The Impact of Managerial Traits on Corporate Investment

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Abstract

This thesis examines the impact of the firm's dominant structure and ability on corporate, financing and investment activities. Particularly, CEO duality is examined as a structure whose power and board supremacy provides a single agent with highly centralized power. Second with the use of Demerjian et al. (2012) managerial ability index, CEO managerial ability is quantified and assessed in the context of corporate activity and performance.

The empirical analysis shows that the impact of CEO duality engages to misallocations which affect investment efficiency and verifying that such regime increases unprofitable investment which is detrimental to the firm value. Furthermore, this thesis provides strong support that the adverse impact of CEO duality on investment efficiency prevails only among firms that face high agency problems, as captured by high free cash flows, firm complexity, staggered board structure, low board independence, and medium-sized board. However, CEOs' equity-based compensation, high managerial ability, as well as the occurrence of externally promoted CEO curb the negative effect of CEO duality on internal capital allocation efficiency.

Furthermore, this thesis evinces a positive relation between pre-crisis managerial ability and crisis period investments. This occurs because of the capacity of firms with higher pre-crisis managerial ability to secure greater financing and to keep their firms less vulnerable to financial constraints, which in turn help mitigate severe underinvestment problems evident during the financial crisis. Interestingly, the positive relation between managerial ability and investments holds only for firms with CEOs who have general managerial skills (generalists) rather than firm-specific skills (specialists). When looking at the value implications of the main findings, it is observed that the stock market positively assesses crisis period investments, yet this effect is solely evident among firms characterized by high levels (i.e., above-median) of pre-crisis managerial ability.

Overall the evidence in this thesis informs, for the first time, the agency theory regarding the mechanism through which CEO duality is destructive for internal capital markets and firm value, and sheds light on the importance of certain moderators that can mitigate the

negative impact of CEO duality on investment allocation and efficiency. Regarding the management team as a whole, the findings of this thesis show that managerial ability can ameliorate inefficiencies during distress times, through gaining access to more resources, investing at greater levels and more efficiently than less able peers, thus, adding to the value of firms.

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Declaration

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Chapter 1

Introduction

Introduction

1. Contextual Background and Motivation

To understand power and control within a firm, more than 80 years ago Coase (1937) paralleled the way decisions are taken in the broader economic system and the marketplace with the way decisions are taken within the firm. Referring to price movements which are coordinated through a series of exchange transactions in the market, Coase argued that such movements are evident in the economic system and are the ones that determine and direct production. He then suggested that in the firm setting, these exchange transactions are substituted by the "entrepreneur- coordinator" who also has the responsibility to control and direct production. Thus, contrary to the marketplace in which the price mechanism controls decisions, the decision control in a firm is a consequence of power within the hierarchy. Implicit in this notion is that firms vary significantly in the skills and resources needed to function efficiently and profitably. This variation influences the costs of transaction performing within the firm. In the modern firm, Coase's "entrepreneur- coordinator" role refers to the apex of the firm hierarchy, whose control role now is considerably larger and far more complex in determining overall performance and value (Chemmanur et al., 2011; Chemmanur et al., 2009; Demerjian et al., 2012).

Perhaps a strong evidence on the importance of decision control and power in the modern firm is the substantial heterogeneity in firm financial policies and outcomes (Chemmanur, Paeglis, & Simonyan, 2009; Gompers, Ishii, and Metrick, 2004). Such heterogeneity largely calls for a better understanding of the roles and responsibilities of executives and board members. Most importantly, the recent global economic turmoil brought to the surface several concerns regarding certain firm structures which provide executives with excess power. Such concerns point to the weakening role of board monitoring associated with

powerful executives which is at several times the cause of investment, financing, and value related decisions that significantly deviate from the first best alternative which would benefit shareholders. At the same time, the global financial crisis has called for an identification of managerial factors that could immunize the firm from suffering from potential underinvestment problems because of limited access to external and internal finance. Consequently, this thesis places emphasis on the dominant figure and the dominant coalition within the firm, both considered in explaining investment, financing, and other strategic decisions. The role of CEO duality as a powerful structural regime and the board's dominating role, along with the ability of the management team are examined, with an expectation to yield stronger explanations of organizational outcomes than what has been already provided in the literature.

2. Main Research Questions

The purpose of this thesis is to identify the effects of CEO duality and managerial ability on firm investment, financing, and valuation outcomes. CEO duality is a leadership regime that grants the CEO with the legislative right to exercise power over the board and the executive team, therefore it is considered as the role in the apex of the frim that is determinant in such firm outcomes. Additionally, prior literature has pointed to superior managerial ability which serves as a guarantee to the firm, securing greater resources, conducting more investments and safeguarding the firm's performance (Bertrand and Schoar, 2003, Chemmanur and Paeglis, 2005, Demerjian et al. 2012).

The thesis assesses the above-mentioned relations with the adoption of specific settings which are deemed as suitable to enable a thorough investigation of research questions. The focus of chapter one and chapter two on firm investment efficiency and segment investment allocation respectively, requires data on investment expenditures at the segment level. The attention on internal capital markets of diversified firms is considered as the only way to

observe capital allocations and assess their overall valuation effect. Such attention facilitates an investigation of intra-firm mechanisms that are activated when decisions are taken at the top level of hierarchy under a CEO that holds the position of the board chairman. Internal capital markets are created when capital is allocated internally from a diversified firm's headquarters to the different segments that make up the firm. Unlike single-segment firms which are solely dependent on external capital markets for funding, the internal capital markets created in diversified firms enable the transfer of capital between segments circumventing any frictions that exist in external capital markets (Hovakimian, 2011; Ahn et al., 2006). Such financial flexibility has been proved to benefit or detriment a firm's investment efficiency (Rajan *et al.*, 2000; Scharfstein, 1998; Shin and Stulz, 1998). In this respect, research on internal capital markets offers a good starting point for gaining initial insights into how CEO duality leads to certain investment decisions, whether the investments are efficient, and whether they translate into firm value. Second, diversified structures endow CEOs with additional discretion in allocating resources across business segments, so it is of interest to investigate how the dual role of the CEO produces the allocation of resources and affects the value of firms, as well as whether certain moderators alter these relations. Therefore, in this context the critical research question arising is whether such flexibility creates a fruitful environment for entrenchment and rent extraction in which investment misallocations, inefficiencies and value distractions are evident acts of dual CEOs. Besides, given what is highly cited in the literature that the implications of CEO duality on firm financial outcomes are complex and contingent on several variables (Krause *et al.*, 2014; Boyd 1995), and may well vary conditionally on the level of firm performance, a second research question arises on whether certain firm, CEO and board characteristics can alleviate the investment misallocations or inefficiencies caused by CEO duality.

Chapter 3 adopts the recent financial crisis as a natural experiment to examine the capacity of pre-crisis managerial ability to secure internal and external financing and overcome underinvestment problems likely to occur during such burdensome periods. The financial crisis constitutes an exogenous shock on firm policies because of the difficulties it caused in obtaining credit lines, accessing external capital, and generating sufficient internal capital. Thus, such a setting is deemed as ideal in investigating the impact of managerial ability on firm policies, because it provides a natural experiment suitable to alleviate endogeneity concerns usually evident in empirical analyses in the corporate finance literature. The research questions arising in chapter three, relate to the critical matter on whether managerial ability could be one of the main factors that can alleviate potential underinvestment problems evident in firms affected by financial crises. Still two more research questions stemming from this; first whether this alleviation is due to greater capacity of more able managers to secure greater internal and external financing during these times, and second, whether the stock market positively values crisis investments undertaken by higher managerial ability.

3. Contribution

The initial contribution of this thesis is that it considers the investment mediations through which CEO duality and managerial ability affect firm value. In the case of chapter one and two this mediation relates to the investment allocation and efficiency of CEO duality. Prior literature failed to consider the means through which CEO duality affects firm value; therefore, chapter 1 contributes to strategic leadership literature by identifying this mediation and by looking at specific investment related valuation outcomes rather than generic performance measures which have been identified to constitute an impediment in prior studies relevant to the performance consequences of CEO duality. Furthermore, provided that the implications of CEO duality are contingent on an array of factors (Boyd, 1995; Krause & Semadeni, 2013),

the main contribution of chapter 2 is the identification of certain agency cost moderators, arguing that value destructive tendencies and inefficient investment are only prevalent in firms that are potentially exposed to agency problems.

In a similar vein, investments which seem to be highly valued by the stock market, appear to constitute the mediation through which managerial ability affects firm value in financial crises periods. As a result, this finding in chapter 3 contributes to the extant literature (e.g., Graham et al., 2013; Falato et al., 2015; Malmendier and Tate, 2007; Francis, 2008) by highlighting the differential way managerial ability impacts firm value. Findings in this chapter also contribute to the literature which focused on how firms managed liquidity shortfalls during such times (e.g., Campello et al., 2010; Duchin et al., 2010; Campello et al., 2011), suggesting that higher managerial ability is one important factor because of its capacity to secure more financing and offset crisis period underinvestment problems that enhanced firms' value. Lastly, chapter 3 contributes to the recent literature highlighting importance of general versus firm-specific skills, showing that generalists CEOs are the ones able to mitigate underinvestment at times of constraining economic conditions (e.g., Murphy and Zabojnik, 2004; Custodio et al., 2013; Brockman et al., 2016). Perhaps this can justify why generalist CEOs earn significantly higher annual pay premiums compared to their specialist peers.

4. Structure of the Thesis

Three essays are incorporated in this thesis. The first chapter assesses CEO duality in the context of corporate diversification and examines its impact on investment effciciency and valuation. Empirical results provide evidence that dual CEOs make inefficient investments which incrementally reduce firm value. Findings also evince that the marginal value of investment is lower for firms managed by CEO duality, substantiating the argument that such regime increases unprofitable investment which is detrimental to the firm value.

To dig deeper into the findings of this thesis's first chapter, the second chapter puts its lens on the investment impact of CEO duality studying particularly the firms' internal capital allocation efficiency. With the addition of an array of corporate governance and CEO control variables, results provide strong support for the agency theory, which postulates that CEO duality weakens board monitoring and increases managerial power, suggesting that boards should be independent from the management to prevent managerial entrenchment (Fama and Jensen, 1983; Eisenhardt, 1989). Most importantly the chapter adopts a contingent approach on the impact of CEO duality on investment efficiency, to show that the documented negative relation exists only in firm contexts with potentially high agency problems, as captured by high free cash flows, firm complexity, staggered board structure, low board independence, and board size. Nonetheless it seems that CEOs' equity-based compensation, high managerial ability, and the occurrence of externally promoted CEO moderate the negative effect of CEO duality on internal capital allocation efficiency.

Given the intriguing results in the second chapter particularly with regards to the CEO attributes appearing to alleviate the negative impact of CEO duality on internal capital allocation, the third chapter attempts to gain more insight into how managerial ability and skills affect corporate investment. This attempt is done with the adoption of a natural experiment, the financial crisis, and its main finding demonstrates a positive relation between pre-crisis managerial ability and crisis period investments. This is because of the capacity of firms with higher pre-crisis managerial ability to shield greater financing and to keep their firms less vulnerable to financial constraints, which helps mitigate severe underinvestment problems evident during the financial crisis. Since the CEO is the most influential figure in corporate decision making, and the one who most likely affects corporate investment, the chapter focuses on CEO skills and shows that the positive relation between managerial ability and investments holds only for firms with CEOs who have general managerial skills (generalists) rather than

firm-specific skills (specialists). Lastly, it seems that the stock market greets positively crisis period investments, yet, only for firms characterized by high levels (i.e., above-median) of pre-crisis managerial ability.

Chapter 2

CEO Duality, Investment Efficiency, and Firm Value

CEO Duality, Investment Efficiency, and Firm Value

1. Introduction

Executives have a central effect on firm outcomes if they have power over critical decisions. According to Finkelstein (1997), settings in which the chief executive officer (CEO) exerts dominant power, may constitute an adequate source of information on which inferences on executive power can be drawn. This chapter considers the capacity of the CEO to also hold the position of the chair of the board as a leadership regime that provides the CEO with the legislative right to exert power over the board and the executive team. Such polarization of power provides additional influence over decisions, since the chairman often has a catalytic role in decision-making, and therefore, on firm outcomes.

CEO duality—the act of a sole individual as both CEO and chair of the board—has produced one of the most prolific and contentious issues in the field of strategic leadership (Dalton, Hitt, Certo, & Dalton, 2007; Finkelstein, Hambrick & Cannella; 2009). The recent global turmoil has raised oppositions against CEO duality by activist shareholders, institutional investors, proxy advisory firms, and regulators, with a view to achieving independent leadership on the board. Yet, current evidence shows a clear preference by firms to maintain a dual CEO regime. Proponents of the dual role argue that it fosters a more cohesive decision making emphasizing unity of command and speed of decision making as crucial aspects afforded by the combined structure (Donaldson & Davis, 1991).

Academic research on CEO duality maintained an equally unsettled character. Notwithstanding the lack of comprehensive evidence supporting the existence of a relation between CEO duality and accounting or market-based performance, the theoretical ground for such a relationship is substantial (Dalton et al., 2007). According to Dalton and Dalton (2011), despite voluminous empirical attention, there is little consistency in studies relating CEO duality to financial performance; hence, any inferences drawn so far are still in a premature

stage and command for more scholar research using a multilevel examination. In accord with this view Krause et al. (2014) argued that research should consider moderating variables which alter the strength or direction of the relationship, or mediating variables that explain the circumstances under which the relationship occurs. This ongoing academic scholarly attention renders the need for deeper examination of CEO duality on corporate policies and firm performance an empirical issue of significance, which is considered by this study.

The notable conflicting evidence in both the professional and academic arena, along with the need for an identification of new ways and contexts to explore this multidimensional strategic leadership aspect constitutes the main motivation of the proposed chapter. Specifically, this chapter examines the investment efficiency implications of CEO duality and the valuation consequences of these investments. Findings provide compelling empirical evidence that CEO duality has a detrimental role in firm investment efficiency, causing an overall loss in firm value. Despite the extant research on certain organizational implications, this is the first study attempting to examine the investment implications of CEO duality as well as the valuation consequences emanating from these investments. Prior literature failed to consider the mediation through which CEO duality affects firm value; therefore, the chapter contributes to strategic leadership literature by identifying this mediation. An important aspect of the study is that it looks at the valuation consequences of investments by specifically adopting models that concentrate on the value added to the firm by its investment mediation and avoids the use of generic performance measures which reflect other types of firm efficiency other than investment. In addition, given that the implications of CEO duality are contingent on several factors (Boyd, 1995; Krause & Semadeni, 2013), only some of which are already identified, the results of the study also underscore the importance of certain agency cost moderators, and suggest that conditions prohibiting agency risk can have a determinant role in ameliorating value destroying and inefficient investment decisions made by CEO duality. By

assessing this moderation, the study sheds light on the importance of certain factors cultivating higher agency risk settings in investment efficiency and firm valuation.

The rest of the paper is organized as follows. Section 2 details relevant literature to provide a foundation for the testable hypotheses, pertaining to the relations among CEO duality, investment allocation, and the efficiency of investment allocation. Section 3 describes the sample and key variables used in the empirical analyses. Section 4 presents the results, and Section 5 concludes.

2. Literature review and hypothesis development

2.1. CEO duality and firm performance

In academia and particularly in management literature, the impact of CEO duality on firm performance has received increased attention. Noting the complexity and conflicting nature of the effects of CEO duality on firm performance, Rechner and Dalton (1989) attempted to compare the shareholder returns of firms with and without dual CEO roles, but this early study uncovered no significant differences over the entire period under investigation. Even more notably, no such differences arise in any given year, in the form of higher or lower abnormal returns. Rechner and Dalton (1991) then sought to focus on accounting-based measures, but the results were clearly dissimilar from those stemming from their first study. That is, with the same sample, they found that firms with non-dual CEO roles significantly outperformed firms with CEO duality in each year, in explicit support of agency theory predictions. Intrigued by these inferences, multiple authors tested their assertions across various assumptions and predictions providing different perspectives. Donaldson and Davis (1991), applying stewardship theory to the board leadership debate for the first time, concurred that firms with CEO duality should be more effective and outperform those with separated roles, because the mean shareholder return was significantly larger for the former. Therefore, a critical implication of the study was that CEO duality is desirable because it enhances firm

performance. Daily and Dalton (1992, 1993) also addressed the impact of CEO duality on the performance of small firms, predicting that the impact of this combined leadership role would be more pronounced in smaller firms, because larger firms tend to be more inertial. Yet, the accounting and market-based performance measures they used exhibited no significant relationship. Across all these early studies, the empirical analysis remains relatively simplistic, so they serve mainly as a backbone for current scholarly research on this topic.

With a meta-analysis of empirical studies of board composition and board leadership structure, Dalton *et al.* (1998) find no evidence of a relationship between CEO duality and firm performance. Rather, the different performance metrics in the available studies meant the direction of the relationship flipped at times. Accounting-based metrics exhibited a negative correlation between duality and firm performance; market-based measures suggested a somewhat positive link. Neither correlation was large enough to provide meaningful inferences for or against agency and stewardship theories though. Instead, these results informed the research field that different metrics have varying impacts, depending on the circumstances.

This uneven disposition seemed stop there, with Dalton *et al.*'s (1998) meta-analysis. But the more complex interactions and different outcomes associated with CEO duality suggest the need for investigations that go beyond an agency versus stewardship polarity.

2.2. CEO duality and investment efficiency

The over-reliance of CEOs on a single source which provides them with income, reputation, and human capital, shows that their positions may be over-invested in the firms they run, compared with firm shareholders. If CEOs cannot diversify their employment risk, they may commit to investments that best serve their personal motives to entrench themselves and make their replacement much costlier to the firm (Shleifer and Vishny, 1989). Yet headquarters still are endowed with residual rights of control that provide the CEO with the authority to choose the level of funding for individual projects (Stein, 1997). Overall then, the value created

from investments in a firm depends significantly on the efficiency of the allocation of capital across various projects, but the ability to allocate these corporate resources to projects or business segments gives self-interested CEOs a ready opportunity to extract private benefits, by misallocating corporate resources.

Studies of CEO investment decisions consider the presence of "pet" projects that generate unduly high private benefits for the CEO (Shleifer and Vishny, 1989; Shin and Stulz, 1998). As Shleifer and Vishny (1989) show, managers have an incentive to allocate the firm's resources to investments whose value is higher under them than under the best alternative. This result reflects an aspect of the classic agency problem, that is, excessive investment in assets that are complementary to managers' skills, background, or experience, even when such investments are unprofitable for the firm. For example, managers may be intrigued by investments that require their specific human capital and thus entrench them against potential replacement threats or increase their chances for a compensation raise. In that vein, self-interested CEOs have incentives to channel more resources to such segments, even if the marginal investment has a negative net present value.

Managers pursuing their own private goals and benefits also might tend to engage in empire building (Jensen and Meckling, 1976; Jensen 1986, 1993;; Xuan, 2009). Stein (1997) challenges this idea though, because conditional on the level of investment, any allocation of resources should work toward enhanced efficiency. The power and prestige associated with managing a larger firm (Jensen, 1986; Stulz, 1990) or managerial compensation related to firm size (Jensen and Murphy, 1990) remain efficiency-destructing motives for CEO investments though.

In a diversified firm, the CEO also derives private benefits of control from all divisions, whereas divisional managers extract private benefits only from their own divisions. Scharfstein and Stein (2000) account for both kinds of agency conflicts in their examination of resource

misallocation and rent payments by the CEO to divisional managers, who unjustifiably receive a greater share of resources for their divisions. That is, CEOs can distil their private benefits of control by engaging in inefficient cross-subsidization, funding value-destroying projects, and ceding to rent-seeking efforts by divisional managers (Lamont, 1997; Shin and Stulz, 1998; Scharfstein, 1998). Duchin and Sosyura (2013) also consider the influence of managerial ties, measuring social connections that reflect mutual qualities or experiences between the CEO and divisional managers. Their findings suggest that under weak corporate governance, managerial ties tend to result to lower investment efficiency and firm value (Duchin and Sosyura, 2013). Glaser *et al.* (2013) also uncover mechanisms by which more powerful, better connected divisional managers realize greater capital allocations in a financially slack environment. Such problems are more likely when decision management and decision control are delegated to the same agent; in these circumstances, board monitoring weakens, and external monitoring, which seemingly could discipline CEO actions, is trivial, because the internal capital markets provide CEOs with means to avoid monitoring from external financial markets.

Building on such emerging evidence, this study examines whether CEO duality leads to greater proneness to cultivate a domain for pursuing self-serving interests and engaging in opportunistic behaviours. According to Boyd (1995), the combined role—chair of the board and CEO of the firm—is detrimental to the balance between the CEO and the board because it limits the board's efficacy in monitoring managerial actions. The CEO's excess power, because of the combined leadership structure, provides additional legitimacy to the board's control function and promotes a fruitful environment, in which the CEO can engage in managerial actions that deviate from shareholders' interests. In the absence of a clear, separated hierarchical structure, resulting from the distinction between CEO and chairperson positions, the board's role in overseeing managerial opportunism is minimized.

In summary, a board may fail to interfere in CEO investment decisions as a result of its weak role when a CEO is too powerful, due to his or her simultaneous position as the chair of the board. Then CEO duality can lead to investment inefficiencies which incrementally erode firm value.

Hypothesis 1*: Firms with combined CEO and chair positions make inefficient investments.*

2.3. CEO duality and the impact of agency problem factors

Following the meta-analysis of Dalton *et al.* (1998), scholars agreed that CEO duality has an important role that differs with the circumstances. Duality can produce both positive and negative consequences in different market settings (Boyd, 1995) and when the CEO and board have varying characteristics (Krause *et al.*, 2014). Drawing on both management and finance literature, this study argues that agency problem factors moderate the relation between CEO duality and the firm's investment allocation and efficiency. Following the extant literature, free cash flow and compensation incentives are employed to characterize the severity of agency issues within the firm.

Firms with excess free cash flow encounter major agency problems (Chung *et al.*, 2005), especially if their investment opportunities are limited (Gul, 2001). Excess cash, may urge management to act opportunistically and derive personal gains from unnecessary value destroying investments. Such resource misallocations may offer personal rewards, at the expense of shareholders. Limited free cash flows instead inherently reduce managerial discretion, so managerial waste and inefficiencies should be reduced, such that the limited free cash flows act like disciplining forces on CEOs who might be prone to misuse resources to pursue their private goals. The degree of free cash flow availability thus should moderate the relationship among dual CEOs, and overall investment efficiency.

