000	1.000	1,632,646
Motivation	0.332	0.401	0.000	0.000	0.000	0.758	1.000	1,632,646
Outside Shared Experience	0.930	0.173	0.000	0.984	1.000	1.000	1.000	1,632,646
TW-Co-opted	0.226	0.271	0.000	0.000	0.117	0.393	1.000	1,632,646
Public Board Experience	20.600	20.190	0.250	6.583	14.333	27.750	118.167	1,632,646
Industry Experience	9.899	7.208	0.000	4.333	8.583	13.917	34.250	1,632,646
Tenure Overlap	4.886	3.185	0.000	2.361	4.500	6.883	14.845	1,632,646
Director Tenure	7.568	5.962	0.000	2.833	6.083	10.917	24.833	1,632,646
Busy Size	0.100	0.300	0.000	0.000	0.000	0.000	1.000	1,632,646
Perc. Ownership	0.001	0.003	0.000	0.000	0.000	0.000	0.035	1,632,646

Table 6.15: Logistic Regression Results: Non-linear Model

	(1)	(2)	(3)	(4)
Performance Measurement	Annually		Quarterly	
Dependent Variable	App. Director is QQ (0/1)			
Nbr. QQ Dirs$_t$	0.556*	0.556	0.595**	0.595*
	(0.292)	(0.342)	(0.282)	(0.340)
Nbr. QQ Dirs$_t$ * Nbr. QQ Dirs$_t$	-0.089	-0.089	-0.090	-0.090
	(0.079)	(0.110)	(0.079)	(0.108)
	⋮	⋮	⋮	⋮
Peer Performance Controls	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Level Cluster-robust SE	Industry	Firm	Industry	Firm
Observations	923	923	923	923
Firm Clusters	25	432	25	432
Pseudo R^2	0.122	0.122	0.122	0.122
Wald χ^2	15613.57	121.3	2081.06	116.5

Figure 6.3: Director Appointments Reported in BoardEx (2009–2014)

This figure shows the distribution of announcements for different director types in the BoardEx 'Board and Director Announcements' dataset. *Joining Director* refers to all incoming director-related announcements. The figure *Spencer Stuart Board Index* is for means of comparison and refers to all independent director appointments in the S&P 500 (Spencer Stuart, 2019, 2017, 2015, 2014, 2012).



Chapter 7

Conclusions

7.1 Summary of Findings

This thesis attends to the quad model by Hambrick and colleagues and the question of what constitutes an effective director and board, respectively. On that score, this thesis particularly focuses on three monitoring domains: CEO turnovers, CEO pay, and director appointments.

Based on an in-depth literature review in Chapter 2, which corroborates the propositions of Hambrick et al. (2015) and others (e.g., Forbes and Milliken, 1999; Payne et al., 2009; Boivie et al., 2016a) that an individual's performance in specific monitoring tasks is a function of the individual's ability and motivation, this thesis develops an approach to operationalise the quad model and empirically test it in the context of both individual-level and board-level quad-qualification. This approach allows testing the propositions made by Hambrick and colleagues, which are, to date, not substantiated by any study.

The resulting insights extensively contribute to the corporate governance and the strategic leadership literature in several ways. They generally provide a better understanding of the microfoundations of effective board monitoring and particularly highlight the importance of focusing on the dynamics between individual-level characteristics and their effects on group-level outcomes.

7.1.1 Quad-qualification and CEO turnover-performance sensitivity

The findings of Chapter 4 indicate that the addition of quad-qualified directors leads to greater monitoring effectiveness regarding CEO turnover decisions. This effectiveness rests upon the board's ability and motivation to process information more efficiently, to

interpret signals regarding CEO ability more effectively, and finally to make appropriate decisions about the CEO's future within the company.

The results show that the greater ability and motivation is less needed when boards decide to involuntarily dismiss a CEO, which is generally preceded by a substantial loss in shareholder value. In fact, quad-qualification is particularly important in non-forced CEO turnover decisions which often rest on less public and more private information. Quad-qualified boards then appear to factor external contingencies, i.e. peer firm performance, into their decision-making process.

While quad-qualified directors are not unicorns on the director labour market, they constitute a minority among outside directors. Interestingly, the results show that a minority of three quad-qualified directors on the board already induces effective decision-making. Supported by the minority influence literature, this finding fundamentally supports the Hambrick and colleagues' emphasis on a director-level identification of quad-qualification and their considerations concerning group dynamics. Beyond demographic characteristics, this result altogether suggests that critical mass levels take an important part in the functioning of the board.