Past literature also highlights the effects of compensation on managerial incentives (Lambert *et al.*, 1991; Carpenter, 2000). Aligning executive incentives with shareholder interests is a direct way to mitigate agency problems; the absence of a relevant connection between CEO compensation and firm performance may raise questions about whether investments can be managed efficiently enough to enhance shareholder value. Mehran (1995) and Palia (2001) suggest that increasing executives' equity-based incentives creates value, and Hall and Liebman (1998) indicate a tripling of the median exposure of CEO wealth to firm value between 1980 and 1994. These trends may have exerted prevention impacts on prodigal empire building (Bergstresser and Philippon, 2006), such that firms with CEOs who are more incentivized, due to the connection of their overall compensation with stock prices, exhibit greater alignment with the interests of shareholders. Thus, proper incentive provision, particularly equity-based compensation, should alleviate actions such as ceding to rent-seeking behaviours by divisional managers to extract private benefits or entrenchment efforts. Instead, these CEO might be motivated to decide upon more efficient investments.

Another important effect of compensation on managerial incentives arises from the sensitivity of option-based compensation to stock prices. This exposure gives CEOs an incentive to reduce the systematic and idiosyncratic risk of their firms, though the effect thus far has remained theoretically ambiguous. On the one hand, it encourages CEOs to decrease their firms' systematic and idiosyncratic risk while increasing their own exposure to their firm's risk (Coles *et al.*, 2006), but on the other hand, it can motivate CEOs to take risks that promise to increase firm value (John and John, 1993). With their empirical findings, Armstrong and Vashishtha (2012) support a strong positive relation between the sensitivity of option-based compensation to stock prices and the level of idiosyncratic risk, perhaps suggesting that the sensitivity of option-based compensation to stock prices incentivizes CEOs to invest more in positive net present value projects, which eventually increases their firms' idiosyncratic risk.

Certain forms of option-based compensation thus may help alleviate the adverse impact of CEO duality on investment efficiency. Taking all this evidence together, we argue:

Hypothesis 2: *Agency problem factors moderate the negative relationship between CEO duality and firm investment efficiency, such that the relationship is weaker among firms with lower agency problems.*

2.4. CEO duality and firm value

Notwithstanding Dalton,et al. (1998) meta-analysis coming to an absence of an empirical association between CEO duality and firm performance, the debate over this highly discussed theme still continues among professionals and academics. Firm performance receives substantial attention in prior studies that attempt to capture the overall impact of CEO duality on the firm by combining accounting and market-based performance measures. Faced with equivocal support though, researchers also have called for the consideration of other outcomes associated with CEO duality that are more proximal than firm performance (He and Wang, 2009; Krause *et al.*, 2014). For example, in relation to the investment channel through which CEO duality affects firm value, a specific valuation model is needed that can incorporate this mediation mechanism. Such incorporation can help identify the differential value of dual CEOs investments and reveal the availability of valuable marginal investment opportunities. To address the aforementioned debate, this study predicts that CEO duality is a corporate governance regime that drives unprofitable investments and erodes firm value. The ability to allocate corporate resources presents the CEO with an opportunity to extract private benefits, at the cost of misallocating corporate resources. In these circumstances, board monitoring is weak, so CEO duality leads to corporate and investment decisions that are detrimental to shareholder value. Therefore,

Hypothesis 3: *Combined CEO and chair positions have negative effects on firm value.*

3. Sample and variable description

3.1. Sample

Three sets of databases serve to construct the sample with the required data: Standard & Poor's Execucomp, firm-level financial data from Compustat, and segment-level financial data from the Compustat Industrial Segment (CIS) database. The focus on the investment efficiency of dual CEOs means that the primary tests require data on investment expenditures at the segment level, the only way to observe capital allocations and their overall valuation effect. For this purpose, the study sample is restricted to diversified firms that report at least two segments, operating in different, three-digit, standard industrial classification (SIC) codes. This criterion is necessary for two main reasons. First, data about the allocation of capital expenditures across industries are available for diversified firms facilitating an investigation of intra-firm investment efficiency.

The sample begins in 1992, which is the year Execucomp coverage commences. The initial sample for the time window of 1992-2013 from Compustat consists of 504226 firm year observations. To steer clear from distortions caused by small firms, because of having sales or assets near zero, total sales of at least $20 million are required. Furthermore, financial firms (SIC codes 6000-6999), as well as any divisions that operate in these sectors are excluded because they are subject to capital structure regulations. Those lacking the required data at the firm level or segment level and those with operating and state segment records are also excluded from the sample (Ahn et al., 2006). Based on these restrictions, and on certain restrictions proposed by WRDS for the elimination of non-accurate observations, the sample is reduced to 43460 multi-segment firm years. Since sales are usually completely allocated among the reported segments of a diversified firm, it is also required that the summation of all segment sales should be within 1% of total sales for the firm (Berger & Ofek, 1995). The

attainment of a portfolio of single segment industry comparables for the sample of multi-segment firms is a requirement. For each division of a multi-segment firm five industry-matched firms based on three-digit SIC code are required. The final sample, for the period 1992–2013, the sample ends up with after accounting for missing observations on the independent variable, and control variables 11,403 segment-year and 5,480 firm-year observations.

3.2. Model specification and variable definitions

To measure the effect of CEO duality on internal investment efficiency and value added by capital allocations at the firm-level, we adopt the following regression equation:

$$RINV\ (or\ RVA)_{i,t} = \alpha_i + \alpha_t + \beta_1\ CEO\ Controls_{i,t-1}\ + \beta_2\ Firm\ Controls_{i,t-1} + \beta_3\ CEO\ Duality_{i,t-1}\ + \varepsilon_{i,t}, \quad (1)$$

where the dependent variable is either *RINV* as defined or *RVA* for firm *i* at time *t*. The firm-level regression equation accounts for firm and year fixed-effects denoted by α_i and α_t, respectively. Further, the regression equation is estimated using robust standard errors that are heteroskedasticity-consistent and clustered at the firm level.

The independent variable of interest in Eq. (1) is *CEO Duality*, defined to be a dummy variable set equal to one for firm-years during which the CEO also served as the board chair, and zero otherwise. The regression coefficient β_3 measures the relation between CEO duality and overall investment (in)efficiency for the case of *RINV*, or firm value added (or destructed) by capital allocations for the case of *RVA*; thus a negative coefficient would provide empirical support for Hypothesis 1, using evidence from the capital allocation process of the firm as a whole.

For firm investment efficiency two variables are used. The first measure attempting to examine internal capital market efficiency is the firm level measure of relative value added, *RVA*, as devised by Rajan et al. (2000). This measure adds the weighted transfer across all the

segments of a firm in a year to achieve a sum that represents the relative value added by allocation, capturing the overall value consequences of the allocation procedure of a diversified firm. To calculate RVA, firm- and industry-adjusted segment investment are weighted by the difference between the industry median Tobin's q for that segment and the sales-weighted average q for the firm. The second firm level measure of investment efficiency is the relative investment ratio, *RINV*, defined as the sales-weighted sum of firm- and industry-adjusted investment in high q segments minus the sales-weighted sum of firm- and industry adjusted investment in low q segments (Ahn & Denis, 2004). Positive values for e *RINV* indicate that the firm invests relatively more in its high growth segments than in its low growth segments.

Three agency problem moderators, are employed; (1) CEO equity-based incentives which rely on CEO compensation incentives as an inverse proxy for agency problems as in Bergstresser and Philippon (2005), (2) the CEO's portfolio sensitivity of option-based compensation to stock prices, *DELTA*, as in Guay (1999) and Core and Guay (2002), and (3) the firm's free cash flows *FCF* defined as the cash flows in excess of what is needed to fund all projects with positive net present values when discounted by the relevant cost of capital (Jensen, 1986).

To assess the valuation consequence of investments, this chapter examines their *marginal profitability*, using the valuation regression procedure of Fama and French (1998). This approach is ideal, in that it allows for an assessment of the interplay between duality and investment and the marginal effect on firm value. Firm value refers to the total market value of the firm minus the book value of assets, all divided by the book value of the firm's assets. Fama and French (1998) proposed that firm value is related to a set of firm characteristics like earnings, assets, R&D, interest expense, and dividends, and changes in these characteristics. These changes in variables are calculated -1 to 0 and 0 to +1 years relative to the current year.

In accord with Fama and French, variables are scaled by contemporaneous total book assets to avoid heteroskedasticity resulting from firm size differences.

Detailed definitions of these variables appear in the Appendix.

4. Empirical findings

4.1. Descriptive statistics

Table 1 reports the correlations for the study variables. Table 1 reports the correlations for the study variables. CEO duality shows significantly negative levels of relative value added (correlation with *RVA* is -0.032, *p*-value<0.05) and relative investment (correlation with *RINV* is -0.029, *p*-value<0.05). CEO duality, however, appears to be positively and significantly correlated to the spread of value (correlation with *Marginal Profitability* is 0.022, *p*-value<0.10). The examination of correlation coefficients also exhibits that CEO duality is correlated with higher levels of industry adjusted Tobin's q (correlation with firm Tobin's q is 0.025, *p*-value<0.05) and is associated with larger firms (correlation with *Firm Size* is 0.213, *p*-value<0.01). There is also a negative correlation between CEO duality and R&D spending (correlation with *R&D* is -0.042, *p*-value<0.01). Lastly, table 1 reveals that CEO duality exposes a tendency for significantly longer tenures (correlation with *Tenure* is 0.226, *p*-value<0.01). It should be noted, that none of the correlations is high enough to raise any concerns for multicolinearity. This fact is further confirmed with the use of Variance Inflator Factor (VIF) test in Table 3.

[Table 1 here]

Table 2 presents summary statistics for the firm characteristics, internal capital market efficiency measures, and CEO characteristics for the firm-years of diversified firms. On average, diversified firms include segments, resulting in a total of 11,403 segment-year observations. CEO Duality appears to be on average evident in 64% of the sample firms. The

firms have mean (median) *Firm Size*, of 7.6 (7.6); their mean (median) *Marginal Profitability* is 0.6 (0.3). The mean (median) relative value added, or *RVA*, is -0.04 (-0.01), and for the relative investment ratio, or *RINV*, the values are -0.15 (-0.05). The mean (median) values of *Firm Tobin's q* are 0.07 (0.02). With the assumption that industry Tobin's q is a good proxy for the marginal q of the diversified firm's segment, these values suggest that the sample of diversified firms allocate too little capital to their segments in high-growth industries. Thus, similar to earlier studies of investment policy in diversified firms, this sample of diversified firms indicates inefficient internal capital allocation, on average. Finally, an average dual CEO has a mean firm tenure of 7.5 (median 5.2) years.

[Table 2 here]

4.2 CEO duality and overall investment efficiency

For an investment to be efficient, capital must be directed toward projects with superior investment opportunities and away from those with poorer investment prospects. To examine the relation between CEO duality and investment efficiency, this study undertakes a firm-level analysis, in which the dependent variable is relative investment efficiency (*RINV*). Following Ahn et al. (2006), RINV is utilized to account for a firm's capital allocations across all the segments it operates in, by measuring whether (or not) allocations toward the relatively high-*q* segments outweigh allocations to its relatively low-*q*. *RINV* is an overall firm measure of investment efficiency; a positive (negative) value designates that the firm is investing relatively more (less) in its high *q* segments (Ahn and Dennis, 2004). Most importantly, to examine the overall value consequences of the firm's transfers of capital to its various investment opportunities, it is important to investigate whether the segment-level investment inefficiency transpires in investment misallocations aggregated at the firm level. For this reason, a firm-level measure of relative value added, *RVA*, is employed as proposed by Rajan *et al.* (2000).

The measure of *RVA* is of particular interest in this study since it directly captures the valuation impact resulting from the firm's investment allocation. As aforementioned, rather than inheriting generic measures which do not particularly examine the investment consequences of CEO duality, a metric that can be regarded as a measure of the overall value added (subtracted) by the firm's investment allocation is instead used. In essence, *RVA* postulates that firm value is created when segments with better growth opportunities than those that the firm is facing as a whole receive relatively more resources compared to segments with inferior growth opportunities than those that the firm is facing as a whole. The use of *RINV* and *RVA* as dependent variables allows discerning at the *firm level* the impact of CEO duality on, respectively, the firm's value creation, and investment efficiency.

Table 3 reports the variance inflation factor (VIF) to identify the presence of multicollinearity among the predictors in the two main regression factors with RINV and RVA as dependent variables. The largest VIF among all predictors is often used as an indicator of severe multicollinearity. All predictors have a variance inflation factor ranged between 1.0-3.9, which indicates that there is absence of multicollinearity between the predictors in the regression models. We additionally use robust standard errors clustered at the firm level to account for possible heteroskedasticity, and all variables are winsorized at the 1% and 99% values, to ensure that our results are not driven by outliers.

[Table 3 here]

Moving to the regression results, Table 4 reports estimates for the two regression models of investment efficiency. For both models, a set of control variables accounts for relevant firm characteristics in the context of the internal capital market efficiency of diversified firms. Specifically, the models include the industry-adjusted ratio of research and development to sales, *R&D*, which controls for the variation in information asymmetry across

sample firms. The industry adjustment for focused firms reflects a median focused firm operating in the same three-digit SIC code. According to Datta *et al.* (2009) high information asymmetry can give self-interested managers an opportunity to pursue their private benefits, to the detriment of shareholders, by hiding misallocation actions from the market. The models also control for the *Number of Segments,* to capture the breadth of diversification. *Firm Size* is a proxy for the overall effect of other firm characteristics. Other control variables include industry-adjusted *Investment, CEO Tenure* as a proxy for formal experience, and institutional ownership as a control for corporate governance. Consistent with Rajan *et al.* (2000) and Datta *et al.* (2009), the models include the sample firm's industry-adjusted Tobin's q to control for growth opportunities. As with the previous specifications, firm- and year-fixed effects provide further controls in the models and the standard errors are clustered at the firm level.

[Table 4, here]

In Table 4, *CEO Duality* has negative and significant effect in model (1) on RVA. This finding confirms that CEO duality is a significantly negative determinant of internal capital market efficiency. In the sample firms, CEO duality thus leads to the allocation of relatively more capital to segments with lower growth opportunities, which incrementally reduces firm value, as captured by the RVA variable that represents the overall value added by the firm's investment allocation process. The results of regression model (2) for RINV are aligned with the results for RVA, confirming that dual CEOs invest relatively more in low q segments and relatively less in high q segments. This investment pattern aligns with the predictions of rent-seeking models by Rajan *et al.* (2000) and Scharfstein and Stein (2000), implying that capital is inefficiently allocated across the segments of diversified firms.

Regarding the control variables, a similar tendency arises in both models, such that the coefficient of the *Number of segments* is insignificant, in weak support of Rajan *et al.*'s (2000)

prediction that greater diversity of segment *q* leads to the misallocation of capital to investments and increased investment inefficiency. Firm size is positive and significant only in the estimation in which the dependent variable is RINV, indicating a strong relation between larger firms and relative investment. The industry-adjusted R&D to sales ratio is positive and significant in both models. That is, high information asymmetry does constitute a cover for CEO duality, enabling the misallocation of capital to gain private benefits. Though insignificant, the negative coefficient for *Investment* in models provides an indication that larger investments lead to less efficient allocations, because they give the CEO room for more self-interested allocations. Finally, *CEO Tenure* and *Institutional Own* emerge as insignificant throughout.

4.3. Impact of agency problem factors

If CEO duality leads to investment misallocation and inefficiency, are there also factors that can mitigate its impact? Do firms with key elements designed to mitigate agency problems, such as executive compensation, alleviate the documented negative relations? Table 5 presents the results of the tests of Hypothesis 2, which examine the potential moderating effects of three agency problem factors: *CEO incentives,* compensation sensitivity captured by the CEO's portfolio *Delta* value, and the level of free cash flows *FCF*. With the baseline specification utilized in Table 4, Table 5 reports the regression results for the firm-level sample where RINV and RVA are the main dependent variables. The sample is divided into two sub-samples, whereby each sub-sample includes observations above or below the yearly median values of *CEO incentives*, *Delta,* and *FCF,* respectively. Because the distribution of Delta is right-skewed, the natural logarithm transformation of the variable serves to break up the full sample. All agency problem factors are measured as of the year-end, prior to the year of the investment measures because their occurrence in the former year likely influences the internal capital allocation in the current year. If a CEO's lagged *CEO incentives,* lagged *Delta* are greater than

the yearly median, the CEO is considered highly incentivized and sensitive to compensation. If these variables fall below the respective yearly median values, the CEO has low compensation incentives and sensitivities. Likewise, if a firm's lagged *FCF* is greater than the yearly median, the firm has a high level of free cash flows and low levels if the lagged *FCF* falls below the yearly median. High agency environments are those with low compensation incentives but high free cash flows.

[Table 5, here]

Models (1), (3), and (5) in Table 5 show that in low agency problem environments, the adverse impact of CEO duality on investment efficiency disappears. High levels of *CEO incentives* and *Delta* and low *FCF*, associated with low agency problem environments, significantly moderate the negative relation between CEO duality and investment efficiency. These results are consistent with the literature on executive equity-based compensation, in which not only the slope but also the convexity of the equity-based payoff function is central to mitigating CEOs' self-interest (Guay, 1999). The result for *Delta* is intriguing; high levels of *Delta* appear to encourage managers to work toward reducing inefficiencies, presumably to increase firm value. This result sheds light on the risk–value trade-off that executives face, and it confirms that dual CEOs are willing to increase firms' idiosyncratic risk when faced with high *Delta* levels, for the sake of investing in projects with better net present value, even though this risk cannot be hedged. For low levels of *CEO incentives* and *Delta* but high levels of *FCF*, the results in models (2), (4) and (6) support Hypothesis 1; they confirm the negative and significant relation between CEO duality and RINV. There is compelling evidence that conditions of high agency problem allow dual CEOs to manifest agency behaviours that erode the firm's investment efficiency. Collectively, these results support the notion that an adverse

impact of CEO duality on investment efficiency happens only in high agency environments characterized by poor compensation schemes or high levels of free cash flows.

Results evince a similar pattern for RVA. In low agency problem environments, particularly models (1), (3), and (5), of Table 6, the negative and significant relation of CEO duality with *RVA* disappears. Dual CEOs do erode firm value in low agency environments. A consistent pattern also arises for high agency environments, as shown in models (2), (4), and (6) of Table 6. That is, CEO duality and relative value added are negatively and significantly related when CEO incentives and Delta sensitivities are low but FCFs are high. Overall, the evidence from the second sub-sample analysis in Table 6 substantiates the inferences about agency problem moderators in Table 5; it also comprehensively affirms that conditions cultivating or prohibiting agency problems can have a determinant role in ameliorating the value-destroying inefficient investment decisions that result from CEO duality.

[Table 6, here]

4.4. CEO duality and marginal profitability of investments

The main findings show that CEO duality has a strong negative influence on investment efficiency and firm valuation. These results can be related to the marginal profitability of investments using the valuation approach of Fama and French (1998). Fama and French (1998) propose that firm value relates to a set of firm characteristics, including earnings, assets, R&D, interest expense, and dividends, as well as changes in these characteristics. The changes are calculated for –1 to 0 and 0 to +1 years relative to the current year. Marginal profitability is an appropriate valuation measure for this setting, because it refers to the marginal valuation effects of firms' investments and focuses on contribution of the investment to the value of the firm.

The regression model in Table 7 aims to capture the expected effects of the explanatory variables on firm value. The dependent variable is *Firm value*, while the independent variables include features that prior literature identifies as having strong effects on the spread of value over cost (Fama and Frech, 1998; Denis and Sibilkov, 2007). The model includes prior and future changes in assets; earnings before interest and extraordinary items and after depreciation and taxes; R&D expenditures; interest expenses; and total dividends paid, as well as future changes in market value. Changes in these variables are calculated over a one-year period. The regression model also details current levels of earnings, R&D expenditures, interest expenses, and total dividends paid. All variables are deflated by contemporaneous total book assets. The primary independent variables of interest in the regression are the coefficients of the asset variables; the main focus is the interaction between CEO duality and asset variables, because these interactions record the impact of the investments of the dual CEO on firm value. Therefore, adding the interaction term between prior changes in assets and CEO duality, as well as between future changes in assets and CEO duality, captures the effect of CEO duality on the marginal profitability of past and future investments. Similar to the previous analysis, *CEO Tenure, Institutional Own*, and the breadth of diversification proxied by the *Number of Segments* are incorporated in the model too. Finally, the regression model includes industry- and year-fixed effects.

[Table 7, here]

The evidence in Table 7 indicates that both prior and future changes in assets are positively and significantly related to firm value; the marginal value of investment is positive. The interaction between these changes in assets and CEO duality also is significantly negative, so the investments by a dual CEO deteriorate firm value; this means that the firm's investments are unprofitably exploited. The ability to allocate corporate resources provides the CEO with

an opportunity to extract private benefits, at the cost of misallocating corporate resources, such that he or she makes investment decisions that deteriorate shareholder value. Consistent with Fama and French (1998) and Dennis and Sibilkov (2007), earnings, investment, R&D, and dividends, as well as changes in these variables, relate strongly and positively to the spread of value over cost. Similar comments apply to the change in the spread of value over cost, which is strongly and negatively related to firm value, and the negative and significant coefficients for the current level of interest and its changes. Regarding the *Number of Segments*, the negative and statistically significant coefficient reveals reduced firm value with the increase in the breadth of diversification.

To alleviate any concerns about sample selection bias, i.e. ensure that results are not driven solely by the choice of diversified firms as a sample in the study, a sensitivity check is performed whereby all potential firms (diversified and single segment firms) satisfying the restriction criteria imposed to diversified firms, are included in the sample. Table 8 reports the regression results of the relation between CEO Duality and the marginal profitability of investments. Similar to the results obtained in Table 7, the interaction term of CEO duality with prior and future changes in assets is negatively and significantly related to firm value. This outcome mitigates concerns relating to sample selection biases and verifies that comprehensively investments conducted by CEO duality are performed at the detriment of the firm's value.

[Table 8, here]

5. Conclusion

Building on evidence from agency theory and strategic leadership literature, this study shows empirically that CEO duality produces a governance context that may encourage CEOs to direct investment resources inefficiently, to the "wrong" segments, ultimately causing a loss

in firm value. Prior research on CEO duality has produced notable conflicting evidence, likely due to its rather monotonic focus on accounting or market-based performance outcomes. This study is the first to show the channel through which CEO duality exerts an adverse effect on investment decisions that lead to a loss of value.

In particular, this study offers compelling empirical evidence that CEO duality leads to investment decisions that are detrimental to overall firm value. The evidence of investment inefficiency suggests that when board monitoring becomes weak (because power is concentrated in the hands of a sole agent) and external monitoring is trivial (because internal capital markets help the agent avoid monitoring from external markets), agency costs, in the form of risk reduction and managerial entrenchment manifest, to the detriment of the firm's shareholders. Two important points arise from this study. First, low agency problem regimes can help eliminate investment misallocation and efficiency. Such regimes can be cultivated by high compensation incentives and sensitivities. Second, unlike prior literature that focuses mainly on direct relations with performance metrics, this study provides an investment perspective on CEO duality behaviour, which produces valuation consequences for this investment behaviour. These results add to both strategic leadership literature and internal capital markets literature, while also illustrating that agency problem factors are significant determinants and moderate the adverse effects that arise from CEO duality.

Tables

Table 1. Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10
1. CEO Duality										
2. Relative Value Added (RVA)	-0.032**									
3. Relative Investment (RINV)	-0.029**	0.760***								
4. Marginal Profitability (Spread of Value)	0.022*	-0.037***	-0.002							
5. Firm Size	0.213***	0.011	0.012	-0.021***						
6. Number of Segments	-0.008	0.019**	0.026***	0.009	0.308***					
7. R&D	-0.042***	0.042***	0.004	-0.088***	-0.025***	-0.016***				
8. Investment	-0.012	0.023***	0.027***	0.022**	0.013*	0.017**	0.037***			
9. Firm Tobin's q	0.025**	-0.014	-0.008	0.646***	0.369***	0.109***	0.089***	0.042***		
10. CEO Tenure	0.226***	-0.008	0.012	0.046***	-0.095***	-0.002	-0.065***	0.011	0.061***	
11. Institutional Own	0.015	0.013	0.001	-0.009	-0.112***	-0.040***	0.014**	0.016*	0.012*	-0.001

Notes. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 1. Descriptive Statistics

Variable	Mean	Minimum	Median	Maximum	St. Deviation
CEO Duality	0.642	0.000	1.000	1.000	0.480
Relative Value Added (RVA)	-0.037	-3.947	-0.005	4.236	0.803
Relative Investment (RINV)	-0.148	-16.204	-0.046	16.090	3.561
Marginal Profitability (Spread of Value)	0.649	-0.401	0.271	5.000	1.101
Firm Size	7.614	2.848	7.597	10.882	1.445
Number of Segments	3.037	2.000	3.000	7.000	1.076
R&D /Sales	-0.058	-1.394	-0.003	0.399	0.204
Capx /sales	0.005	-0.402	-0.001	0.495	0.093
Firm Tobin's q	0.071	-3.416	0.017	4.073	0.858
CEO Tenure	7.529	0.496	5.240	37.996	7.373
Institutional Own	0.366	0.000	0.351	0.982	0.179

Notes. This table reports summary statistics for the sample of diversified companies included in the Compustat tapes at any time during 1992–2013 that operate in at least two business segments in different three-digit, standard industrial classification (SIC) codes. All variable definitions are given in Appendix.

Table 3: Multicolinearity Test

	RVA (VIF)	RINV (VIF)
CEO Duality$_{t-1}$	1.109	1.109
Firm Size	1.225	1.223
Number of Segments	1.064	1.063
R&D	1.007	1.007
Investment	1.007	1.006
Tobin's q	1.014	1.014
CEO Tenure $_{t-1}$	1.052	1.051
Institutional Own $_{t-1}$	1.068	1.066
CEO Own $_{t-1}$	1.001	1.001
Firm Risk $_{t-1}$	1.071	1.071

Table 4. Investment efficiency and CEO duality

	Model 1 RVA	Model 2 RINV
Intercept	-0.058	-0.916
	(0.144)	(0.581)
CEO Duality$_{t-1}$	-0.063*	-0.332**
	(0.036)	(0.157)
Firm Size	0.014	0.111**
	(0.013)	(0.0482)
Number of Segments	0.016	0.014
	(0.019)	(0.082)
R&D	0.272**	0.735*
	(0.129)	(0.437)
Investment	-0.484	-2.741
	(0.449)	(2.410)
Firm Tobin's q	-0.044	-0.030
	(0.028)	(0.068)
CEO Tenure $_{t-1}$	0.001	0.015
	(0.002)	(0.010)
Institutional Own $_{t-1}$	-0.005	-0.245
	(0.101)	(0.452)
Year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
N	4,404	4,368
R^2	0.378	0.307

Notes. This table reports investment efficiency regressions for the years 1992-2013. The adopted measure of investment efficiency is RVA in model 1 and RINV in model 2. To calculate RVA, firm- and industry-adjusted segment investment are weighted by the difference between the industry median Tobin's q for that segment and the sales-weighted average q for the firm. RINV is the sales-weighted sum of firm- and industry-adjusted investment in high q segments minus the sales-weighted sum of firm- and industry-adjusted investment in low q segments. Both RVA and RINV are multiplied by 100. All variable definitions are given in Appendix. Regression models are estimated with calendar year dummy variables and firm fixed effects. Standard errors are clustered at the firm level, and are reported in parenthesis. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 5.Investment efficiency (RINV) and CEO duality: High versus low agency risk
RINV as a proxy for investment efficiency

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Managerial Incentive Type:	High Incentive Ratio	Low Incentive Ratio	High Log(Delta) $_{t-1}$	Low Log(Delta) $_{t-1}$	Low FCF $_{t-1}$	High FCF $_{t-1}$
Agency Risk Level:	Low	High	Low	High	Low	High
Intercept	0.975	2.339	-0.893	-0.810	-1.189	-0.749
	(2.670)	(2.707)	(0.921)	(0.775)	(1.043)	(0.693)
CEO Duality$_{t-1}$	-0.325	-0.591**	-0.207	-0.443**	-0.106	-0.494**
	(0.231)	(0.288)	(0.201)	(0.226)	(0.242)	(0.199)
Firm Size	0.094	-0.056	0.131*	0.073	0.205**	0.052
	(0.327)	(0.398)	(0.070)	(0.077)	(0.088)	(0.055)
Number of Segments	0.123	0.180	0.023	0.003	-0.146	0.110
	(0.113)	(0.181)	(0.086)	(0.131)	(0.165)	(0.076)
R&D	0.887	0.133	0.961*	0.312	0.197	0.922*
	(0.924)	(0.758)	(0.581)	(0.517)	(0.805)	(0.509)
Investment	-7.056**	-0.494	-0.643	-5.121	-0.609	-4.535
	(3.598)	(4.840)	(3.191)	(3.512)	(3.110)	(3.096)
Firm Tobin's q	-0.031	0.084	-0.059	0.017	-0.050	-0.024
	(0.146)	(0.223)	(0.095)	(0.096)	(0.120)	(0.079)
CEO Tenure$_{t-1}$	0.006	0.073*	0.008	0.023	-0.002	0.026**
	(0.016)	(0.039)	(0.012)	(0.019)	(0.015)	(0.012)
Institutional Own $_{t-1}$	-0.145	-0.087	-0.211	-0.339	0.078	-0.455
	(0.815)	(0.920)	(0.707)	(0.532)	(0.746)	(0.571)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2120	2248	2176	2192	1633	2735
R^2	0.412	0.419	0.343	0.448	0.456	0.342

Notes. This table reports investment efficiency regressions for the years 1992-2013. Panel A (Panel B) uses RVA (RINV) as a proxy for investment efficiency. Models 1, 3, and 5 use the subsample of firms with low agency risk, and models 2, 4, and 6 the subsample of firms with high agency risk. The dependent variable is RVA for the years 1992-2013. To calculate RVA, firm- and industry-adjusted segment investment are weighted by the difference between the industry median Tobin's q for that segment and the sales-weighted average q for the firm. RINV is the sales-weighted sum of firm- and industry-adjusted investment in high q segments minus the sales-weighted sum of firm- and industry-adjusted investment in low q segments.RVA and RINV is multiplied by 100. High agency risk environments are found in firms with low lagged CEO *Incentive Ratio,* low lagged CEO *log(Delta)* and high lagged *FCF*. Low agency risk environments are found in firms with high lagged CEO *Incentive Ratio*, lagged CEO *log(Delta)* for their CEOs and low lagged *FCF*. All variable definitions are given in Appendix. Subsample is formed based on the yearly median values of each variable. Regression models are estimated with calendar year dummy variables and firm fixed effects.
Standard errors are clustered at the firm level, and are reported in parenthesis. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 6. Investment efficiency (RVA) and CEO duality: High versus low agency risk
RVA as a proxy for investment efficiency

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Managerial Incentive Type:	High Incentive Ratio	Low Incentive Ratio	High Log(Delta) $_{t-1}$	Low Log(Delta) $_{t-1}$	Low FCF $_{t-1}$	High FCF $_{t-1}$
Agency Risk Level:	Low	High	Low	High	Low	High
Intercept	0.450	0.798	-0.046	-0.098	-0.170	0.002
	(0.645)	(0.502)	(0.260)	(0.162)	(0.232)	(0.171)
CEO Duality$_{t-1}$	-0.075	-0.116**	-0.027	-0.085*	-0.009	-0.095**
	(0.057)	(0.056)	(0.049)	(0.049)	(0.050)	(0.045)
Firm Size	0.027	-0.052	0.013	0.017	0.048**	-0.007
	(0.076)	(0.075)	(0.022)	(0.015)	(0.019)	(0.016)
Number of Segments	0.020	0.040	0.016	0.016	-0.025	0.041*
	(0.031)	(0.042)	(0.021)	(0.028)	(0.032)	(0.021)
R&D	0.143	0.139	0.372**	0.064	0.351	0.235*
	(0.245)	(0.238)	(0.158)	(0.166)	(0.243)	(0.139)
Investment	-1.001	-0.324	-0.081	-0.950	-0.260	-0.706
	(0.630)	(0.796)	(0.597)	(0.620)	(0.591)	(0.533)
Firm Tobin's q	-0.023	-0.086	-0.062	-0.011	-0.073	-0.039
	(0.058)	(0.063)	(0.039)	(0.034)	(0.049)	(0.033)
CEO Tenure$_{t-1}$	0.001	0.009	0.001	0.002	-0.002	0.003
	(0.004)	(0.006)	(0.003)	(0.003)	(0.004)	(0.003)
Institutional Own $_{t-1}$	0.284	0.014	0.103	-0.096	-0.050	0.029
	(0.214)	(0.162)	(0.164)	(0.117)	(0.149)	(0.130)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,134	2,270	2,183	2,221	1,643	2,761
R^2	0.471	0.457	0.417	0.470	0.489	0.443

Table 7. Marginal Profitability and CEO Duality

	Coef.	S.E.
Intercept	0.581***	(0.151)
Prior change in assets	0.356***	(0.097)
Future change in assets	0.705***	(0.076)
Future change in firm value	-0.149***	(0.031)
CEO Duality$_{t-1}$	0.037	(0.036)
Prior change in assets × CEO Duality$_{t-1}$	-0.201**	(0.097)
Future change in assets × CEO Duality$_{t-1}$	-0.170***	(0.065)
Earnings	0.001***	(0.000)
Prior change in earnings	1.092***	(0.164)
Future change in earnings	0.944***	(0.189)
R&D expenditures	0.001***	(0.000)
Prior change in R&D	7.376***	(1.226)
Future change in R&D	11.632***	(1.563)
Interest expense	-0.003***	(0.000)
Prior change in Interest	-5.116***	(1.883)
Future change in Interest	-8.869***	(1.558)
Dividends	0.001***	(0.000)
Prior change in Dividends	11.679***	(2.639)
Future change in Dividends	10.838***	(2.469)
CEO Tenure $_{t-1}$	0.002	(0.004)
Institutional Own $_{t-1}$	-0.030*	(0.018)
Number of Segments	0.112	(0.141)
Year fixed effects	Yes	
Industry fixed effects	Yes	
N	5,480	
R^2	0.422	

Notes. This table reports marginal profitability regressions for the years 1992-2013. The first column displays the coefficient estimates, and the second column the corresponding standard errors. The dependent variable firm value, defined as the level of the spread of value over cost. The spread of value over cost is equal to the total market value of a firm net of book value of its assets divided by the book value of its assets. The independent variables include prior and future changes in total assets, in earnings before interest and extraordinary items and after depreciation and taxes, in R&D expenditures, interest expense, and in total dividends paid, as well as the future change in the market firm value. Changes in variables are calculated over one-year periods. The regressions also include current levels of earnings, R&D expenditures, interest expense, and total dividends paid. All variables are deflated by contemporaneous total book assets. All other variable definitions are given in Appendix. Regression models are estimated with calendar year dummy variables and industry fixed effects. Standard errors are clustered at the firm level, and are reported in parenthesis. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 8. Marginal Profitability and CEO Duality (Full Sample of Diversified and Non Diversified Firms)

	Coef.	S.E.
Intercept	0.596***	(0.066)
Prior change in assets	0.371***	(0.035)
Future change in assets	0.605***	(0.023)
Future change in firm value	-0.119***	(0.007)
CEO Duality$_{t-1}$	-0.027*	(0.016)
Prior change in assets × CEO Duality$_{t-1}$	-0.095**	(0.044)
Future change in assets × CEO Duality$_{t-1}$	-0.054**	(0.026)
Earnings	0.001***	(0.000)
Prior change in earnings	1.639***	(0.076)
Future change in earnings	1.177***	(0.066)
R&D expenditures	0.001***	(0.000)
Prior change in R&D	9.3919***	(0.386)
Future change in R&D	1.831***	(0.494)
Interest expense	-0.003***	(0.000)
Prior change in Interest	-6.482***	(0.671)
Future change in Interest	-8.348***	(0.535)
Dividends	0.002***	(0.000)
Prior change in Dividends	14.790***	(0.950)
Future change in Dividends	10.405***	(0.759)
CEO Tenure $_{t-1}$	0.004***	(0.001)
Institutional Own $_{t-1}$	0.288***	(0.048)
Number of Segments	-0.009***	(0.001)
Year fixed effects	Yes	
Industry fixed effects	Yes	
N	19,915	
R^2	0.404	

Notes. This table reports marginal profitability regressions for the years 1992-2013. The first column displays the coefficient estimates, and the second column the corresponding standard errors. The dependent variable firm value, defined as the level of the spread of value over cost. The spread of value over cost is equal to the total market value of a firm net of book value of its assets divided by the book value of its assets. The independent variables include prior and future changes in total assets, in earnings before interest and extraordinary items and after depreciation and taxes, in R&D expenditures, interest expense, and in total dividends paid, as well as the future change in the market firm value. Changes in variables are calculated over one-year periods. The regressions also include current levels of earnings, R&D expenditures, interest expense, and total dividends paid. All variables are deflated by contemporaneous total book assets. All other variable definitions are given in Appendix. Regression models are estimated with calendar year dummy variables and industry fixed effects. Standard errors are clustered at the firm level, and are reported in parenthesis. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Chapter 3

CEO Duality, Agency Costs, and Internal Capital Allocation Efficiency

CEO Duality, Agency Costs, and Internal Capital Allocation Efficiency

1. Introduction

The debate about whether to join or separate CEO and chair positions continues to receive considerable attention from both practitioners and academics (see, for example, Rechner and Dalton, 1989, 1991; Donaldson and Davis, 1991; Daily and Dalton, 1992, 1993; Dalton *et al.*, 2007; Kim *et al.*, 2009; Dalton and Dalton, 2011; Krause and Semadeni, 2013; Yang and Zhao, 2014; Krause, 2017). Despite a wave of proposals to eliminate CEO duality and achieve independent board leadership, corporate leaders and policy-making bodies appear reluctant to adopt such an obligatory separation that suggests a "one size fits all" approach (Krause *et al.*, 2014). Even as recent years have seen a doubling of the number of firms that have separated their CEO and chair positions, most firms in Standard & Poor's Execucomp continue to uphold CEO duality. During 1992-2013 the proportion of firms with CEO duality rarely drops below 50%.

Academic research on CEO duality focuses mainly on firm performance and to date remains rather controversial. The theoretical grounds for a link between CEO duality and accounting- or market-based performance are extensive, yet no comprehensive evidence is available to confirm it. According to Dalton and Dalton (2011), little consistency appears in extant studies that relate CEO duality to financial performance. Krause *et al.* (2014) accordingly call for research that considers moderating attributes that might alter the strength or direction of the relationship. Subsequently, Duru *et al.* (2016) uncover that board independence attenuates the negative effect of CEO duality on firm performance, while Yang and Zhao (2014)

show that when their competitive environment changes, CEO duality firms outperform non-duality firms.

Chapter 3 draws motivation from Chapter 2 main inferences on the negative relation between CEO duality and firm investment efficiency, thus, it digs deeper into investment allocation mechanisms and shows that it is only prevalent in firms that are potentially exposed to agency issues; particularly in the presence of high free cash flows, firm complexity and weak board governance. In addition, the results of Chapter 3 underscore the importance of CEOs' equity-based compensation as an important internal governance device to align the interest of the CEO and the shareholders, and as such to curb the negative effect of CEO duality on investment efficiency. Lastly, this chapter identifies CEO ability, CEO succession origin, and longevity of business segments as additional important moderating attributes that moderate the (negative) effect of CEO duality on investment efficiency.

The findings in this chapter provide strong support for the agency theory, which predicts that CEO duality reflects weaker board oversight and stronger managerial power, and suggests that boards should be independent from the management to prevent managerial entrenchment (Fama and Jensen, 1983; Eisenhardt, 1989). The findings emphasize that the adverse impact of CEO duality on corporate policies affecting value is contingent on a firm's board characteristics (Finkelstein and D'Aveni, 1994; Davidson *et al.*, 2004; Duru *et al.*, 2016); further, they support the notion about complementarities in corporate governance practices, which appear to be aligned with one another and mutually enhance the ability of those practices to achieve effective corporate governance (see, for example, Rediker and Seth, 1995; Aguilera *et al.*, 2008). In this vein, executive compensation is a powerful internal governance mechanism, able to mitigate the CEO duality rent-seeking behaviour (Fama and Jensen, 1983; Datta *et al*., 2009). Finally, in the spirit of Dalton and Dalton (2011) and Krause *et al*. (2014), the findings suggest that any future attempts to advance research towards the strategic importance of this phenomenon should consider competing theories through the lenses of such moderating or mediating factors.

The remainder of this paper proceeds as follows. Section 2 details relevant literature, to provide the theoretical foundation for the testable hypotheses. Section 3 describes the sample and key variables used in the empirical analyses. Section 4 presents the results, and Section 5 concludes.

2. Literature review and hypotheses development

2.1. Literature review

Prior literature proposes two main competing theories to understand the relation between CEO duality and firm performance: agency and stewardship theories (see, for example, Fama and Jensen, 1983; Eisenhardt, 1989; Donaldson and Davis, 1991). Agency theory predicts that agents commit to opportunistic behaviour and indulge in excessive benefits for themselves, at the expense of shareholder' interests. CEO duality is therefore undesirable from this perspective, because it grants excess power to a single executive, weakening board monitoring, fostering managerial entrenchment and negatively affecting firm performance (Finkelstein and D'Aveni, 1994; Dalton *et al*., 1998; Krause *et al*., 2014). This view appears widely supported by practitioners and a growing group of scholars advocating CEO and chair separation, arguing that CEO duality weakens corporate governance (for example, Lublin, 2009; Iannelli, 2013; Krause, 2017).

In contrast, stewardship theory asserts that CEO duality can be beneficial for firm performance, because it ensures cohesive leadership, signals firm stability, and inspires confidence in firm management (Donaldson and Davis, 1991). Expertise and knowledge can result from CEO duality, along with faster decision-making and status rewards for executives (Finkelstein and D'Aveni, 1994; Boyd, 1995; He and Wang, 2004). Therefore, a fundamental implication of stewardship theory is that CEO duality enhances firm performance by reducing costs and inefficiencies that can result from separating the two roles (Brickley *et al*., 1997).

Elsayed (2010) adopts a more nuanced view on the determinants of board leadership, and emphasizes that the optimal leadership structure varies with the context in which firms are operating (see also, He and Wang, 2009; Ramdani and Witteloostuijn, 2010; Krause and Semadeni, 2013; Krause, 2017). An important implication of this perspective is that agency theory and stewardship theory are complementary viewpoints, which explain different parts of the same picture.

Despite the strong theoretical predictions, the evidence for the impact of CEO duality on firm performance is at best mixed, with some studies providing empirical support for the agency perspective (for example, Rechner and Dalton 1991; Daily and Dalton 1994; Worrell *et al*., 1997), and others endorsing the stewardship perspective (for example, Donaldson and Davis 1991; Boyd, 1995; Brickley *et al*., 1997), while many others are inconclusive (for example, Rechner and Dalton 1989; Daily and Dalton 1992, 1993; Daily 1995; Baliga *et al*., 1996). Dalton *et al*.'s (1998) meta-analysis of board composition and leadership structure reveals little supporting evidence for the relationship between CEO duality and firm performance. Empirical research in more recent years has in consequence steered away from investigating the existence of a direct (and simple) duality-performance relationship, as researchers quest for new contexts that could help them demystify the strategic importance of CEO duality (Dalton and Dalton, 2011; Krause *et al*. 2014; Yang and Zhao, 2014; Duru *et al*., 2016; Krause, 2017).

In this vein, some studies consider new empirical approaches and moderating factors to investigate the performance effect of CEO duality. For instance, He and Wang's (2009) findings show that CEO duality strengthens the already positive effect of innovative knowledge assets on firm performance. In another study, Ballinger and Marcel (2010) report that interim CEO successions are associated with lower performance during the period in which the interim serves, while CEO duality moderates the impact of this type of succession on firm performance. Similarly, Krause and Semadeni (2013) find that separation of the CEO and Chair positions positively (negatively) impacts future firm performance when current performance is poor

(high), with the effect being most dramatic for demotion separations. More recently, Yang and Zhao (2014) rely on an exogenous shock to industry competition to show that, when there is a change in the firm's competitive environment, CEO duality firms outperform non-duality firms, with the difference in performance being greater for duality firms with better corporate governance. In a similar vein, Duru *et al.* (2016) show that the negative effect of CEO duality on firm performance is attenuated by the degree of board independence.

To conclude this review, despite a very rich literature investigating either the direct or moderating effects of CEO duality on firm performance, it appears that evidence is still missing regarding the possible channel(s) through which CEO duality affects firm policies and impacts firm performance.