7.1.2 Quad-qualification and incentive-aligned CEO pay

Chapter 5 extends the analysis of CEO ability and whether quad-qualified boards appropriately reward and punish CEOs towards CEO pay. In contrast to the prevailing argument that boards deliver effective monitoring when CEO pay is closely related to firm performance, and excessive pay levels are rare, the findings unambiguously show that firms overpay the CEOs when the board has quad-qualified directors. Further, CEOs also receive a greater share of total top executive compensation, which suggests that CEOs under quad-qualified boards are given greater importance. These findings are robust to whether quad-qualification is measured on the board or the compensation committee.

Such findings are not surprising considering that extant research underpins the endogenous relationship between board composition and monitoring effectiveness in the context of CEO-related decisions (i.e. Hermalin (2005) model). Correspondingly, the results show that although CEOs receive higher compensation in the presence of quad-qualified directors, their past superior stock performance justifies greater ability and hence higher pay. Moreover, the greater monitoring propensity and ability of quad-qualified directors increase the CEO's job risk, which is essentially supported by the greater

CEO turnover-performance sensitivity of quad-qualified boards, as shown in Chapter 4. Thus, the CEO receives compensation for this increased risk, which reflects under these circumstances, optimal contracting.

Much of the extant literature emphasises on a strongly positive relationship between firm performance and CEO compensation to signal optimal contracting. However, when directors have the ability and motivation to examine managerial actions and performance directly, then the strength of this relationship should be weaker. Therefore, fundamentally supporting both agency and resource-dependence perspectives, another explanation for the challenging findings regarding the traditional optimal contracting prediction is that quad-qualification reduces a board's need to rely on public information, e.g. through stock-based incentives.

7.1.3 The appointment of quad-qualified directors

Chapter 6 picks up on the relationship between the board and the CEO. As proposed by Hermalin (2005) and others, board composition is ultimately a bargaining game, in which CEOs can bargain for less monitoring propensity in exchange for proven ability. Thus, monitoring-inclined boards would appoint a director who can carry out effective monitoring, because it strengthens their position in the bargaining game, and it further extends a board's monitoring capabilities. Accordingly, the findings demonstrate that the current presence of other quad-qualified directors drives the probability of appointing another quad-qualified director.

Finally, the findings further underpin Hambrick and colleagues' proposition regarding that group dynamics and minority influence are essential determinants of effective board monitoring. As the presence of incumbent quad-qualified directors increases, it is more likely to appoint another quad-qualified director, which resembles prior studies finding that boards seek to appoint like-minded and equally qualified directors. Further, although the results suggest that even one quad-qualified director is sufficient to impose a significant effect on the probability of appointing a quad-qualified director, the effect is strongest when the board has a minimum of two quad-qualified directors.

Altogether, the appointment of quad-qualified directors increases a board's chances to retain and even extend its monitoring effectiveness.

7.2 Practical Implications

Learning from the theoretical contributions of this thesis, there are important practical implications for firms and directors.

First, the shift from the customary board-averages approach to the individual level approach has great practical relevance. While the vast majority of prior research focuses on the board rather than the individual directors (Johnson et al., 2013), the quad model offers decision-makers a tool to identify directors suitable for delivering effective monitoring. Appointing individually quad-qualified directors is a more direct and less complex approach to board composition. Therefore, it is more efficient than optimising board composition towards an overall sufficiently qualified board. For instance, in the context of CEO turnovers, the presented evidence suggests that firms may need to appoint three or more quad-qualified directors to achieve optimal effectiveness in monitoring the CEO's ability relative to firm performance.

Second, the supply of fully suitable directors on the director labour market is scarce. Driven by prior studies on the individual attributes, the identification process of quad-qualified directors sets high requirements. At least, an ideal director candidate has no tie to the incumbent CEO, has strong industry-related expertise, has not more than two other board memberships and is sufficiently motivated. In this context, Chapter 6, which investigates the labour market for quad-qualified directors, shows that it is more likely for firms which have already a quad-qualified director on the board, to appoint another one. This circumstance suggests that the initial costs of composing a quad-qualified board, including efforts taken to overcome managerial power, is high when the incumbent board has no quad-qualified director. However, this would pay off in the long term, because any subsequent additional appointment of a quad-qualified director is less costly. Accordingly, an initial step in the practical implementation of the quad model is to raise its awareness among practitioners. Since quad-qualification is only broadly defined and not a recognised metric, it would be advantageous for the model's wider recognition if practitioners can agree to certain key requirements for satisfying quad attributes. This thesis generally applies the quad model according to widespread convictions of needed director qualification and thereby provides practitioners with some methodological guidelines.