2.2. Hypotheses

This chapter adopts the agency perspective of the firm to consider the internal capital allocation policy as a potential channel through which CEO duality might be detrimental to firm value. Several studies show that misallocation of internal capital in diversified firms leads to investment inefficiencies that are value-destructive (for example, Shin and Stulz, 1998; Rajan *et al*., 2000; Scharfstein and Stein, 2000; Ahn and Denis, 2004; Ahn *et al*., 2006; Datta *et al*., 2009; Hovakimian, 2011; Duchin and Sosyura, 2013). While offering a variety of important insights, these studies focus on agency problems that arise from managerial self-interest, irrespective of the board leadership structure and of how CEO duality influences the internal capital allocation policy. In this spirit, the two main hypotheses pertaining to the relationship between CEO duality and investment efficiency in diversified firms are derived.

As already discussed in Chapter 2, agency problems arise from conflicts of interest resulting from the separation of ownership and control in large corporations. When the boards' attention to monitoring is reduced and when incentive devices are not in place, managers will use the authority of the board chair role to entrench themselves against accountabity and might

undertake actions that maximize their own utility (see, for example, Jensen and Meckling, 1976; Shleifer and Vishny, 1989) or simply enjoy the quiet life (Bertrand and Mullainathan, 2003). In diversified firms agency theory maintains that CEOs can distil their private benefits of control by engaging in inefficient cross-subsidization, funding value-destroying projects, and ceding to rent-seeking efforts of divisional managers by overinvesting in weak projects at the expense of good ones (Lamont, 1997; Shin and Stulz, 1998; Scharfstein and Stein, 2000; Rajan *et al*., 2000). In support of this view, Ahn and Denis (2004) find that diversified firms allocate investment funds inefficiently. In a similar vein, Ahn *et al*. (2006) find that diversified firms invest more than their focused peers, this behaviour being driven by favouring overinvestments in low-growth business segments, to the detriment of segments with high growth opportunities that add value to the firm. Other studies (i.e. Duchin and Sosyura, 2013) consider managerial ties and social connection suggesting that under weak corporate governance, managerial ties tend to result in investment inefficiencies and lower firm value. Under these circumstances, a board may fail to interfere diligently in major corporate decisions because of its weak role when a CEO is too powerful. Accordingly, CEO duality can then lead to misallocation of capital to business divisions, including allocations of more investments to low growth, relative to high growth, segments.

Hypothesis 1: *Firms with CEO duality make inefficient investments, allocating more to low growth segments than to high growth segments*.

The aforementioned arguments confirm the substantial body of research to date on CEO duality. As has been documented, the overabundance of incongruous evidence followed by the comparatively decisive meta-analysis by Dalton et al., (1998) conclusively terminated the exploration for direct and simplistic relationships of CEO duality and firm performance. More critically, scholars identified that CEO duality should have important role that differs according to the circumstance. Duality can have both positive and negative consequences in different market settings (Boyd, 1995) and under different market characteristics (Boyd, 1995; Worrell

et al., 1997; He and Wang, 2009; Kraise, 2014), moderating attributes originating from CEO and board characteristics (Krause *et al.*, 2014), and may well vary conditionally on the level of firm performance (Ramdani and Witteloostuijn, 2010; Krause and Semadeni, 2013; Krause, 2017). For this reason, a revived interest in the topic has contemplated more complex settings and interactions of CEO duality, considering outcomes other than the performance outcome.

The extant literature advocates free cash flow as a proxy for the existence of potential agency issues. Firms with excess free cash flow encounter major agency problems, especially if their investment opportunities are limited (see, for example, Jensen, 1986; Lang *et al.*, 1991, Chung *et al.*, 2005). The agency costs arise because, when the firm holds too much excess cash, a powerful CEO can act opportunistically and seize personal gains from unnecessary value-destroying investments. Such resource misallocations may offer personal rewards, at the expense of shareholders' interests. Limited free cash flows, on the other hand, do not allow for such managerial discretion; under lower free cash flows levels, waste and inefficiencies on behalf of management should be reduced, acting as disciplining forces for overpowering CEOs who are more prone to misuse resources to pursue private goals. Low free cash flows restrict dual CEOs ability to pursue opportunistic behaviors at the expense of shareholder value, thus mitigating the investment inefficiency problems caused by dual CEOs. Zajac and Westphal (1994) point to the firm's complexity as another firm-level factor that may intensify agency conflicts. They assert that when monitoring is more costly, i.e under strategic complexity, the task of monitoring becomes harder, resulting to a less vigilant board. It is, therefore, argued that the degree of free cash flow availability as well as strategic complexity are important determinants of the magnitude of agency costs in a firm, thus, moderate the relation between dual CEOs, resource allocation and overall investment efficiency.

Several management scholars argue that the performance impact of CEO duality is contingent on the board's characteristics (Finkelstein and D'Aveni, 1994; Davidson *et al.*, 2004; Duru *et al.*, 2016), and internal governance mechanisms can be substitutes for CEO duality

(Rediker and Seth, 1995). Three important board characteristics considered in the literature are a board's independence, staggered boards, and board size. Independent board members, those with no ties to the company and its CEO, are better suited to improve the effectiveness of board monitoring and to sanction the CEO in case of underperformance (see, for example, Fama and Jensen, 1983; Weisbach, 1988). Duru *et al.* (2016) emphasize that board independence amplifies the positive effect of CEO duality on firm performance and mitigates the associated costs, which in turn leads to a more profitable balance between strong leadership and better board monitoring. The implementation of a staggered board is another board characteristic that has attracted the interest of scholars in finance and management.[1] A staggered board may exacerbate agency problems and lead to CEO entrenchment, as it potentially insulates the firm from the pressure of the market for corporate control (Bebchuk *et al.*, 2002; Cohen and Wang, 2013; Amihud and Stoyanov, 2017). Board size has also been found to influence the capacity of the board to vigilantly function. Relevant literature has largely supported that larger boards are ineffective in monitoring the CEO because of the presence of co-ordination problems and free rider directors (Lipton & Lorsch, 1992;Jensen,1993), being in favor of smaller boards which appear to relate to higher valuations (Yermack, 1996; Eisenberg et al., 1998). Coles, Daniel, and Naveen (2008) point to a U-shaped relation between firm value and board size advocating that either very small or very large boards are optimal in disciplining the CEO. Therefore, board characteristics that curb (or heighten) agency problems may act as important moderating attributes in the relation between CEO duality and the efficiency of internal capital allocation.

To add to the debate on the role of the moderating effects of CEO duality, this thesis revisits equity-based compensation, due to its role in diminishing managerial entrenchment. CEO compensation constitutes a vital internal governance device to alleviate managerial slack

[1] A staggered board is a board structure in which only a fraction of the directors is elected during a shareholder meeting, rather than all at once.

and align managerial incentives with shareholder concerns and its role should not be undermined (Jensen and Meckling, 1976; Hölmstrom, 1979). In the context of CEO duality, the main focus in past literature is only on examining compensation as a consequence of CEO duality (Westphal & Zajac, 1994) rather than utilising it as a moderating attribute. Equity-based compensation is known to attenuate agency costs by reducing the non-value-maximizing behaviour of managers (Shleifer and Vishny, 1989), and to promote collaboration in large diversified firms (Oxley and Pandher, 2016). In the spirit of agency theory, Datta *et al.* (2009) document that stock grants play an important role in motivating CEOs to make more efficient internal capital allocation decisions. As it helps to align managerial interests with those of shareholders, equity-based compensation may play an important role in curbing the negative effect of CEO duality on internal investment allocation.

Taken collectively, all these arguments lead to the second hypothesis:

Hypothesis 2: *The negative effect of CEO duality on internal capital allocation efficiency prevails only in diversified firms that are exposed to high agency problems*.

3. Data and empirical strategy

3.1. Sample and data sources

Four data sets serve to construct the sample with the required data: CEOs' equity-based compensation and characteristics from Execucomp, firm-level financial data from Compustat, segment-level financial data from the Compustat Industrial Segment (CIS) database, and corporate governance data from Institutional Shareholder Services (ISS). Since the focuses on a contingency approach on an intra-firm examination of investments to business segments, the sample is restricted to diversified firms that report at least two segments, operating in different three-digit standard industrial classification (SIC) codes.

The primary sample for the time frame of 1992-2013 from Compustat consists of 504226 firm year observations. Similarly to Chapter 2, to attenuate distortions caused by small firms, which may have negligible sales or assets, the selection criteria require total sales of at least $20 million. Financial firms (SIC codes 6000-6999), as well as firms with any divisions that operate in these sectors, are excluded, because they are subject to specific regulations. Further, taking into consideration certain WRDS recommendations for the elimination of non-accurate observations, the sample is reduced to 43460 multi-segment firm years. Sales generally are allocated across the reported segments of a diversified firm, so the sum of all segment sales must be within 1% of the total firm sales (Berger and Ofek, 1995). For the purpose of industry benchmarking (defined by the median peer-focused firm), another requirement is the existence of at least five peer-focused firms in the same three-digit SIC for each segment of the sample of diversified firms. The final sample covers the period 1992-2013 and is made up of 4,168 firm-years and 10,740 segment-year observations, after accounting for missing observations on the two variables, and control variables.

3.2. Model specification and variable definitions

3.2.1. Baseline specification

To measure the effect of CEO duality on internal capital allocation efficiency, the segment-level regression equation adopted is the following:

$$\begin{aligned} Segment\ Investment_{j,i,t} = {} & \alpha_i + \alpha_t + \beta_1\ CEO\ Duality_{i,t-1} + \beta_2\ High\text{-}q\ Segment_{j,i,t} \\ & + \beta_3\ CEO\ Duality_{i,t-1} \times High\text{-}q\ Segment_{j,i,t} + \beta_4\ Segment\ Controls_{j,i,t} \\ & + \beta_5\ Firm\ Controls_{i,t-1} + \beta_6\ CEO\ Controls_{i,t-1} + \varepsilon_{j,i,t}, \end{aligned} \quad (1)$$

where the dependent variable is the industry-adjusted investment of segment *j* at time *t*, defined as segment *j*'s capital expenditure-to-sales ratio minus the capital expenditure-to-sales ratio of the median peer-focused firm operating in the same three-digit SIC industry as segment *j*. Subscript i denotes the firm, and α_i and α_t are firm and year fixed-effects, respectively. Year fixed-effects control for changing economic and financing conditions through time. Firm fixed-

effects help isolate intra-firm changes and allow us to better capture the sensitivity of segment investment to changes in the independent variable of interest. Firm fixed-effects also mitigate concerns about omitted variable biases due to time-invariant firm-level unobservable factors. It is also important to note that industry fixed-effects are indirectly controlled for using industry-adjusted segment variables.

The two independent variables of interest in Eq. (1) are *CEO Duality* and *High-q Segment*. *CEO Duality* is a dummy variable set equal to one for firm-years during which the CEO served also as the board chair, and zero otherwise. *High-q Segment* is a dummy variable set equal to one if the corresponding segment belongs to a high growth industry (high-*q*), and zero otherwise (low-*q*). Following Ahn *et al.* (2006) and Datta *et al*. (2009), a segment is classed as high-*q* if the Tobin's *q* of the median peer-focused firm in the corresponding three-digit SIC industry is greater than the sales-weighted average Tobin's *q* for the firm as a whole. To empirically investigate Hypothesis 1, an interaction term of these two independent variables of interest is used (i.e., *CEO Duality* × *High-q Segment*). A negative β_3 coefficient indicates that the capital allocation process in firms with CEO duality favors low-*q* over high-*q* segments, indicating the existence of inefficiencies in the capital allocation policy of the firm. In the current empirical framework, underinvestment in high-*q* segments is a measure of agency cost due to having CEO duality. This is captured by a negative β_3 coefficient in Eq. (1). The more negative β_3, the higher the agency cost associated with CEO duality. The study by Ang *et al*. (2000) also relies on efficiency ratios as a measure for agency costs, but its focus is on operating expenses and efficient use of assets, while this thesis focuses on the efficiency of cross-segment capital allocation.

The specification in Eq. (1) also controls for a large set of time-varying segment, firm, and CEO characteristics: *Segment Size*, the natural logarithm of the sales of the corresponding segment; *Relative Segment Size*, the segment's sales divided by the sum of sales across all segments of the firm; *Segment CF*, the industry-adjusted operating cash flow to sales ratio for

the corresponding segment; *Other Segment CF*, the industry-adjusted operating cash flow to sales ratio for the firm's remaining segments; *Industry Tobin's q*, the Tobin's q ratio of the median peer-focused firm in the three-digit SIC code industry for the corresponding segment; *Institutional Own*, the proportion of institutional ownership in the firm's ownership structure; *Firm risk*, the variance of the firm's monthly excess stock returns during the fiscal year; *CEO Tenure*, the natural logarithm of one plus the length of time between the date when the person became the CEO and the current fiscal year end; and *CEO Own*, the proportion of CEO ownership in the firm. Detailed variable definitions are provided in the Appendix. To avoid potential problems with outliers, all continuous variables are winsorized at the 1st and 99th percentiles of their distributions. Robust standard errors that are heteroskedasticity-consistent are clustered at the firm level. Firm- and CEO-level right-hand side variables are lagged by one-period, to alleviate the concern that CEO duality and the firm's investment policy may be simultaneously determined in equilibrium.

3.2.2. Moderating attributes

The chapter aims to shed light on whether the internal capital allocation policy is inefficient in firms characterized as facing potentially high agency problems. Empirically this is done by conditioning the regression coefficient of interest, β_3, in Eq. (1), on prominent firm-specific and CEO-specific variables known to be correlated with agency issues, and therefore by capturing the potential misalignment of interests between the CEO and the shareholders. Such investigation is also in the spirit of recent studies probing for more research that considers moderating attributes that might alter the strength or direction of the relationship (see, for example, Krause *et al*., 2014).

The first set of moderating attributes considered is related to firm characteristics, in particular the firm's free cash flow (*Free Cash Flow*) and firm complexity (*Complex Firm*).

Complex firms and firms with high free cash flow are associated with potentially severe agency problems, particularly in the presence of a powerful CEO (Jensen, 1986). Free cash flow is calculated as income before extraordinary items plus depreciation expense scaled by total assets. The second firm- level moderating variable relates to whether the firm is complex or simple. Following Aktas, de Bodt and Roll (2009), complexity is proxied with the sales concentration ratio, which declines with the number and variety of firm activities, and it is therefore considered as a negative determinant of complexity.

Next, three important board characteristics are considered which are known to be correlated with weak board monitoring and CEO entrenchment: board independence ,staggered board, and board size (see, for example, Fama and Jensen, 1983; Weisbach, 1988; Bebchuk *et al*., 2002). Board independence (*Board Independence*) is measured using the proportion of outside directors in a firm's board of directors. Staggered board (*Staggered Board*) is a dummy variable set equal to one in cases where not all members of the board are elected at the same time, and zero otherwise. Board size (*Board Size*) reflects the total number of directors in a firm's board.

Following Jensen and Murphy (1990), equity-based compensation is also adopted as another moderating attribute, since its use can be an effective tool for aligning the interests of managers and shareholders by exposing managers' wealth to their firms' stock prices. To capture this, the CEO's *Incentive Ratio* as in Bergstresser and Philippon (2006), and the *Delta* as in Core and Guay (2002) are used. The *Incentive Ratio* is calculated such that it captures the share of a hypothetical CEO's total compensation that would come from a 1% increase in the value of the equity of their company. The *Delta* gives the CEO's option portfolio price sensitivity estimated as the change in the risk-neutral value of the executive's portfolio for a 1% change in the price of the underlying stock. As such, the higher (lower) the *Incentive Ratio* or *Delta*, the more (less) sensitive the CEO's compensation to a change in the firm's stock price, implying potentially lower (higher) agency costs.

All the moderating attributes are measured with a one-year lag relative to the internal capital allocation policy, to ensure that the attributes are not affected by the investment decision. Detailed definitions of all the moderating variables appear in the Appendix.

3.3. Descriptive statistics

Table 1 presents summary statistics on CEO and firm characteristics in Panel A, and on segment characteristics in Panel B. The proportion of firm-year observations with CEO duality is 67% in the sample, a proportion similar to that reported by Yang and Zhao (2014). The average tenure of the CEOs is 7.6 years and the average CEO is about 57 years old, figures similar to those reported in Andreou *et al*. (2017b). Institutional investors own on average 37% of the firm's equity capital, while the CEO owns slightly less than 3%.

At the segment-level, the average industry-adjusted investment is 0.5%, close to the magnitude reported by Rajan *et al*. (2000) and Ahn *et al*. (2006). The mean size of the segment is about 456 million USD, the average segment generates about 34% of the firm's sales, and the industry-adjusted ratio of cash flows to sales exhibits a mean of 15.4%, while the same ratio for the firm's remaining segments is 16.2%. Finally, the industry Tobin's *q* displays a mean of 1.54, and about 49% of a firm's segments are classified as having high-*q* growth opportunities.

[Table 1 here]

Table 2 reports the correlation matrix for the variables considered. Most variables correlate with CEO duality and exhibit the expected sign. For example, under the agency view, Shleifer and Vishny (1989) and Jensen (1986) imply that CEO duality should be pronounced for bigger firms (correlation with *Segment Size* is 0.177, *p*-value<0.01), Amihud and Lev (1981) suggest that CEO duality firms show a tendency to reduce their own risk (correlation with *Firm Risk* is -0.083, *p*-value<0.01, and *CEO Own* is -0.011, *p*-value<0.10), and as suggested by Jensen and Murphy (1990), such firms engage in self-interested actions at the expense of

shareholders to reap private benefits and thus destruct value (correlation with *Industry Tobin's q* is -0.019, *p*-value<0.01). It is evident that none of the correlations is high enough to raise concerns over multicollinearity. Still to eliminate any possibility, the study relies on the variance inflation factor (VIF) to identify the presence of multicollinearity among the predictors of all the regression models. As recorded in Table 3, all the predictors in Eq. (1) have a VIF that is in principle lower than 3.9, which indicates the absence of severe multicollinearity issues in the models.

[Table 2 here]

[Table 3 here]

4. Empirical findings

4.1. Baseline specification

In the context of diversified firms, an efficient internal capital allocation policy prioritizes business segments with high growth opportunities (high-*q* segments) in directing its resources (Rajan *et al.*, 2000). To examine the relation between CEO duality and internal capital allocation efficiency, Table 4 reports the estimation results of Eq. (1).

Model (1) investigates a specification without the interaction term (*CEO Duality* × *High-q Segment*), whereby the coefficient estimate of *CEO Duality* is equal to 0.005 (*p*-value<0.05). This indicates that firms following a CEO-Chair leadership structure in year *t-1* on average increase their industry-adjusted segment investment by 0.5% over the next year. Overall, model (1) suggests that firms with CEO duality overinvest, relative to firms in which these roles are held by different individuals. This result alone squares with agency theory, supporting the view that diversified firms appear to incubate entrenched managers who engage in self-interested investments at the expense of shareholders to reap private benefits by

overinvesting and growing their firms beyond their optimal size (Jensen and Meckling, 1976; Aggarwal and Samwick, 2003).

In model (2), the coefficient estimate of *CEO Duality* measures the effect of CEO duality on investment in low-*q* segments, while the interaction term measures the differential impact of CEO duality on investment in high-*q* segments. The coefficient estimate of *CEO Duality* is equal to 0.01 (*p*-value<0.01) and shows that the overinvestment pattern identified in model (1) is mainly concentrated in low-*q* segments. The coefficient of the *CEO Duality* × *High-q Segment* (i.e., coefficient β_3 in Eq. (1)), which is equal to -0.009 (*p*-value<0.05), shows that firms with CEO duality fail to give priority to high-*q* segments in their capital allocation policy, a result emphasizing a strong contradiction of the efficient internal capital markets paradigm (see, for example, Stein, 1997; Shin and Stulz, 1998), according to which diversified firms should channel corporate resources first to divisions with high growth opportunities, which can add value. The findings also suggest that part of the observed investment inefficiency documented in prior studies (for example, Rajan *et al.*, 2000; Ahn *et al*., 2006; Datta *et al*., 2009; Hovakimian, 2011; Duchin and Sosyura, 2013) stems from the increased power and the self-interested internal investment behaviour associated with CEO duality.

To assess the robustness of the baseline findings, in model (3) firm fixed-effects are replaced with random-effects that allow for random differences in segment investment across firms. This specification makes use of both time-series and cross-sectional variations, and controls for the effect of unobservable firm heterogeneity on segment investment. Importantly, model (3) shows that the main findings are insensitive to the way unobservable firm heterogeneity is controlled.

[Table 4 here]

The main analysis of this study relates to the impact of CEO duality on investment allocation, therefore an empirical issue tackled is the potential endogeneity in the relation

between CEO duality and internal capital allocation policy (Yang and Zhao, 2014). The firm's internal capital allocation policy may be both a result of CEO duality and itself a determinant of the firm's decision to adopt CEO duality. Hermalin and Weisbach (1998) argue that the decision about the structure and composition of a board of directors represents the firm's answer to organizational design issues or problems. For Kang and Zardkoohi (2005), CEO duality can have various institutional, power, social reciprocity, reward, and organizational antecedents, so a firm's choice of leadership structure is not random but rather represents a response to a constrained optimization process. Yet, Iyengar and Zampelli (2009) find no evidence that CEO duality is a structure intentionally chosen to optimize performance; if the firm is choosing a dual leadership regime, the reason for this choice is not performance. Still, to account for the possibility of endogenous CEO duality and its effects, chapter 3 accounts for the possibility of an endogenous relationship with the use of instrumental variables and endogeneity checks to ensure further validity of the main analysis' results. More specifically, Elsayed (2010) suggests that corporate leadership structure must be viewed as a dynamic process, contingent on the context, actors and time. Elsayed (2010) documents that corporate leadership structure varies with firm size, firm age and ownership structure. Considering Elsayed's findings, 2SLS tests are performed by simultaneously employing as instruments firm size and firm age. The test results are reported in Table 5, whereby models (1) and (2) present the results from the second-stage estimation, investigating the impact of CEO duality on industry-adjusted segment investment. The analysis in model (1) uses two variables to instrument CEO duality: firm age, which is the number of years elapsed since the year of the firm's Compustat of the firm listing, and firm size, which is calculated as the natural logarithm of the firm's assets. The analysis in model (2) uses two other variables to instrument CEO duality: a dummy variable that takes a value of one if the age of the firm is higher than the industry median age in each year, and a dummy variable that takes a value of one if the size of the firm is higher than industry median size in each year. Both models (1) and (2) of Table 5 fully support the findings of the main

analysis; in both models the interaction term (*CEO Duality ×High-q Segment*) remains negative and highly significant (*p*-value<0.10 and *p*-value<0.05, respectively).

To address the endogeneity issue in another way, the study follows Abdallah, Goergen and O'Sullivan (2015) to perform the system generalized method of moments (GMM). In contrast to 2SLS and 3SLS endogeneity tests, system GMM does not rely on exogenous variables used as instruments; rather, it employs a system of two sets of equations with their own internal instruments. The analysis is implemented in the spirit of the estimation approach in Abdallah et al. (2015). Accordingly, the lagged dependent variable, i.e., industry adjusted segment investment (*Segment Investment*), is now included on the right-hand side of the main equation transforming the analysis into a dynamic panel regression. To account for first-order correlation and second order correlation in the residuals, the Arellano−Bond test for autocorrelation is utilized. GMM test results are reported in model (3) of Table 5. Consistent with the main findings, the interaction term (*CEO Duality ×High-q Segment*) remains negative and highly significant (*p*-value<0.05), lending further support to the view that CEO duality adversely affects the internal capital allocation efficiency in diversified firms. Overall, it is observed that the endogeneity tests confirm the robustness and validity of the main findings.

[Table 5 here]

4.2. Moderating effects

This subsection examines three main hypothesis which relate to the moderating role of firm-specific and CEO-specific variables known to be correlated with the severity of agency problems within the firm.

This section first considers a firm's *Free Cash Flow*, *Firm Complexity*, and three important board characteristics, namely, *Staggered Board*, *Board Independence*, and *Board Size* as moderating variables for the relation between CEO duality and the efficiency of internal capital allocation. Next, it adopts the *Incentive Ratio* and *Delta* of the CEO's compensation

package as proxies for the importance of equity-based compensation as an incentive mechanism. With the help of each of these variables as measured in year *t*-1, the sample is split into two subsamples that characterize firm context with potentially *high* and *low* agency problems, respectively. Then for each of these subsamples, the specification in Eq. (1) is estimated and results are reported in Tables 6 to 9.

Models (1) and (2) in Table 6 report on the subsample of firms with high (above the yearly median value) and low (below the yearly median value) free cash flows, respectively. Models (3) and (4) report the results for the subsamples of firms classified as being "Simple" ("Complex") in fiscal year *t-1*, which are firms below (above) the yearly median values of the Herfindahl-Hirschman concentration index of the firm's sales (calculated as the sum of squares of sales shares by business and geographic segments), respectively. High free cash flow, and complex firms denote firm contexts with potentially high agency problems, and it is in these firms that the adverse effect of CEO duality on investment efficiency is expected to be more substantial. As depicted in model (1), firms with high free cash flows that feature CEO duality in year *t*-1 decrease their industry-adjusted investment in high-*q* segments by 1.0% over the next year, relative to their industry-adjusted investment in low-*q* segments. Similarly, Model (4) shows that the adverse effect of CEO Duality on investment efficiency prevails only in the case of complex firms proving that differences in the level of firm complexity matter in attenuating agency costs. Both *CEO Duality* and *CEO Duality* × *High-q Segment* are not statistically significant in models (2) and (3), which are the subsamples of firms with potentially low agency problems, demonstrating that the negative consequences of duality on investment allocation and efficiency vanish in simple firm settings and in firms with low free cash flows.

[Table 6 here]

In Table 7, Models (1) and (2) report on the subsample of firms with and without a staggered board structure, respectively. Models (3) and (4) report on the subsample of firms

with a low (below the yearly median value) and high (above the yearly median value) percentage of independent board members, respectively. The existence of staggered board, and low board independence represent firm contexts prone to severe agency problems, and it is expected that under these regimes the adverse effect of CEO duality on investment efficiency will manifest. Table 7 shows that the positive effect of CEO duality on segment overinvestment tendency prevails only in models (1) and (3). These are the subsamples of observations with potentially high agency problems. Likewise, the coefficient of *CEO Duality* × *High-q Segment* is negative and statistically significant (*p*-values<0.05) only in these models. Likewise, as shown in model (1), firms with staggered board structure reduce their investment in high-*q* segments by 2.1%, whereas as per model (3) the reduction in high-*q* is 1.2% in the case of firms with low board independence. Both *CEO Duality* and *CEO Duality* × *High-q Segment* are not statistically significant in models (2) and (4), which are the subsamples of firms with potentially low agency problems. These results emphasize that the absence of staggered board structure, and high board independence are firm contexts that are beneficial to the balance between strong leadership and better board monitoring. As such, they help to avoid situations according to which powerful CEOs can extract private benefits through misallocating corporate resources.

[Table 7 here]

The chapter also investigates the results separately for small-, medium- and large-sized boards in Table 8 Models (1), (2), and (3) respectively, using three tercile ranks of firms split according to board size in fiscal year *t*-1. The expectation is that larger boards would associate with poorer monitoring and thus weaker corporate governance structures that accentuate agency problems. Results in table 8 reveal a negative relation between CEO duality and investment efficiency for the subsample of firms with a large board; however, this relation is not statistically significant. A finer slicing of the data between small-, medium- and large-sized boards reveals a negative relation between CEO duality and investment efficiency only for

firms with medium-sized boards. A negative and significant coefficient (*p*-values<0.05) for *CEO Duality* × *High-q Segment* is obtained only in this model. This result is in line with the U-shaped evidence documented by previous studies, where smaller as well as larger board sizes are optimal in various firm settings (Coles, et al., 2008).

[Table 8 here]

The low or high agency problems subsamples in Table 9 include observations below or above the yearly median values of, respectively, the *Incentive Ratio* in models (1) and (2), and *Delta* in models (3) and (4), as measured in year *t*-1. The results show that the negative impact of CEO duality on investment efficiency concentrates only in firms with potentially high agency problems, due to the absence of enough incentives (models (1) and (3) featuring low *Incentive Ratio* and low *Delta*, respectively), while the adverse impact of CEO duality on investment efficiency disappears in the subsample of firms with potentially low agency problems (models (2) and (4) featuring high *Incentive Ratio* and high *Delta*, respectively). In general, these findings follow in spirit those of Table 6 to 9, whereby the positive coefficients of *CEO Duality* reveal a clear tendency of over-investments in low-*q* segments, while the negative coefficients of *CEO Duality* × *High-q Segment* offer strong evidence of under-investments in high-*q* segments. Overall, there is compelling evidence that the existence of agency problems allows CEO duality to manifest rent-seeking behaviours that erode a firm's internal investment efficiency, even though equity-based compensation can be effective in mitigating such inefficiencies.

[Table 9 here]

Collectively, the results of Tables 6 to 9 highlight the importance of firm contexts associated with high agency problems in moderating the negative effect of CEO duality on the internal capital allocation efficiency and provide strong support for the main hypothesis of this

chapter. These findings also complement prior literature (see, for example, Finkelstein and D'Aveni, 1994; Rediker and Seth, 1995; Davidson *et al.*, 2004; Aguilera *et al.*, 2008; Duru *et al.*, 2016), because they offer additional evidence in support of the substitution hypothesis of internal corporate governance devices.

4.3. Additional moderating attributes

This subsection investigates additional attributes that might potentially moderate the relation between CEO duality and internal investment efficiency. The considered attributes are *(i)* CEO ability, *(ii)* CEO succession origin, and *(iii)* segment longevity, all measured in year *t*-1. Table 10 reports the results.

The chapter uses a managerial ability index developed by Demerjian *et al.* (2012), which relies on data envelopment analysis and measures managers' efficiency in generating revenues (see the Appendix for a description of the index construction). Although the managerial ability index measures the ability of the whole management team, Demerjian *et al*. (2012) document that a substantial portion of the index variance is explained by CEO fixed-effects and as such can be used to quantify CEO managerial ability. In this regard, many subsequent studies have used this measure to investigate the effects of CEO managerial ability on different firm policies and outcomes (for example, Andreou *et al*., 2017a).

Intuitively, CEO duality is expected to promote strong leadership and to be more beneficial to firm value when the CEO also has high ability, because this is a situation where the manager has the least need to opt for rent-seeking behaviour. This expectation is founded on two reasons. First, Demerjian *et al*. (2012) find that replacing CEOs with more able CEOs is associated with improvements in subsequent firm performance, whereas the reverse is true for less able CEOs. Second, Andreou *et al*. (2017a) find a strong positive relation between CEO ability and capital expenditures during the crisis period, which remains robust in the presence

of a large array of control variables capturing corporate governance attributes, executive compensation incentives and CEO characteristics. Taken together, their results are consistent with the view that high CEO ability helps to mitigate under-investment problems, which in turn increases firm value. To test this premise, models (1) and (2) of Table 10 report the results for the subsample of firms with low and high CEO ability, respectively. The low and high subsamples include observations below or above the yearly median values of the managerial ability index. Evidently, the negative effect of CEO duality on investment efficiency prevails only in model (1), indicating that powerful CEOs with low managerial ability are more inclined to develop entrenchment strategies, perhaps to hedge their employment risk and extract private benefits which they cannot otherwise achieve due to incompetency and mediocre talent.

Next the study assesses whether the impact of CEO duality on investment efficiency relates to the CEO succession origin. Karaevli (2007) argues that externally hired CEOs are more likely to be performance- and change-oriented in comparison to internally promoted CEOs. In addition, internally hired CEOs, having strong ties within the firm and its business segments, might be more tempted to deviate from an efficiency-driven capital allocation process. This reasoning also resonates with the internal capital market efficiency literature, which aims to explain misallocation of resources and rent-payment by the CEO to the divisional managers, who receive unjustifiably more resource allocation for their divisions (Scharfstein and Stein, 2000; Rajan *et al*., 2000; Duchin and Sosyura, 2013). Therefore, the adverse effect of CEO duality is expected to be prevalent particularly in the subsample of internally hired CEOs. In general, a CEO is classified as externally hired if the appointed CEO has tenure of fewer than 365 days in the firm (more details on the classification definition are provided in the Appendix.) Models (3) and (4) in Table 10 report respectively on internally and externally hired CEOs, where the interaction term (*CEO Duality* $\times$ *High-q Segment*) in model (3) is negative and statistically significant (p-value<0.01). As expected, the results indicate that the inefficient

internal capital allocation of powerful CEOs is due to the investment behaviour of internally hired CEOs.

Finally, the longevity of the respective segment is examined. It could be argued that powerful CEOs may find it more convenient for their own personal motives and risk reduction tendencies to invest in a long-lived segment, which has proved to survive through the years, rather than bearing the uncertainty related to younger segments, still unknown as to whether they will be able to survive and succeed in the long-run. It is also plausible that older divisions and their divisional managers may have more power and more say over the allocation process of the firm or could be better connected to the CEO (see Duchin and Sosyura, 2013, for similar arguments). Therefore, it is expected to find more investment inefficiency in the allocation process in long-lived business segments. The results in models (5) and (6) offer support for these conjectures.

[Table 10 here]

Overall, the results of Table 10 provide additional evidence that is broadly consistent with the agency view of the firm (Jensen and Meckling, 1976; Fama and Jensen, 1983; Shleifer and Vishny, 1989; Shin and Stulz, 1998; Scharfstein and Stein, 2000). CEOs' risk reduction, rent extraction, and entrenchment tendencies potentially explain the existence of inefficient allocation of internal capital in firms with CEO duality.

5. Conclusion

As has been demonstrated, the vast majority of CEO duality research has utilized a variant of agency theory or stewardship theory to develop and test hypotheses. While these two prevailing models have permitted pertinent research to produce substantial insights about board leadership, the applicability of these studies given the recent economic turmoil is gradually waning. This chapter builds on this argument and contributes to the literature by drawing on

alternative theoretical paradigms, focusing on firm level and board governance moderators that moderate the (negative) effect of CEO duality on investment efficiency. Additionally, the findings of this chapter emphasize the importance of CEOs' equity-based compensation as an important internal governance mechanism that provides incentives for CEOs to institute their acts and decisions in accord with shareholder interests, and as such to curb the negative effect of CEO duality on investment efficiency.

Although the chapter provides an agency perspective on CEO duality, an important inference is that investment inefficiencies (and as a result firm performance) will not necessarily improve by splitting the CEO and board chair positions. Rather, performance implications of CEO duality must be viewed in a contingent lens in which an array of factors determines the structure that is deemed to be strategically beneficial for their firms. As such, the chapter informs strategic literature that the prospect that CEO duality begets self-interested behavior at the expense of shareholder depends on firm and compensation structure, as well as board and CEO characteristics.

Tables

Table 1. Descriptive Statistics

Variable	Mean	Minimum	Median	Maximum	St. Deviation
Panel A. CEO and Firm Characteristics					
CEO Duality	0.673	0.000	1.000	1.000	0.469
CEO Tenure	7.598	0.496	5.332	37.996	7.344
CEO Age	56.90	41.00	57.00	77.00	6.622
CEO Own	0.028	0.000	0.013	0.276	0.046
Institutional Own	0.368	0.000	0.353	1.000	0.183
Firm Risk	0.014	0.001	0.008	0.311	0.023
Panel B. Segment Characteristics					
Segment Investment	0.005	-0.402	-0.001	0.495	0.091
Segment Size	6.122	-1.269	6.177	9.707	1.731
Relative Segment Size	0.341	0.000	0.274	0.998	0.257
Segment CF	0.154	-1.185	0.145	0.836	0.194
Other Segment CF	0.162	-0.975	0.151	0.673	0.131
Industry Tobin's q	1.539	0.851	1.386	4.860	0.560
High-q Segment	0.489	0.000	0.000	1.000	0.499

Notes. This table reports the summary statistics on the CEO, firm, and segment variables used in the analyses. The sample covers the period 1992-2013 and is made up of 10,740 segment-year observations. Segment-level variables are measured in year *t*, and CEO- and firm-level variables in year *t*-1. The definitions of all the variables are provided in the Appendix.

Table 2. Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10	11
1. CEO Duality											
2. Segment Investment	-0.004										
3. Segment Size	0.177***	-0.013***									
4. Relative Segment Size	0.005	-0.048***	0.220***								
5. Segment CF	0.021***	-0.012**	0.252***	0.047***							
6. Other Segment CF	0.016**	0.013***	0.195***	-0.145***	0.265***						
7. Industry Tobin's q	-0.019***	-0.002	-0.132***	-0.013***	-0.043***	-0.026***					
8. High-q Segment	-0.008	-0.017***	-0.051***	-0.042***	-0.015***	0.001	0.431***				
9. Institutional Own	0.023***	0.016***	-0.119***	0.020***	-0.046***	-0.045***	-0.028***	0.003			
10. Firm Risk	-0.083***	-0.014***	-0.320***	0.053***	-0.175***	-0.209***	0.063***	0.005	0.011*		
11. CEO Tenure	0.210***	0.004	-0.083***	-0.001	-0.036***	-0.024***	0.041***	0.009	0.001	0.145***	
12. CEO Own	-0.011*	-0.001	-0.005	0.001	0.01	0.015**	-0.004	-0.004	-0.003	-0.001	-0.005

Notes. All the variable definitions are provided in the Appendix. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 3. CEO duality and internal capital allocation efficiency: Multicollinearity Test

	Model (VIF)
Intercept	0
CEO Duality$_{t-1}$	2.107
Segment Size	1.432
Relative Segment Size	1.305
Segment CF/Sales	1.056
Other Segment CF/Sales	1.057
Median Tobin's q	1.233
Q_{dum}	3.221
CEO Tenure$_{t-1}$	1.082
Institutional Own $_{t-1}$	1.067
CEO Duality$_{t-1}$ * Q_{dum}	3.939
CEO Own $_{t-1}$	1.002
Firm Risk $_{t-1}$	1.088

Table 4. CEO duality and internal capital allocation efficiency

	(1)	(2)	(3)
		Fixed Effects	Random Effects
Segment Size	-0.017***	-0.017***	-0.007***
	(0.004)	(0.004)	(0.001)
Relative Segment Size	0.045***	0.045***	0.011**
	(0.013)	(0.013)	(0.005)
Segment CF	-0.025	-0.025	-0.025***
	(0.019)	(0.012)	(0.005)
Other Segment CF	-0.001	-0.001	0.008
	(0.022)	(0.022)	(0.008)
Industry Tobin's q	0.001	0.001	0.003
	(0.002)	(0.002)	(0.002)
High-q Segment	-0.003	0.003	0.002
	(0.003)	(0.004)	(0.003)
Institutional Own	0.002	0.002	-0.009
	(0.008)	(0.008)	(0.008)
Firm Risk	-0.053	-0.053	-0.067
	(0.042)	(0.042)	(0.053)
CEO Tenure	0.001	0.001	0.001
	(0.001)	(0.002)	(0.001)
CEO Own	0.026	0.027	-0.020
	(0.040)	(0.041)	(0.027)
CEO Duality	0.005**	0.010***	0.008**
	(0.002)	(0.003)	(0.003)
CEO Duality × High-q Segment		-0.009**	-0.009***
		(0.005)	(0.004)
N	10,740	10,740	10,740
R^2	0.239	0.239	0.213

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) present the results with firm and year fixed-effects, while model (3) presents the results with random effects. Models (4) and (5) present the results from the second-stage estimation of the instrument variable (IV) approach. In model (4) the IV analysis instruments CEO duality using the natural logarithm of CEO age, while a dummy variable that takes a value of one if the age of the CEO is higher that industry mean age in a given year, and zero otherwise is utilized as the instrument in model (5). In all specifications, the dependent variable is the industry-adjusted segment investment in fiscal year *t*. Segment-level variables are measured in year *t*, and CEO- and firm-level variables in fiscal year *t*-1. All variable definitions are provided in the Appendix. Regression models are estimated with year fixed-effects. Robust standard errors that are heteroskedasticity-consistent and clustered at the firm level are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 5. CEO duality and segment investment: 2SLS-IV and GMM

	(1) IV	(2) IV	(3) GMM
Segment Size	-0.021***	-0.022***	-0.031
	(0.005)	(0.005)	(0.075)
Relative Segment Size	0.054***	0.060***	-0.440
	(0.014)	(0.015)	(0.515)
Segment CF	-0.025	-0.025	0.072
	(0.019)	(0.019)	(0.111)
Other Segment CF	0.006	0.001	-0.507
	(0.022)	(0.023)	(0.351)
Industry Tobin's q	0.001	0.002	-0.071
	(0.002)	(0.002)	(0.072)
High-q Segment	0.010	0.013	0.159*
	(0.008)	(0.009)	(0.096)
Institutional Own	0.018**	0.012	-0.425*
	(0.009)	(0.009)	(0.256)
Firm Risk	0.027	0.006	2.181
	(0.045)	(0.047)	(2.661)
CEO Tenure	0.015***	-0.009*	-0.067**
	(0.004)	(0.005)	(0.033)
CEO Own	0.002***	0.002***	-2.507
	(0.001)	(0.001)	(2.921)
CEO Duality	0.130***	0.086**	0.095
	(0.031)	(0.035)	(0.119)
CEO Duality × High-q Segment	-0.020*	-0.0258**	-0.220**
	(0.012)	(0.012)	(0.108)
Segment Investment (*t-1*)			0.220***
			(0.082)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
N	10,392	10,392	9,659

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) present the results from the second-stage estimation of the instrument variable (IV) approach, while model (3) reports the results of system GMM regression. The analysis in model (1) instruments CEO duality using two variables: firm age is the number of years elapsed since the year of the firm's Compustat of the firm listing, and firm size is the natural logarithm of the firm's assets. The analysis in model (2) instruments CEO duality using two dummy variables, a dummy variable that takes a value of one if the age of the firm is higher than the industry median age in a given year, and a dummy variable that takes a value of one if the size of the firm is higher than the industry median size in a given year. The analysis in model (3) is a system GMM estimation. All remaining variable definitions are given in the Appendix. Standard errors are clustered at the firm level, and are reported in parentheses. *, ** and *** indicate 10%, 5% and 1% levels of significance, respectively.