Third, the results altogether serve as a starting point towards a more comprehensive understanding of boardroom dynamics. Practitioners should particularly be interested in how to structure corporate boards to unfold the full potential of adding quad-qualified

directors. The results of this thesis contrast current practices and regulations, which are mostly associated with board independence. Instead, practitioners are well-advised to consider the holistic approach of the quad model, which, besides, assumes the cognitive ability of directors and their motivation. In particular about monetary rewards as a means to motivate directors, the recent development among S&P 500 firms (cf. Section 2.1) documents that the majority of directors also receive board compensation in equity pay. This trend should align their interests more closely with shareholders – an approach that is supported by this thesis.

7.3 Future Research Avenues

Despite strong support for the quad model, this thesis has its limitations. First, drawing from critical mass theory, the results underpin that firms shall emphasise more on boardroom dynamics. It is in the interest of shareholders that minority voices can be heard and not get lost in the rarefied atmosphere of boardrooms. Still, the above results should be interpreted as a starting point for future research that aims for a more comprehensive understanding of the social dynamics of effective monitoring. Even in the presence of quad-qualified directors, group dynamics are an important factor that is likely to affect a board's ability to monitor effectively (Boivie et al., 2016a). In light of the limitations of archival data, it is the author's believe that qualitative research might be most effective in providing a more comprehensive understanding of boardroom social dynamics in the context of the quad model.

Second, extant literature suggests that the composition of boards and their decision-making are endogenous (Adams et al., 2010). Accordingly, board composition arises from a bargaining process that involves several determinants: the CEO's ability and performance, the board's independence/monitoring propensity, the CEO's compensation, and the CEO's job risk (Hermalin, 2005). This thesis generally supports these predictions. While Chapter 5 the endogenous effect of employment risk on CEO compensation, the author recommends further empirical research aiming at explaining the endogeneity in the CEO pay-setting process. Alternatively, it would add to the understanding of the bargaining process if future research considers how boards derive the initial pay contract after an outside CEO succession. Do boards actually consider a CEO has proven ability relative to the CEO labour market? And if yes, are quad-qualified boards more effective?

Third, along with individual and group factors, the literature review in Chapter 2

documents that it is pivotal in the study of board composition and effective monitoring to consider firm-level characteristics as well as external contingencies. As to the quad model, empirical studies might further analyse in more detail the effect of firm complexity on the quad model, i.e. the moderating effects between firm complexity and quad model variables. Prior research, for instance, finds that boards of complex organisations rely more heavily on outcome-based CEO pay (Zajac and Westphal, 1994; Seo, 2014). Accordingly, the insights given in Chapter 5 suggest that the presence of quad-qualified directors would loosen the link between CEO pay and firm performance.

Fourth, the measure of quad-qualification may fall short concerning the weighting, respectively ranking of director attributes. The methodological approach of this thesis treats each attribute equally, which in practice may vary with the actual monitoring requirements. For instance, prior research suggests that advisory and monitoring demands vary across the firm's life-cycle (e.g. Khanna et al., 2014; Kroll et al., 2007; Lynall et al., 2003) and strategy (e.g. internationalisation, M&A activity, see Kroll et al., 2008; Carpenter et al., 2003) that have implications on the relative importance of quad model attributes. Considering the sample firms of this thesis, a text analysis on SEC filings (e.g. annual 10-K and quarterly 10-Q forms) can provide insights into current monitoring demands and board involvement, which can then determine in a machine learning-assisted process particular firm-year-domain attribute weights. Generally, a qualitative and/or survey-based analysis could greatly assist future applications of the quad model.

Fifth, Chapter 6 does not consider any long-term effects of the appointment. However, does the appointment of quad-qualified directors lead to any monitoring improvements ex-post? Such tests are not part of this thesis, yet crucial in the analysis whether the appointment of a quad-qualified director materialises. While Chapter 4 and Chapter 5 document that shareholders can, in fact, expect a more effective board monitoring, it would prove valuable to the overall justification of the quad model to examine whether this improved effectiveness can be directly derived from individual appointments.

Sixth, as assumed by Hambrick and colleagues, quad-qualification is rare among outside directors. Hence, supply-side factors might play an important role in the appointment of quad-qualified directors and the composition of boards. Aside from independence, expertise, and motivation, it is particularly a director's bandwidth that has a constraining effect on the quad-qualified director labour market. Hence, an interesting direction would be an analysis of the wider director labour market and how the supply of quad-qualified

directors shapes the circumstances of a director appointment.

Finally, the lack of comprehensive director-level data, which is the basis for measuring a director's quad-qualification, confined this sample to cover only years of economic expansion. With the continuous expansion of BoardEx and the overall improvement of data availability, the author calls future researchers to draw from the above insights and test the validity of the quad model on a broader sample. Moreover, since the introduction of Regulation S-K, companies are required to lay out the particular reasons for nominating directors (Adams et al., 2018). This data allows analysing whether the analytically derived identification of quad-qualified directors overlaps with the disclosure's description regarding director experience, qualifications, attributes or skills.

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