Table 6. CEO duality and internal capital allocation efficiency: The moderating role of free cash flow, and firm complexity

	(1)	(2)	(3)	(4)
	Free Cash Flow		Firm Complexity	
	High	Low	No	Yes
Segment size	-0.021***	-0.014**	-0.002	-0.025***
	(0.006)	(0.007)	(0.005)	(0.006)
Relative Segment Size	0.072***	0.022	0.013	0.069***
	(0.017)	(0.022)	(0.016)	(0.021)
Segment CF	-0.034	-0.014	0.073***	0.001
	(0.023)	(0.029)	(0.018)	(0.028)
Other Segment CF	0.019	-0.036 *	0.004	-0.024
	(0.038)	(0.021)	(0.032)	(0.027)
Industry Tobin's q	-0.001	0.001	-0.001	0.003
	(0.003)	(0.005)	(0.003)	(0.004)
High-q Segment	0.004	0.005	-0.006	0.011*
	(0.005)	(0.008)	(0.004)	(0.006)
Institutional Own	0.004	0.012	0.009	0.005
	(0.009)	(0.018)	(0.011)	(0.013)
Firm Risk	-0.100**	-0.007	-0.037	-0.032
	(0.049)	(0.069)	(0.050)	(0.068)
CEO Tenure	-0.001	-0.002	0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
CEO Own	-0.024	-0.014	0.072**	0.001
	(0.043)	(0.063)	(0.037)	(0.000)
CEO Duality	0.017***	0.004	0.006	0.010**
	(0.005)	(0.006)	(0.004)	(0.005)
CEO Duality × High-q Segment	-0.010**	-0.010	0.002	-0.019***
	(0.005)	(0.008)	(0.005)	(0.007)
N	6,774	3,966	4641	6099
R^2	0.295	0.263	0.344	0.223

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) report the results for the subsamples of firms that have high and low free cash flows, respectively. These high and low subsamples are formed based on the yearly median values of the *Free Cash Flow* variable in fiscal year *t*-1. Models (3) and (4) report the results for the subsamples of firms classified as Simple (Complex) in fiscal year *t-1*, which are firms below (above) the yearly median values of the Herfindahl-Hirschman concentration index of the firm's sales (calculated as the sum of squares of sales shares by business and geographic segments), respectively.The high and low subsamples are formed based on the yearly median values of the percentage of independent board members in fiscal year *t-1*. In all the model specifications, the dependent variable is the industry-adjusted segment investment in fiscal year *t*. Segment-level variables are measured in fiscal year *t*, and CEO- and firm-level variables in fiscal year *t*-1. All variable definitions are provided in the Appendix. Regression models are estimated with year and firm fixed-effects. Robust standard errors that are heteroskedasticity-consistent and clustered at the firm level are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 7. CEO duality and internal capital allocation efficiency: The moderating role of staggered board and board independence

	(1)	(2)	(3)	(4)
	Staggered Board		Board Independence	
	Yes	No	Low	High
Segment size	-0.018***	-0.022***	-0.023***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Relative Segment Size	0.054***	0.079***	0.078***	0.035***
	(0.013)	(0.014)	(0.012)	(0.012)
Segment CF	0.020**	0.003	-0.063***	-0.002
	(0.010)	(0.011)	(0.009)	(0.009)
Other Segment CF	0.047**	-0.037**	-0.031*	0.019
	(0.019)	(0.018)	(0.016)	(0.018)
Industry Tobin's q	-0.003	-0.001	-0.009**	0.008**
	(0.004)	(0.005)	(0.004)	(0.004)
High-q Segment	0.012**	0.005	0.010*	-0.006
	(0.006)	(0.007)	(0.005)	(0.006)
Institutional Own	0.017	0.015	0.030*	-0.027
	(0.018)	(0.024)	(0.018)	(0.018)
Firm Risk	-0.170	0.014	-0.154	0.063
	(0.126)	(0.147)	(0.118)	(0.097)
CEO Tenure	0.002	0.001	-0.002	-0.003
	(0.002)	(0.003)	(0.003)	(0.002)
CEO Own	-0.008	-0.088	-0.021	0.123
	(0.085)	(0.118)	(0.069)	(0.104)
CEO Duality	0.011*	0.011	0.019***	0.006
	(0.007)	(0.008)	(0.007)	(0.007)
CEO Duality × High-q Segment	-0.021***	-0.004	-0.012**	-0.001
	(0.006)	(0.008)	(0.006)	(0.007)
N	3,068	2,109	2,911	3,093
R^2	0.305	0.314	0.350	0.330

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) report the results for the subsamples of firms based on whether or not the firm has a staggered board in fiscal year *t*-1. Models (3) and (4) report the results for the subsamples of firms based on whether the firm has a low or high percentage of independent board members, respectively. The high and low subsamples are formed based on the yearly median values of the percentage of independent board members in fiscal year *t-1*. In all the model specifications, the dependent variable is the industry-adjusted segment investment in fiscal year *t*. Segment-level variables are measured in fiscal year *t*, and CEO- and firm-level variables in fiscal year *t*-1. All variable definitions are provided in the Appendix. Regression models are estimated with year and firm fixed-effects. Robust standard errors that are heteroskedasticity-consistent and clustered at the firm level are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 8. CEO duality and segment investment: The moderating role with board size

	(1)	(2)	(3)
	Small Board	Medium Board	Large Board
Segment Size	-0.005	-0.025**	-0.041***
	(0.011)	(0.011)	(0.008)
Relative Segment Size	0.047	0.088***	0.116***
	(0.034)	(0.034)	(0.037)
Segment CF	-0.069**	-0.001	0.104**
	(0.027)	(0.038)	(0.046)
Other Segment CF	0.015	-0.031	0.064
	(0.037)	(0.055)	(0.064)
Industry Tobin's q	0.006	-0.003	0.001
	(0.005)	(0.006)	(0.008)
High-q Segment	-0.002	0.016	0.011
	(0.012)	(0.012)	(0.011)
Institutional Own	-0.024	0.073**	-0.004
	(0.029)	(0.030)	(0.041)
Firm Risk	-0.055	-0.129	0.260*
	(0.17)	(0.118)	(0.143)
CEO Tenure	-0.006	0.002	0.005*
	(0.004)	(0.004)	(0.003)
CEO Own	0.022	0.009	0.082
	(0.088)	(0.131)	(0.075)
CEO Duality	0.012	0.010	-0.002
	(0.009)	(0.010)	(0.013)
CEO Duality × High-q Segment	-0.009	-0.035**	-0.007
	(0.012)	(0.015)	(0.013)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
N	1330	1574	1354
R^2	0.272	0.305	0.370

Notes. This table reports segment investment regression results for the years 2001-2013. Models (1), (2) and (3) report the results for the three tercile ranks of firms – small, medium and large – split according to board size in fiscal year *t*-1. All remaining variable definitions are given in the Appendix. Standard errors are clustered at the firm level, and are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 9. CEO duality and internal capital allocation efficiency: The moderating role of CEO equity-based compensation

	(1)	(2)	(3)	(4)
	Incentive Ratio		Delta	
	Low	High	Low	High
Segment size	-0.018***	-0.017***	-0.022***	-0.012***
	(0.006)	(0.006)	(0.006)	(0.005)
Relative Segment Size	0.049**	0.047**	0.057***	0.035**
	(0.020)	(0.019)	(0.020)	(0.016)
Segment CF	-0.018	-0.033	-0.008	-0.056***
	(0.030)	(0.021)	(0.030)	(0.018)
Other Segment CF	0.019	-0.021	-0.019	0.003
	(0.022)	(0.041)	(0.024)	(0.036)
Industry Tobin's q	0.003	0.001	0.001	0.001
	(0.003)	(0.004)	(0.003)	(0.004)
High-q Segment	0.007	0.001	0.003	0.003
	(0.005)	(0.006)	(0.005)	(0.005)
Institutional Own	0.005	-0.003	0.002	0.010
	(0.012)	(0.013)	(0.013)	(0.011)
Firm Risk	-0.093	-0.017	-0.080	0.002
	(0.070)	(0.056)	(0.060)	(0.077)
CEO Tenure	-0.001	0.003*	-0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
CEO Own	-0.041	0.064	0.061	0.035
	(0.053)	(0.077)	(0.093)	(0.043)
CEO Duality	0.016***	0.002	0.013**	0.004
	(0.005)	(0.005)	(0.005)	(0.004)
CEO Duality × High-q Segment	-0.017***	-0.004	-0.012*	-0.007
	(0.007)	(0.006)	(0.007)	(0.005)
N	5,389	5,351	5,229	5,511
R^2	0.242	0.298	0.255	0.285

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) use the *Incentive Ratio* variable, which captures the share of the CEO's total compensation that comes from a 1% increase in the firm stock price, while models (3) and (4) use the CEO's equity portfolio price sensitivity, denoted *Delta*, which is estimated as the change in the risk-neutral value of the executive's equity portfolio for a 1% change in the price of the underlying stock. The low and high subsamples include firms below and above the yearly median values of the corresponding variable, respectively, as measured in fiscal year *t*-1. In all model specifications, the dependent variable is the industry-adjusted segment investment in fiscal year *t*. Segment-level variables are measure in fiscal year *t* whereas CEO- and firm-level variables in fiscal year *t*-1. All variable definitions are given in the Appendix. Regression models are estimated with year and firm fixed-effects. Robust standard errors that are heteroskedasticity-consistent and clustered at the firm level are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respectively.

Table 10. CEO duality and internal capital allocation efficiency: Additional results with moderating attributes

	(1) Low Managerial Ability	(2) High Managerial Ability	(3) Internally Promoted CEO	(4) Externally Promoted CEO	(5) Long-lived Business Segment	(6) Short-lived Business Segment
Segment size	-0.014***	-0.010***	-0.021***	-0.020*	-0.021**	-0.012**
	(0.002)	(0.002)	(0.005)	(0.011)	(0.009)	(0.006)
Relative Segment Size	0.036***	0.048***	0.067***	0.065**	0.067***	0.035*
	(0.009)	(0.008)	(0.017)	(0.031)	(0.025)	(0.019)
Segment CF	-0.076***	-0.058***	-0.016	-0.021	0.028	-0.068***
	(0.007)	(0.007)	(0.024)	(0.041)	(0.035)	(0.023)
Other Segment CF	0.025**	-0.021*	0.022	-0.016	0.019	-0.024
	(0.012)	(0.012)	(0.028)	(0.033)	(0.039)	(0.027)
Industry Tobin's q	-0.001	0.001	-0.001	0.010	-0.006	0.001
	(0.003)	(0.003)	(0.003)	(0.006)	(0.004)	(0.003)
High-q Segment	0.011***	-0.001	0.009	-0.003	0.008	-0.002
	(0.004)	(0.003)	(0.006)	(0.009)	(0.007)	(0.004)
Institutional Own	0.018	-0.005	0.010	-0.006	-0.011	-0.003
	(0.012)	(0.011)	(0.012)	(0.021)	(0.018)	(0.012)
Firm Risk	-0.108	-0.029	-0.082	0.018	0.026	-0.014
	(0.071)	(0.070)	(0.067)	(0.065)	(0.060)	(0.059)
CEO Tenure	0.001	-0.002	0.001	0.004	0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)
CEO Own	-0.026	0.060	-0.027	-0.035	-0.097	0.083**
	(0.043)	(0.053)	(0.062)	(0.106)	(0.086)	(0.038)
CEO Duality	0.007**	0.016***	0.012***	0.024*	0.008	0.009*
	(0.004)	(0.004)	(0.004)	(0.013)	(0.005)	(0.006)
CEO Duality × High-q Segment	-0.017***	-0.003	-0.016***	-0.008	-0.015**	-0.003
	(0.005)	(0.004)	(0.006)	(0.010)	(0.007)	(0.005)
N	4,149	5,253	6,804	2,269	3,845	4,900
R^2	0.316	0.318	0.279	0.295	0.271	0.263

Notes. This table reports segment investment regression results for the years 1992-2013. Models (1) and (2) report the results for the subsamples of firms with low and high managerial ability in fiscal year *t*-1, which are firms below and above the yearly median values of the managerial ability index of Demerjian et al. (2012), respectively. Models (3) and (4) report the results for the subsamples of firms with CEOs that are internally promoted and CEOs that are externally promoted, respectively. Models (5) and (6) report the results for the subsamples of firms with segments that are newer to the firm (age of five years or younger) and segments that are older to the firm (five years and older), respectively. In all the model specifications, the dependent variable is the industry-adjusted segment investment in fiscal year *t*. Segment-level variables are measured in fiscal year *t*, and CEO- and firm-level variables in fiscal year *t*-1. All variable definitions are given in the Appendix. Regression models are estimated with year and firm fixed-effects. Robust standard errors that are heteroskedasticity-consistent and clustered at the firm level are reported in parentheses. *, ** and *** indicate 10%, 5%, and 1% levels of significance, respective

Chapter 4

The Impact of Managerial Ability on Crisis Period Corporate Investment

The Impact of Managerial Ability on Crisis Period Corporate Investment

1. Introduction

The impact of managerial ability on firm policies has for a long time been ignored under the assumption that managers are largely homogeneous entities, which implies a limited role for manager-specific influences on economic outcomes. Only very recently a handful of studies has challenged this view by recognizing that managers play an economically significant role on their firms' choices and performance (Bamber et al. 2010; Chemmanur et al., 2010; Demerjian et al., 2013; Choi et al., 2015; Andreou et al., 2016; Francis et al., 2016). Given the intriguing results in Chapter 3 on the moderating role of managerial ability and other CEO characteristics on the relation between CEO duality and investment efficiency, Chapter 4 extends this literature by using the recent financial crisis as a natural experiment setting to investigate the impact of managerial ability on corporate investment. In addition, the nature of managerial ability is scrutinized to get insights about the type of ability that has the greatest effect on investments. Finally, the relationships of managerial ability with corporate financing and firm value are explored.

Although it could be argued that the relationship between firms' managerial ability and corporate policies is straightforward, prior findings are often contradictory. For instance, a stream of literature suggests that more able managers with great reputation at stake are expected to avert opportunistic rent-seeking actions that harm firm value, since such behaviour could tarnish their ability and fame as perceived by shareholders and investors (e.g., Fama, 1980; Kreps et al., 1982; Graham et al., 2013; Falato et al., 2015). A different stream of literature, however, argues that more able managers may decide upon specific conducts such as ill-based investments or earnings management to preserve their human capital and reputation, albeit

these actions usually reduce firm value (Malmendier & Tate, 2007; Francis 2008; Petrou & Procopiou, 2016). Such mixed evidence indicates that the relationship of managerial ability with firm policies and outcomes has not yet reached a consensus. Perhaps, this controversy is due to confounding effects arising from endogeneity problems whereby contemporaneous realizations of both the dependent variable and the explanatory variables in question affect each other (Abdallah et al., 2015).

Such endogeneity concerns are circumvented by focusing on the relationship between firms' managerial ability and corporate policies during the financial crisis period. This period is an ideal setting for such investigation, not only for its recentness and severity, but primarily because of the adverse impact it largely had on consumers and the availability of corporate finance (Duchin et al., 2010). More specifically, the extreme market conditions characterized by liquidity shortfalls (Ivashina and Sharfstein, 2010) along with the uncertain nature and the conservative approach of financial institutions dictating for more internal control, made it very difficult for corporations to obtain credit lines and access external capital. At the same time, firms faced various exogenously driven bottlenecks such as low demand for their products, resulting in losses that harmed their capacity to internally generate enough resources to finance attractive investments. Such weakened funding capacity creates the conditions for firms to suffer from underinvestment problems (Campello et al., 2010; Duchin et al., 2010; Balakrishnan et al., 2015), which can be detrimental to firm value. Overall, the recent financial crisis abruptly changed the firms' environment by causing an exogenous shock on their policies. Therefore, it provides a natural experiment setting suitable to alleviate endogeneity caveats that usually handicap empirical analyses in the corporate finance research.

In this chapter, it is hypothesized that the impact of managerial ability on firms' corporate investment should not only be more easily identified during the crisis period, but it should also be more profound in the presence of an exogenous negative shock to the availability

of financing resources that potentially undermines investments. Accordingly, it is expected that firms with higher pre-crisis managerial ability to invest more during the crisis period because their managers' ability facilitates greater access to financing resources. In addition, such investments should also be more highly valued by the market because they mitigate severe underinvestment problems that emerged during the crisis period.

To investigate these hypotheses, the study utilizes a measure of managerial ability proposed by Demerjian et al. (2012). The measure is based on a comparison of managers' efficiency in transforming corporate resources to revenues relative to their industry peers. Managerial ability increases when managers generate higher revenues for a given level of resources or, conversely, when they minimize the resources used for a given level of revenues. Using this measure, it is found that firms with higher pre-crisis managerial ability carry more crisis period investments in the form of capital expenditures. The results are robust to the inclusion of additional control variables relating to corporate governance attributes, as well as to the inclusion of executive compensation incentives and CEO-level characteristics.

Despite the financial crisis is an exogenous capable to mitigate endogeneity, for robustness purposes a propensity score matching approach is also employed to ensure that the results are not driven by different characteristics between firms with high or low managerial ability. This treatment controls for the possibility that certain firm attributes simultaneously affect managerial ability and crisis period investments. The results of the propensity score matching approach lend credence to the main finding regarding the positive relationship between pre-crisis managerial ability and crisis period corporate investment.

Further, the types of managerial ability that seem to withstand distressed times are examined, shedding light on the growing importance of general versus firm-specific managerial skills (Custodio et al., 2013; Brockman et al., 2016). The findings point to find a positive relationship between pre-crisis managerial ability and crisis period investments is

concentrated among firms with CEOs who have general managerial skills (coined as generalists) rather than firm-specific skills (coined as specialists). Additionally, a positive relationship between pre-crisis managerial ability and crisis period financing resources is revealed. Thus, an important channel through which managerial ability affects investments is by facilitating financing. Finally, the chapter documents that the stock market highly values crisis period investments only when these are made by firms with high pre-crisis managerial ability. This finding is consistent with the view that managerial ability alleviates underinvestment problems during the crisis period that enhance firm value.

This chapter contributes to the literature as follows. First, the results show positive (negative) valuation of investments during the crisis period for firms with high (low) pre-crisis managerial ability. This finding contributes to the extant literature (e.g., Graham et al., 2013; Falato et al., 2015; Malmendier and Tate, 2007; Francis, 2008) by shedding light on the differential way that managerial ability impacts firm value and helps to settle the conflicting conjectures as debated by prior studies. Second, the chapter contributes to recent studies that investigate how firms managed liquidity shortfalls in their effort to mitigate underinvestment problems following the onset of the crisis (e.g., Campello et al., 2010; Duchin et al., 2010; Campello et al., 2011). Findings suggest that higher managerial ability contributed to the capacity of firms to secure more financing during the crisis that enabled them to pursue more investment opportunities. In this respect, high managerial ability appears to offset crisis period underinvestment problems that enhanced firms' value. Finally, the chapter contributes to the burgeoning literature that highlights the importance of general versus firm-specific skills with respect to CEO pay (e.g., Murphy and Zabojnik, 2004; Custodio et al., 2013; Brockman et al., 2016). Results reveal that generalist, not specialist, CEOs mitigate underinvestment at times of constraining economic conditions. In this vein, findings provide an economic explanation of

why generalist CEOs earn significantly higher annual pay premiums compared to their specialist peers.

The remainder of this paper is organized as follows. Section 2 describes the literature review and the arguments of the study. Section 3 includes the sample and data measurement, Section 4 the statistical methodology and the empirical results. Section 5 concludes**.**

2. Background on managerial ability, corporate policies and outcomes

Recent literature investigates whether managerial characteristics and competencies such as ability, talent, quality or reputation influence corporate decision-making. Starting with Bertrand and Schoar (2003), a significant extent of the heterogeneity in investment, financial, and organizational practices of firms is shown to be explained by managers' fixed effects. Chang et al. (2010) links variations in management actions and styles to variations in firm performance, consistent with the view that differences in firm performance may also stem from managers' traits or experiences. This view is also supported by Chemmanur and Paeglis (2005), Chemmanur et al. (2009) and Switzer and Bourdon (2011) who document positive relations between firms' management quality and IPOs/SEOs performance. In addition, Chemmanur et al. (2010) find value enhancing anti-takeover provisions in the presence of higher quality firm management. In the banking industry, Andreou et al. (2016) demonstrate that higher ability managers have the capacity to handle higher risks and to facilitate greater intermediation for their banks. Finally, Francis et al. (2016) show that firms with higher ability managers obtain more favourable loan contract terms, such as lower loan spreads, less stringent covenants, and longer term maturity. Overall, this literature demonstrates the importance of managerial ability on firm policies and outcomes.

More able managers, inter alia, are more knowledgeable of their business leading to better judgments and estimates about product demand, better understand technology and industry trends and manage their employees more efficiently than less able managers

(Demerjian et al., 2012, 2013). Therefore, firms with higher managerial ability are expected to better align resources with the environment in which they operate resulting in greater internal profitability that is particularly important in the presence of growth opportunities, since it can facilitate undisruptive investments especially if these firms face difficulties in raising external finance.[2]

Perhaps the most prominent channel through which managerial ability affects the firms' policies is through the reputational capital that managers accumulate over their career. When financing investment opportunities through internal profitability is not adequate, the reputational capital of more able managers is expected to enable their firms' to access external financing; for instance, through repeated negotiations and dealings with market participants (Chemmanur and Paeglis, 2005; Chemmanur et al., 2009) in a credible and transparent way that help them stand out. Higher managerial ability can therefore act as a guarantee since it certifies their firms' quality to outside markets, achieving in that way a decrease to the cost of capital because of a reduction in information asymmetry between firm insiders and outside markets about firm value (Chemmanur and Paeglis, 2005). A reduction in information asymmetry allows creditors to anticipate future performance and more accurately evaluate the probability of default states, which translates into a lower price of debt and more flexible contract terms such as maturity, limitations on covenants, or collateral requirements (Aivazian, et al., 2010; Francis, et al., 2016). Together with their perceived ability to better resolve agency issues (Chemmanur, et al., 2009), more able managers raise their credibility in the eyes of creditors and other stakeholders in general. Credibility is important especially during financial

[2] Campello et al. (2010) report that during the financial crisis, 86% of U.S. firms facing financial constraints bypassed attractive investments due to difficulties in raising external finance, compared to 44% of financially unconstraint firms that did the same. Also, they report that more than half of U.S. firms rely on internally generated cash flows to fund investment under financially constraint circumstances, and 56% of constrained firms are found to cancel investment projects when they are unable to obtain external funds compared to 31% of unconstrained firms that may cancel investment.

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crises because such periods intensify the frictions in external capital markets. The latter hinders firms' capacity to acquire capital to pursue their investment projects (Bernanke and Gertler, 1989; Bernanke et al., 1999), resulting in underinvestment; but not so for firms with more able managers because they could overcome such frictions. Therefore, firms with higher managerial ability should have better chances to access external financing such as loans and achieve lower loan rates or less stringent non-price contract terms, lowering in this way their investments' financing cost.

Overall, it is hypothesized that firms with higher managerial ability are likely to have a larger scale of corporate investment during the crisis period due to greater access to financing resources, mitigating in this respect underinvestment problems that enhance firm value. Thus,

Hypothesis 1: *High pre- crisis managerial ability will be positively related to the level of crisis period investments.*

Hypothesis 2: *High pre- crisis managerial ability will be positively related to crisis period financing resources.*

Hypothesis 3: *Crisis period investments executed by high pre- crisis managerial ability, will be positively related to firm value*.

3. Data and Variables

3.1. Data

To construct this chapter's dependent variables, data is obtained from the COMPUSTAT/CRSP merged database for the fiscal year 2008. According to Duchin et al., (2010) and Balakrishnan et al., (2015), the crisis period lasted from August 1, 2007 to August 31, 2009. During that period, there was an abnormally high LIBOR-OIS spread, which skyrocketed loan spreads, consistent with the view that the financial crisis exogenously

tightened firms' access to finance. Therefore, the fiscal year 2008 is used to represent the *crisis* period since this year resides somewhere in the middle of the abovementioned dates. Compustat contains 7216 firm observations for 2008. Out of these 7216 firm observations, available information on the main dependent variables for 2006-2008 and on listed firms for which available information enables a calculation of stock returns, leaves the sample with 3936 observations. Crisis period dependent variables are then linked with two measures of managerial ability estimated before the onset of the crisis (i.e., at the end of fiscal year 2006 or before); estimating ability during the *pre-crisis* period ensures that the measure is not affected by consequences arising from the crisis. The sample on which an estimate of the measures of managerial ability is obtained features 2,748 firms; however, depending on the regression model, the analysis results in fewer data due to missing observations of the control variables, which account for firm characteristics, corporate governance attributes and CEO characteristics/executive compensation incentives. Corporate governance attributes and CEO education information are collected from BoardEx, while executive compensation and other CEO characteristics data are collected from Execucomp. To lessen the influence of outliers, all continuous variables at the 1st and 99th percentiles.

3.2. Model specification and variable definitions

In this section, the baseline specification is provided along with the measurement of the three sets of variables used to empirically test the baseline models is described, in particular: (i) dependent variables, i.e., investments, financing and firm value (ii) independent variables, i.e., managerial ability, and (iii) main control variables relating to firm-level characteristics. Detailed variable definitions can be found in the Appendix.

3.2.1. Baseline specification

$$Crisis\ Investment_{i,2008}(Crisis\ Q)(Crisis\ CF)(Crisis\ Resources)(Crisis\ Fincon) =$$

$$\alpha_{ff} + \beta_1\ Firm\ Controls_{i,2006} + \beta_2\ MA\ (MA\ \ AV)s_{i,2006} + \varepsilon_{i,t}, \quad (1)$$

where the dependent variables are crisis investment, crisis Tobin's, crisis cash flows, crisis resources and crisis financial constraints. α_{ff} are industry fixed-effectx. Industry fixed-effects account for disciplining effects on managerial opportunism which correlates with severe agency problems that constitute significant caveats for firms in noncompetitive industries. To ensure that results are not driven by outliers, all variables are winsorized at the 1% and 99% values. It is noteworthy to remark that both managerial ability measures utilize information from fiscal year 2006 or before that is at least two years away from the time-point the dependent variables are measured. This is a crucial treatment ensuring that the measurement of the managerial ability is less likely to be spuriously related to unobserved within-firm changes in financing and investment policies following the onset of the crisis. The latter advantage should be stronger for *MA_AV* that aggregates (per-firm) information from 2002 to 2006, and therefore it is even less likely to be confounded from effects related to a potential anticipation of the crisis.

3.2.2. Dependent variables

Different dependent variables are utilized to cover the three main areas examined in the study: investments, financing and firm value. Crisis period corporate investment (*CRISIS_INVESTMENT*) is measured with capital expenditures divided by lagged net assets, while crisis period firm value is measured using Tobin's Q (*CRISIS_Q*) defined as market value of equity plus total debt plus preferred stock liquidating value minus deferred taxes and investment tax credits all deflated by the book value of assets. For financing resources three measures are employed. First, crisis period cash flow (*CRISIS_CF*) is defined as operating income before depreciation deflated by beginning of the year stockholders' equity. Second, crisis period total resources (*CRISIS_RESOURCES*) is defined as the difference between

issuance of long-term debt and long term debt reduction plus operating activities all deflated by the total value of net assets. Third, a crisis period financial constraints' index (*CRISIS_FINCON*) is defined as in the Whited and Wu (2006) study, which is based on firm characteristics associated with external finance constraints and as such it reflects the severity of liquidity constraints faced by each firm in the sample during the crisis period.

3.2.3 Independent variable: Managerial ability

The managerial ability measures are derived from the method proposed in Demerjian et al. (2012). This measurement of managerial ability captures the ability of a firm's managers to produce more revenue while using either the same or even fewer resources than their peers in the same industry. Demerjian et al. (2012) use data envelopment analysis (DEA) to model firm efficiency and they follow a two-step procedure to quantify managerial ability. The first step requires the estimation of firm efficiency scores defined as the ratio of outputs over inputs using the following DEA optimization problem:

$$DEA - Eff: \ max_v \theta = \frac{\sum_{i=1}^{s} u_i \, y_{ik}}{\sum_{j=1}^{m} v_j x_{jk}}, k = 1, \dots n \qquad (2)$$

In Eq. (2), *s* are the outputs, *m* are the inputs, *n* is the number of firms, while *u* and *v* represent the weights for the outputs and inputs, respectively, which are necessary to calculate the firm efficiency score. Following the rationale in Demerjian et al. (2012), the output variable used in Eq. (2) is sales whereas the input variables are: net property, plant and equipment, net operating leases, net research and development, purchased goodwill, other intangible assets, cost of inventory, and selling, general and administrative expenses. All these inputs contribute to the generation of revenues and are affected by managerial ability, as each input is subject to managerial discretion. The solution to the above optimization problem results to an efficient frontier that measures the amount and mix of resources used to generate revenues by the firms within each industry. Firms operating on the frontier are assigned a score of one and the least

efficient firms are assigned a score of zero; the lower the firm's score, the further away it is from the frontier.

As theorized by Demerjian et al. (2012), firm efficiency scores are affected by both firm-specific factors and management ability. Therefore, the second step purges out the effect of key firm-specific characteristics, which may aid or hinder managers' ability, by regressing the DEA efficiency scores (*DEA-Eff*) on firm size, market share, positive free cash flows, firm age, number of segments and a foreign currency indicator. Demerjian et al. (2012) estimate the following Tobit regression model per industry:

$$DEA - Eff = a_0 + a_1 Firm\_Size + a_2 Market\_Share + a_3 Free\_Cash\_Flow + a_4\, Firm\_Age + a_5 Number\_of\_Segments + a_6 Foreign\_Currency\_Indicator + a_7 Year\_Fixed\_Effects + RES\_EFF. \quad (3)$$

In regression Eq. (3), the residual term (*RES_EFF*) captures the effect of firm efficiency attributed to managerial ability. Hence, the first measure of managerial ability, denoted as *RES_EFF_2006*, is the residual term of Eq. (3) using data only from the fiscal year 2006. An alternative managerial ability measure is also estimated, denoted as *RES_EFF_AV*, by using the per-firm average value of *RES_EFF* using data from the fiscal years 2002−2006. As shown in Table 1 that describes the summary statistics of the main variables, the mean (median) values of *RES_EFF_2006* and *RES_EFF_AV* are -0.005 (-0.042) and -0.017 (-0.065) respectively, all close to the value of -0.004 (-0.013) reported by Demerjian et al. (2012). The standard deviations of *RES_EFF_2006* and *RES_EFF_AV* are respectively 0.257 and 0.263, which are higher than the value of 0.149 reported by Demerjian et al. (2012). This discrepancy is attributed to the significant difference in the sample size between the two studies. Specifically, Demerjian et al. (2012) employ 177,134 observations sampled from 1980 to 2009, which is enormously a much bigger data set than the one employed in this chapter, and due to statistical reasons it is natural to observe a much lower standard deviation in their case.

This managerial ability measurement approach is deemed as appropriate for the particular investigation since it reflects the ability of managers to generate revenues through efficient exploration of resources pertaining to decisions and choices that regard capital, labour, investment, and other revenue generating practices. In this respect, higher ability firms are the ones with more able managers who are more knowledgeable of their business in terms of cost and revenue drivers and have better skill attributes and superior judgment to anticipate future changes than their less able peers. Therefore, the choice of the managerial ability measure for this study is directly linked to the main research questions under investigation that reflect access to resources and utilization of those in the form of investments to enhances firm value. Further, this approach lends credence to this analysis since it enables the computation of managerial ability measures for a broader set of firms, even small ones, offering more generalized inferences compared to studies that have focused exclusively on certain type of firms and specific events (e.g., Chemmanur and Paeglis, 2005; Chemmanur et al., 2009).

Because *RES_EFF* in Eq. (3) is calculated based on a two-step estimation approach, it is likely to suffer from random measurement errors that could harm the precision of the ability measure and consequently to distort statistical inferences. Therefore, to mitigate a potential bias in the managerial ability measures like in the case of Demerjian et al. (2013), *RES_EFF_2006* and *RES_EFF_AV* are recoded into deciles by assigning the value of 0 to the decile with the 10% lowest values, the value of 9 to the decile with the 10% highest values, while in-between deciles are assigned accordingly the values from 1 to 8. The categorical definitions of managerial ability are correspondingly denoted as *MA* and *MA_AV*.[3]

[3] The recoding of managerial ability from a continuous into a categorical variable leads to slightly stronger relations with the dependent variables. For example, the correlation coefficient between *RES_EFF_AV* and *CRISIS_INVESTMENT* is 0.069 (p-value<1%), whereas the correlation coefficient between *MA_AV* and *CRISIS_INVESTMENT* is 0.071 (p-value<1%). In general, a slightly higher power is obtaned in test statistics when using the categorical definition of managerial ability, albeit all of the statistical inferences and conclusions remain unaltered if instead *RES_EFF_2006* and *RES_EFF_AV* are used.

3.2.4 Main control variables

Following prior studies within the context of this investigation (see Chemmanur et al., 2009; Duchin et al., 2010; Balakrishnan et al., 2015, Francis et al., 2016), the study controls for size, leverage, profitability, cash flow, and growth opportunities to account for firm-related heterogeneity that can influence corporate investment and financing opportunities, all of them measured at the pre-crisis period (i.e., fiscal year 2006). Specifically, size (*SIZE*) is defined as the natural logarithm of the firm's market value of equity. Size signals firm quality and power whereby larger firms may enjoy easier access and more favourable financing terms and hence they might have the capacity to carry out more investments. Leverage (*LEV*) is the book value of debt divided by book value of total assets and could account for potential investment distortions and impediments to financing in case of over-indebtedness; conversely, leverage may also signal a firm's stronger corporate governance quality as higher levels of leverage discipline and incentivize managers in delivering strong operating performance and high growth in the net assets of the firm. Cash flow (*CF*) is calculated as operating income before depreciation deflated by beginning of the year stockholders' equity and used to account for financial slack that could allow for more investments that remedy underinvestment problems. Return on equity (*ROE*) is calculated as earnings before interest and taxes deflated by beginning of the year net assets and used to account for profitability that enhance the firm's internal sources of financing allowing for more investments. Further, growth opportunities are proxied with the use of the firm's market-to-book ratio (*MTB*) and stock return performance (*RET*). *MTB* is calculated as the market value divided by book value of equity. Firms with higher *MTB* values feature richer growth opportunity sets implying higher market expectations for future profitability. Hence, such firms may have easier access to external financing for making investments. To capture growth opportunities and market expectations not reflected in *MTB*, the firm's stock return performance (*RET*) is also considered, calculated as the 12-month

compounded stock return (excluding dividends) spanning the fiscal year 2006. Complimentary, the study accounts for the firm's asset growth rate (*GROWTH*) calculated as the difference between the beginning and ending of the year total assets deflated by beginning of the year total assets. A firm featuring greater past asset expansions might have exhausted its financial slackness and hence has less capacity to access additional financing to offset underinvestment.

4. Empirical results

4.1 Descriptive statistics

Table 1 provides summary statistics of the main variables employed in the empirical analysis. These statistics are computed using a sample of 2,583 observations with full available information for all variables tabulated in this table.[4] In terms of crisis period investments, *CRISIS_INVESTMENT* has a mean of 0.140 and a standard deviation of 0.258. In terms of the various financing resources, *CRISIS_CF* has a mean (standard deviation) of 0.209 (0.562), while these figures for *CRISIS_RESOURCES* and *CRISIS_FINCON* are 0.196 (0.510) and -0.171 (0.187), respectively. In terms of firm value, *CRISIS_Q* has a mean of 2.617 and a standard deviation of 6.872. Finally, in terms of control variables, the mean values (standard deviations) for *SIZE*, *MTB*, and *LEV* are 6.435 (2.025), 3.289 (4.003) and 0.259 (0.285), respectively. Other mean values (standard deviations) are 0.190 (0.413) for *GROWTH*, 0.228 (0.784) for *RET*, 0.128 (0.508) for *ROE* and 0.215 (0.598) for *CF*. Additionally, to account for any possibility of the presence of multicollinearity among the predictors in the main regression models, the chapter examines the variance inflation factor (VIF). As recorded in Table 2, all the predictors in the main Eq. (1) have a VIF that is in principle lower than 1.143, which indicates the absence of severe multicollinearity issues in the models.

[4] In the regression analysis that follows, simultaneous availability for *MA* and *MA_AV* is required, therefore certain regression models are estimated using a larger number of observations.

[Table 1]

4.2 Multivariate analysis

In this section, the methodology of the multivariate regression tests is described and the results from investigating the relation between pre-crisis managerial ability and crisis period investments, financing and firm value are discussed.[5] If managerial ability matters, then it is expect to evince higher scales of crisis period investment and financing in the presence of higher pre-crisis managerial ability. This should consequently be echoed on the crisis period firm value.

4.2.1 Pre-crisis managerial ability and crisis corporate investment

Table 2 reports the results of the relation between pre-crisis managerial ability (*MA*, *MA_AV*) and capital expenditures during the crisis (*CRISIS_INVESTMENT*). The regression models include Fama-French 48 industry fixed effects under the assumption that such treatment largely captures product market competition which highly correlates with corporate governance mechanisms (Giroud and Mueller, 2011). Thus, the inclusion of the industry dummies is conceived to control for disciplining effects on managerial opportunism which correlates with severe agency problems that constitute significant caveats for firms in noncompetitive industries. The regression models also include the abovementioned set of control variables. Characteristics featuring larger firms, and firms with greater growth opportunity sets and higher liquidity supply/slackness should have a positive impact on the scale of corporate investment.

[5] For the regression analysis, all continuous variables have been standardized to have a mean of 0 and standard deviation of 1. Such standardization is useful to avoid potential influences attributed to scaling differences. Nevertheless, all results are robust in using instead the unstandardized variables.

The results in Table 2 show positive and significant relations between the pre-crisis managerial ability measures, namely *MA* (p-value<10%) and *MA_AV* (p-value<5%), and crisis period investments (*CRISIS_INVESTMENT*). These findings lend support to the notion that more ably managed firms invest more during the crisis and this could act as a remedy to underinvestment problems. With regards to the control variables, the coefficients of firm size (*SIZE*), market-to-book (*MTB*) and leverage (*LEV*) are positive and statistically significant (p-values<5%). Past asset growth rate (*GROWTH*), stock return performance (*RET*) and cash flows (*CF*) carry the expected coefficients signs but are not statistically significant, mainly because their influence on *CRISIS_INVESTMENT* is subsumed by the other variables.

[Table 2 here]

4.2.2 Propensity score analysis

If the baseline characteristics of firms managed by more able managers are fundamentally different than firms managed by less able managers, then the managerial ability impact on corporate investment might be a statistical artefact stemming from model misspecification. To mitigate any potential nonrandomized confounding biases relating to either measured or unmeasured baseline characteristics, the study follows in spirit Andreou et al. (2017) and create two data samples using a one-to-one propensity-score matching estimation method. Based on this method, the resulting firm-year observations in each sample are comparable across all the control variables, except managerial ability. Specifically, the method consists of a probit regression to estimate propensity scores, p(Y=1/X=x), based on the probability of receiving a binary treatment, Y, conditional on all the control variables, x. Thus, to operationalize the probit regression, firms' having more able managers are considered as treatment. More able managers are defined using a binary variable based on the median value of pre-crisis managerial ability measures (e.g. *MA*, *MA_AV*). Then, for each managerial ability measure,

separately, the probability of firms' having more able managers is estimated using as independent variables the controls included in the baseline models as per Table 2. Finally, for each firm where a firm has more able managers, the propensity scores are used to find comparable firm observations where a firm has less able managers. To do so, the nearest-neighbour method is employed, requiring that the absolute difference of the propensity score among pairs does not exceed 0.01. Whenever there are more firms with a less able manager that meet this criterion, only the firm with the smallest difference in the propensity scores is kept. This method yields 1,244 and 1,364 unique pairs of matched firms when using *MA* and *MA_AV*, respectively. Panel A (Panel C) of Table 3 reports difference-in-means of the control variables for firms with more and less able managers for both the unmatched and matched samples when the treatment effect is based on *MA* (*MA_AV*). As expected, the corresponding difference-in-means show that some control variables differ statistically for the unmatched sample. Nevertheless, the difference-in-means becomes statistically insignificant for the matched sample, consistent with the view that the propensity score matching approach successfully makes the sample of firms with more able managers comparable to the sample of firms with less able managers. Based on these matched samples, the regression models of Table 2 are re-run using the *MA* and *MA_AV*, as main variables of interest, respectively. The results in Panels B and D of Table 3 show positive and significant relations between *MA* (p-value<10%), *MA_AV* (p-value<1%) and crisis period investments (*CRISIS_INVESTMENT*).

Overall, the propensity score matching results continue to demonstrate that pre-crisis managerial ability has a strong positive relation with crisis period corporate investments, lending further credence to the results as obtained in Table 2.

[Table 3 here]

4.2.3 Additional controls

Analyses in this subsection investigate the robustness of the main finding to the inclusion of a large array of corporate governance and CEO related controls. Such an investigation is motivated by previous literature that documents links between firms' policies with corporate governance (e.g., Harford et al., 2012) and CEO characteristics (e.g., Bertrand and Schoar, 2003, Chemmanur and Paeglis, 2005). If the positive effect of pre-crisis managerial ability on the scale of corporate investment is because of stronger governance structures or due to managerial traits, then this effect is expected to considerably diminish (or vanish) when such controls are included in the regression analysis.

The importance of corporate governance is scrutinized by augmenting the main regression models with corporate governance variables and retaining all of the other explanatory variables. Particularly, the Gompers, Ishii, and Metrick (2003) index (*GIM*) is incorporated, which proxies for the balance of power between shareholders and managers, board size (*BOARD_SIZE*) to control for the effects of larger boards on investment levels, board independence (*BOARD_INDEP*) as an indication of superior governance, as well as stock (*INC_STOCKS*) and option (*INC_OPTIONS*) compensation incentives to account for the degree of alignment of executive incentives with shareholder interests as a direct way to mitigate agency problems (all of these variables are defined in the Appendix of this paper). Firms with lower GIM indices, smaller board sizes, higher proportions of independent directors, as well as more incentivized CEOs in terms of compensation, are expected to maintain superior governance structures (Hoechle et al., 2012).

Along with the corporate governance controls, the analysis also considers the effects of certain managerial characteristics. A proxy for a CEO's formal power is included, defined as a dummy that equals one when the CEO also serves as chairman of the board (*CEO_DUALITY*). Also the natural logarithm of the CEO's age (*CEO_AGE*) and the natural logarithm of the

CEO's tenure (*CEO_TENURE*) are added in the model to proxy for the CEO's risk-taking and investment behaviour. Similarly to the inclusion of corporate governance variables, a decreasing impact of pre-crisis managerial ability is expected on crisis period investments in the presence of: powerful CEOs, since they have discretionary authority to opportunistically engage in additional investments for servicing their risk-preferences (e.g., Kim et al., 2009; Aktas et al., 2017), older CEOs consistent with the view that risk-taking behaviour pertaining to certain corporate policies decreases as CEOs become older (Serfling, 2013, Andreou et al., 2017), and shorter tenures since CEOs become more conservative as their tenure increases which constitute important factor influencing CEOs to adapt less to the circumstances of external environment and may limit their appetite to take more investments (e.g., Miller, 1991; McClelland et al., 2012).

Model (1) of Panels A and B in Table 4 shows the regression results after including the additional corporate governance variables. Results maintain the positive and significant coefficients (p-value<1%) for both measures of managerial ability (*MA*, *MA_AV*). A similar positive relation is shown in model (2) when the regression model controls for CEO characteristics. When all corporate governance and CEO characteristics controls are added in model (3), a strong positive and significant (p-value<1%) relation is still maintained between both measures of pre-crisis managerial ability and crisis period corporate investment.

Overall, it can be concluded that impact of managerial ability on investments is distinct and remains robust in the inclusion of other variables that feature corporate governance and CEO characteristics.

[Table 4 here]

4.2.4 Types of managerial ability and crisis investments

Since the measure of managerial ability is generic capturing a broader notion of managers' impact on firms' operational effectiveness, it would be beneficial to delve into greater depth to understand the types of managerial ability that appear to be more influential within the setting of the analysis. Custodio et al. (2013) argue that general managerial skills have recently become more important than firm-specific skills. Firms and respective boards show an inclination to outside hiring reflecting a shift towards the relative importance of general versus specific human capital chosen for executive positions. These facts are substantiated by the premium paid particularly to "generalist" CEOs who have accumulated general managerial capital that is transferrable across firms and industries, rather than "specialist" CEOs whose human capital is firm specific (Custodio et al., 2013; Brockman et al., 2016).

To investigate if the main inferences from Table 2 hold across the whole array of generalist-specialist skills, the general ability index is used as in Custodio et al. (2013). The general ability index classifies CEOs into either generalists or specialists to investigate the types of managerial skills that matter most in corporate investment during the financial crisis. It is important to note that, while Demerjian et al. (2012) ability score is attributed to the management team, the general ability measure by Custodio et al. (2013) is attributed to the CEO; since the CEO is the most influential personality in corporate decision-making, is considered as the one who, on average, most likely impacts corporate investment (Fee and Hadlock 2003; Demerjian et al. 2012). Demerjian,et al. (2012) find for the period 1992-2009 that 60.5% of their CEO fixed-effects are statistically significant in explaining managerial ability after controlling for firm fixed effects. They argue that these results indicate that the managerial ability measure reflects, to a large extent, the CEOs impact on firm organizational output. Their approach is revisited to observe in this study's sample a CEO fixed effects

explanatory power of about 67%. This evidence suggests that the managerial ability measures used reflects decision-making highly attributed to the CEO.

The general ability index is constructed based on the lifetime work experience of CEOs in publicly traded firms prior to their present CEO position. The index encompasses the skills which are transferrable across firms and industries, rather than firm-specific. Custodio et al. (2013) consider five aspects of general managerial ability; past number of positions in CEO's career to examine the exposure of the CEO to different organizational fields such as production, finance, sales, etc; past number of firms the CEO had been employed before; past number of industries, to identify the degree of the CEO's exposure to different business environments; past CEO positions at different firms which could be viewed as a signal of skills to internally manage these firms and externally maintain the appropriate strategies for all involved stakeholders; past work experience in a conglomerate firm, which serves as an indication of generic skill enhancement of managing complex and multi-industry settings. The index of general managerial ability is derived as the first factor of principal components analysis of these five dimensions to derive a one-dimensional index of general managerial ability, with more weight attributed to those components that more precisely represent the general skills of a CEO; specifically, equal weights are assigned to the past number of positions, firms, and industries, and a lower weight is assigned to the past CEO positions and conglomerate experiences. The index is estimated by applying the scores of each proxy to the standardized general ability components, and it is standardized to have a mean equal to zero and a standard deviation equal to one. This construction of a composite measure from the five variables helps to steer clear of problems arising from multicollinearity and measurement errors. The five variables are positively correlated with the index indicating that higher values of the index reflect greater general human capital.

In Table 5, model (1) re-examines the relation between the two measures of managerial ability (Panel A for *MA* and Panel B for *MA*_AV) and crisis investments (*CRISIS_INVESTMENT*) for the sample in which the general ability index is available. In support of Table's 2 findings, these results also show that pre-crisis managerial ability is in both measures significant (p-values<5%) and positively related to crisis period investments. Then the effect of the types of managerial ability on this relation is investigated, whereby the relation is re-examined based on whether the CEO is classified as a specialist (observations with values below the median general ability scores) in model (2) or as a generalist (observations with values above the median general ability scores) in model (3).[6] Overall, the results show that the positive relation between pre-crisis managerial ability and crisis investments is statistically significant only in model (3) of Panels A and B, which refers to firms run by generalist CEOs (p-value<1% for *MA* and p-value<5% for *MA_AV*). It appears that generalist CEOs, as opposed to specialist CEOs, may be the best match at distressed times as general knowledge and skills during such times is an important dimension of the CEO ability. This finding adds to Custodio et al. (2013) work by providing further evidence of the growing importance of general versus firm-specific skills in the market for CEOs, particularly at distressed times when firms face several challenges in terms of liquidity shortfalls and underinvestment problems.

[Table 5 here]

4.2.5 Additional analysis on the types of managerial ability

Following a similar line of reasoning as for the analysis in Table 4, the chapter investigates whether the above positive relation between managerial ability and investment that

[6] This classification follows Custodio et al. (2013). I am indebted to Claudia Custodio, Miguel Ferreira, and Pedro Matos for providing access to the database on the general ability index.

is prevalent only for generalist CEOs remains robust to the inclusion of additional controls. In Table 6, models (1) to (3) report the results for the sample of specialist CEOs, while models (4) to (6) report the results for the sample of generalist CEOs. Models (1) and (4) include corporate governance control variables, namely *GIM* index, board size (*BOARD_SIZE*), board independence (*BOARD_INDEP*), as well as executive stock (*INC_STOCKS*) and option (*INC_OPTIONS*) compensation incentives. For both managerial ability measures (Panels A and B), the results of model (1) show that the relation between pre-crisis managerial ability and crisis period investments is insignificant for the sample of specialist CEOs. On the contrary, the results in model (4) show that both measures are significant (p-value<1%) and positively related to the scale of corporate investment for the sample of generalist CEOs. Hence, generalist CEOs help to increase investments during distressed times even after taking into account corporate governance attributes, a tendency that is absent from their specialist counterparts. The same pattern appears in models (2) and (5) when CEO-level characteristics, namely CEO age (*CEO_AGE*), tenure (*CEO_TENURE*), duality (*CEO_DUALITY*) and education (*CEO_EDU*) are included as control variables in the models. CEOs' education is included as an extra managerial characteristic for this analysis that conditions on a sample with available observations for the generalist-specialist skills. This additional control variable is deemed necessary since variation in the CEOs' educational background might be driving the strong positive relationship that is observed for the sample of generalists. *CEO_EDU* takes the value of 0 when the CEO has no university education, the value of 1 when the CEO has a bachelor degree, the value of 2 when the CEO also holds a master degree and a value of 3 when the CEO holds a PhD degree. The ability of CEOs with more general managerial skills, as opposed to those with firm-specific managerial skills, to increase investments during crisis periods is again robust to the inclusion of CEO-level characteristics. The same conclusions can

be reached even when all corporate governance and CEO characteristics are combined together in models (3) and (6).

Overall, after the inclusion of a large array of corporate governance and CEO related characteristics, the results in Table 6 continue to show a strong positive relationship between pre-crisis managerial ability and crisis period investments that is prevalent only among firms with CEOs that have general (rather than firm-specific) managerial skills.

[Table 6 here]

Additional robustness checks of the abovementioned relations are also performed. In Table 7, alternative measures of the dichotomous definition of generalist vs. specialist CEOs are used. Using detailed data on the educational background of CEOs, CEOs are classified based on their field of study for their highest educational degree. First, the study conducts a test by dividing the data into the sample of CEOs who hold a PhD (i.e., specialists) and all others who do not hold a PhD (i.e., generalists). Second, an additional test is conducted on whether the CEO is holding some general postgraduate education degrees; thus, the data is divided into the sample of CEOs who have been awarded with an MBA and/or a CPA degree (i.e., generalists) and all others who have specific postgraduate education degrees (i.e., specialists). The reasoning in utilizing the educational background to characterize a CEO as a specialist or generalist emanates from the fact that education is considered to affect managerial decision-making (e.g., Bertrand and Schoar, 2003). In this vein, for example, CEOs with PhD degrees can be conceived as individuals with rather firm-specific skills who can process specific information and make better decisions for specialized business/scientific-related issues. On the contrary, CEOs with MBA and/or CPA degrees can be conceived as individuals with rather generic skills that can process better information pertaining to factors such as

investing, financing, forecasting, etc., which allow them to make better and sharper decisions during highly evolving and turbulent market conditions.

Table 7, models (1) to (6) report estimates for regression models of *CRISIS_INVESTMENT* when the CEO is classified as a specialist or a generalist based on whether (s)he holds a PhD. To maintain consistency with the previous analyses, the study also incorporates controls of corporate governance and CEO-level characteristics. Similarly to the findings in Table 6, regression coefficients for both managerial ability measures emerge as insignificant in models (1) to (3) for the sample in which the CEO is classified as a specialist (under the heading "CEO holds a PhD"). Conversely, for the sample in which the CEO is classified as a generalist (under the heading "CEO does not hold a PhD"), regression models (4) to (6) evince a positive and significant relation between the two measures and investments. The same patterns continue to hold true for the specific vs. general education subsample analysis in models (7) to (12), which ascertain the robustness of the findings. Overall, the results confirm that generalist CEOs are the types of managers whose ability is most influential for the scale of corporate investment during the financial crisis.

[Table 7 here]

4.2.6 Pre-crisis managerial ability and crisis period financing

Duchin et al. (2010) argue that corporate investment declines significantly following the onset of the crisis, and this decline appears to be greatest for firms with low cash reserves or high net short-term debt, with high financing frictions, or in industries which are heavily dependent on external finance. If higher ability managers are more capable to mitigate underinvestment during the crisis, then one important conjecture to be made is that more ably managed firms should also be able to mitigate the impact of negative shocks on the supply of

internal and external finance, thus preserving the firms' capacity to carry out corporate investment. On one hand, more ably managed firms conveys trust and credibility to external markets and thus confronted with reduced financial constraints and greater supply of external funds; on the other hand, more ably managed firms might have less need to raise funds externally if they generate internally sufficient cash flows to undertake attractive investments during the crisis.

To examine these arguments, the study investigates the relation between pre-crisis managerial ability and crisis period financing resources as captured by cash flows (*CRISIS_CF*), total financing resources (*CRISIS_RESOURCES*) and financial constraints (*CRISIS_FINCON*). Table 8 presents regression results of the relation between the pre-crisis managerial ability (*MA*, *MA_AV*) and these financing measures. As before, the regression models include the main control variables measured at the end of fiscal year 2006, as well as industry fixed effects. Moreover, it is reasonable to posit that more able managers are superior at anticipating future changes in their firms' underlying economic conditions (Trueman 1986). This means that more able managers may foresee an upcoming financial crisis and build precautionary cash reserves or secure additional credit lines which can be used to fund investments during the crisis. To control for this possibility, which could otherwise create a mechanical relation between pre-crisis managerial ability and crisis period financing, the pre-crisis period value (measured in fiscal year 2006) of each of dependent variable under investigation is included, namely *CF*, *RESOURCES* and *FINCON*, respectively. Further, since information asymmetry between the firm and external capital markets may affect the relation between managerial ability and financing, the study reports regression results that control for the number of analysts following the firm (*NUM_ANAL*), calculated as the natural logarithm of one plus the number of analysts following the firm in fiscal year 2006, as well as the standard deviation of daily returns during the fiscal year 2006 (*RET_STD*). High information asymmetry

may impede the capacity of the firm to attract external financing, thus an inverse relation is expected between *NUM_ANAL* and *RET_STD* and total financing resources (*CRISIS_RESOURCES)*, while a positive relation is anticipated between these variables and financial constraints (*CRISIS_FINCON)*.

Models (1) and (2) in Table 8 present the relation between managerial ability and *CRISIS_CF*. Findings for model (1) evince that both measures of pre-crisis managerial ability are positively related to crisis cash flows (p-values<1%), and the results maintain their statistical significance when controlling for information asymmetry in model (2). Is seems that in the presence of high pre-crisis managerial ability, firms manage to internally generate more cash flows during the crisis. With regards to the coefficient of the crisis period cash flow variable, *CF*, it emerges as positive and significant (p-value<5%) supporting that firms with strong internal financial positions prior the crisis continue to generate higher crisis period internal resources. The two measures of pre-crisis information asymmetry appear weakly related to crisis cash flows, a behavior that is expected since information asymmetry is a problem primarily affecting the credibility the firm signals to its external markets.

In model (3) the relation between the two measures of pre-crisis managerial ability is again positive and significant (p-values<1%) with total financing resources (*CRISIS_RESOURCES*), and they remain significant after the inclusion of information asymmetry controls as shown in model (4). These results provide strong empirical evidence that firms with higher pre-crisis managerial ability have higher levels of financing resources during the crisis. Overall, these findings complement Chemmanur et al. (2009) who support that superior managerial quality tends to disclose accurately to the markets the true future cash flows and firm performance, thus attaining easier access to financing resources compared to inferior management quality. Higher managerial ability conveys the intrinsic value of the firm more credibly to outsiders and reduces information frictions, thus achieving higher levels of

external fund raising even at times when this is hard to tap. The positive and significant coefficient of the pre-crisis total resources variable (*RESOURCES*) confirms that crisis total resources are significantly larger for firms with higher total resources before the onset of the crisis. Further, in model (4) and according to expectations, *RET_STD* is negative and significant to crisis period total resources.

The chapter also looks at the relation between pre-crisis managerial ability and the severity of liquidity constraints during the financial crisis as proxied by the Whited and Wu (2006) financial constraints index (*CRISIS_FINCON*). Results in models (5) reveal a strong negative relation between managerial ability and financial constraints, which is also robust to additional information asymmetry controls as in model (6). The more able the firm's managers are, the less the firm suffers from financial constraints, substantiating the results of the previous models. The positive and significant relation of pre-crisis financial constraints (*FINCON*) to crisis period financial constraints (*CRISIS_FINCON*) verify that a priori constrained firms will most likely be heavier constrained in the crisis.

Overall, the results in Table 8 suggest that higher managerial ability immunizes firms against adverse negative liquidity shocks caused by the financial crisis, as the findings support that more able managers have greater availability of financing that is necessary to enable them support the increased investments they undertake during the crisis period.

[Table 8 here]

4.2.7 Managerial ability and firm value

As discussed so far, more ably managed firms undertake more investments as they appear to have greater access to financing resources during the crisis period. Yet, the act of increasing investments does not necessarily imply conducting more value-enhancing

investments. Therefore, to gain more insights the chapter examines the valuation effects of the increased investment activity initiated by high ability managers.

The regression models in Table 9 are intended to capture the effects of crisis period investments (*CRISIS_INVESTMENT*) on firm value as measured by crisis period Tobin's Q (*CRISIS_Q*). The following variables are additionally included in the models along with the main controls as used in previous regression models: (i) R&D (*RD*) defined as research and development expense in the fiscal year 2006 divided by lagged net assets to proxy for discretionary investments at the realm of the CEO power which might have value-relevance (Lev and Sougiannis, 1996), and (ii) capital expenditure investments made in the fiscal year 2006 (*INVEST*) to capture potential crisis period valuation effects emanating from past investments. Under an agency view, more able managers with great reputation at stake are expected to avert opportunistic rent-seeking actions that harm firm value; therefore, discretionary investments conducted by low ability managers would destruct firm value, whereas such investments undertaken by high ability managers would enhance value. In models (2) to (4) further controls for corporate governance (*GIM*) and equity (*INC_STOCKS*) and option (*INC_OPTIONS*) related incentives are included. Stronger corporate governance and better compensation alignment to shareholders' interest should be positively related to crisis firm value.

[Table 9 here]

In model (1) of Table 9, crisis investments (*CRISIS_INVESTMENT)* are found to have a significantly positive effect (p-value<1%) on crisis firm value (*CRISIS_Q).* There is evidence that on average the market highly values investments made during the financial crisis. Model (2), controls for corporate governance and executive compensation incentives and results still show a strong positive relation (p-value<1%) between crisis period investments and firm value.

In models (3) and (4) *MA* is used to divide the available sample to *low* versus *high* pre-crisis managerial ability firms. This is done to examine the effect of crisis investments on firm value based on whether these investments are a result of inferior or superior managerial ability. Firms with pre-crisis managerial ability values below the median are classified as low ability (LOW−MA) firms, whereas firms with pre-crisis managerial ability values above the median are classified as high ability (HIGH−MA) firms. The results show that for the sample of LOW−MA firms there is a strong negative relation (p-value<1%) between crisis investments (*CRISIS_INVESTMENT*) and firm value (*CRISIS_Q*); it seems that the market does not value the investments made by low ability firms during the crisis. This is perhaps the outcome of bad and/or unprofitable investments made by low ability managers, which in turn are not appreciated by the market. This finding is not surprising and squares with managers' careers and reputation concerns in the labour market as in Scharfstein and Stein (1990), who posit that under distressed financial conditions, when managers cannot utilize their own private information they expose a type of herding behaviour choosing to mimic the investment decisions of other (more able) managers. Another explanation for this negative value effect is failure to optimally downsize when in fact the market expects low ability managers to have shrunk their existing operations by reducing crisis period investments. Such explanation gains more merit given that low managerial ability implies low capacity on behalf of the managers to accurately foresee and estimate economic conditions and market expectations (e.g., Trueman, 1986, Baik et al., 2011, Demerjian, et al., 2013).

Conversely, for the sample of HIGH−MA firms, *CRISIS_INVESTMENT* is positively and significantly related (p-value<1%) to *CRISIS_Q*. This finding reflects that more able managers do not bow to opportunistic rent-seeking actions and are prudent to pick high quality investments that eventually enhance firm value (e.g., Fama, 1980; Kreps et al., 1982, Graham et al., 2013; Falato et al., 2015). Such investment decision-making also reflects the intentions

and capacity of high ability managers to further strengthen their perceived reputation and human capital during highly distressed periods.

Overall, these findings provide a scope on the role of managerial ability during the financial crisis, which complements the work of Campello et al. (2009) and Duchin et al. (2010), among others, who find that managers surpass profitable investment opportunities during the crisis as a result of external financing constraints. Managerial ability is an important driver of corporate investment activity and through this channel more able managers enhance firm value. Specifically, this finding allows an identification of a channel through which CEO ability explains cross-sectional variation in firms' valuation during distressed and turbulent periods.

5. Conclusions and Implications

This chapter investigates the effect of pre-crisis managerial ability on corporate policies and value during the recent financial crisis. The chapter primarily documents positive and robust relation between pre-crisis managerial ability and crisis period corporate investment. To gain more insight into the types of managerial ability appearing to be more effective during the crisis, evidence is provided that managers with general skills (versus managers with firm-specific skills) are driving their firms' scale of corporate investment. Additionally, evidence shows a positive relation between pre-crisis managerial ability and crisis period financing. Finally, the increased crisis period investment activity is mediated on market valuation, evincing strong positive relations between the levels of investments undertaken by high managerial ability and firm value.

Overall, the findings of this chapter suggest that managerial ability appears to be a crucial dimension of firm quality and performance during the crisis period. The chapter proposes that a firm's managerial ability is useful to curtail underinvestment problems through gaining access to more resources that enhance firm value. Consequently, in light of these

results, assuming homogeneity in the managerial factor, as in the case of several past studies, can be proved problematic; rather, understanding the impact of managerial ability on firm policies and economic outcomes is fundamental, especially at times when the firm is financially distressed suffering from several liquidity shortages and harsh finance provisions. It is important to note that firms should acknowledge that there are aspects of managerial ability that seem to be more effective to hard economic times and as such general managerial skills should be seriously taken into consideration when CEOs are hired.

In this chapter, the focus is on investigating the role of managerial ability in mitigating or worsening the impact of the crisis on the scale of corporate investment. The chosen setting recognizes that inferences may be confounded as variation in managerial ability and corporate decision-making are endogenous to unobserved variation in investment opportunities. To address this issue, the analysis employs data from the fiscal year 2008 to take advantage of the natural experiment conditions enabled by the negative liquidity shock and the deteriorating product demand observed during the recent financial crisis. However, the empirical findings and implications remain agnostic of whether the positive effect of managerial ability on corporate investment, financial policies and firm value is also present during normal times or when such negative shocks are temporary. Despite this limitation, it is remarked that these results are fully consistent with market-based theories which predict that differences in managerial ability should relate to corporate decision-making and lead to potentially large differences in firm valuation (e.g., Fama, 1980; Kreps et al., 1982; Murphy and Zabojnik, 2004; Graham et al., 2013; Custodio et al., 2013, Falato et al., 2015).

Tables

Table 1. Descriptive statistics

	Mean	Median	Standard Deviation
Dependent Variables			
CRISIS_INVESTMENT	0.140	0.063	0.258
CRISIS_CF	0.209	0.206	0.562
CRISIS_RESOURCES	0.196	0.158	0.510
CRISIS_FINCON	-0.171	-0.197	0.187
CRISIS_Q	2.617	2.355	6.872
Main Independent Variables			
RES_EFF_2006	-0.005	-0.042	0.257
RES_EFF_AV	-0.017	-0.065	0.263
Main Control Variables			
SIZE	6.435	6.351	2.025
MTB	3.289	2.429	4.003
LEV	0.259	0.189	0.285
GROWTH	0.190	0.092	0.413
RET	0.228	0.092	0.784
ROE	0.128	0.165	0.508
CF	0.215	0.252	0.598

Note. This table reports descriptive statistics for the dependent variables, managerial ability and main control variables using a sample of 2,583 observations with available information for all tabulated variables. All variables are defined in the Appendix.

Table 2. Managerial ability and investments: **Multicolinearity Test**

	Model (VIF)	Model (VIF)
MA	1.023	
MA_AV		1.034
SIZE	1.138	1.143
MTB	1.056	1.056
LEV	1.056	1.035
GROWTH	1.050	1.050
RET	1.060	1.060
CF	1.097	1.105

Table 3. Managerial ability and investments

	CRISIS_INVESTMENT	
Main Independent Variables	**(1)**	**(2)**
MA	0.010*	
	(0.006)	
MA_AV		0.012**
		(0.006)
SIZE	0.041**	0.042**
	(0.018)	(0.018)
MTB	0.115***	0.116***
	(0.017)	(0.017)
LEV	0.176***	0.176***
	(0.018)	(0.018)
GROWTH	0.004	0.004
	(0.017)	(0.017)
RET	0.021	0.022
	(0.017)	(0.017)
CF	0.011	0.011
	(0.018)	(0.018)
No. of Firms	2,748	2,748
R^2	0.262	0.262

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). Model (1) includes the managerial ability measure, *MA*, whereas model (2) includes the managerial ability measure *MA_AV*. *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%

Table 4. Propensity score matching

PANEL A: Difference-in-means of control variables between High Managerial Ability and Low Managerial Ability (based on the median value of *MA*)

	Unmatched sample		Matched sample	
	Difference-in-means	t-stat	Difference-in-means	t-stat
SIZE	0.078**	2.04	-0.052	1.35
MTB	0.008	0.22	-0.016	-0.53
LEV	0.017	0.44	0.054	1.50
GROWTH	-0.030	-0.80	0.016	0.43
RET	-0.033	-0.86	0.016	0.47
CF	-0.188***	-4.94	-0.031	-1.38
Observations				
Total sample	2,748		2,488	
High MA	1,374		1,244	
Low MA	1,374		1,244	

PANEL B: Managerial Ability (*MA*) and investments: Matched Sample

MA	0.010*
	(0.006)
SIZE	3.578**
	(1.471)
MTB	0.575***
	(0.188)
LEV	0.718***
	(0.219)
GROWTH	-0.660**
	(0.277)
RET	-0.859**
	(0.367)
CF	-6.170**
	(2.565)
No of Firms	2,488
R^2	0.665

PANEL C: Difference-in-means of control variables between High Managerial Ability and Low Managerial Ability (based on the median of *MA_AV*)

	Unmatched sample		Matched sample	
	Difference-in-means	t-stat	Difference-in-means	t-stat
SIZE	0.058	1.53	-0.042	-1.12
MTB	0.038	1.00	0.011	0.31
LEV	0.020	0.52	0.004	0.11
GROWTH	-0.018	-0.47	0.018	0.46
RET	0.012	0.31	0.036	0.97
CF	-0.160***	-4.21	-0.016	-0.44
Observations				
Total sample	2,748		2,728	
High MA	1,374		1,364	
Low MA	1,374		1,364	

PANEL D: Managerial Ability (*MA_AV*) and investments: Matched Sample

MA_AV	0.018***
	(0.006)
SIZE	0.137***
	(0.032)
MTB	0.095***
	(0.027)
LEV	0.146***
	(0.026)
GROWTH	0.031
	(0.025)
RET	0.041*
	(0.025)
CF	0.047
	(0.036)
No of Firms	2,728
R^2	0.625

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*) using propensity score matched samples. Panels A and C display for each control variable in Table 2 the difference-in-means between the high and low pre-crisis managerial ability subsamples (*MA* and *MA_AV*, respectively) together with the corresponding *t*-statistics. The unmatched sample corresponds to the original sample. The matched samples are the samples based on pre-crisis managerial ability propensity score matching. Panels B and D present coefficient estimates of specifications (1) and (2) of Table 2 (for *MA* and *MA_AV*, respectively) using the matched samples. *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 5. Managerial ability and investments: Additional control variables

	CRISIS_INVESTMENT		
PANEL A	**(1)**	**(2)**	**(3)**
MA	0.027***	0.014*	0.028***
	(0.010)	(0.009)	(0.010)
SIZE	-0.035	0.008	-0.028
	(0.056)	(0.035)	(0.057)
MTB	0.061*	0.051	0.051
	(0.036)	(0.031)	(0.036)
LEV	0.255***	0.219***	0.256***
	(0.035)	(0.028)	(0.035)
GROWTH	-0.031	0.009	-0.036
	(0.040)	(0.033)	(0.040)
RET	0.181***	0.098***	0.184***
	(0.051)	(0.036)	(0.051)
CF	0.030	0.121***	0.034
	(0.041)	(0.034)	(0.040)
GIM	-0.014		-0.011
	(0.012)		(0.012)
BOARD_SIZE	0.0289		0.045
	(0.036)		(0.036)
BOARD_INDEP	0.007		0.006
	(0.030)		(0.030)
INC_STOCKS	0.075**		0.079**
	(0.030)		(0.033)
INC_OPTIONS	0.019		0.016
	(0.034)		(0.035)
CEO_AGE		-0.091***	-0.108***
		(0.028)	(0.033)
CEO_TENURE		0.051*	0.047
		(0.028)	(0.036)
CEO_DUALITY		0.0192	-0.060
		(0.052)	(0.062)
No of Firms	844	1,090	844
R^2	0.317	0.292	0.329
PANEL B	**(1)**	**(2)**	**(3)**
MA_AV	0.026***	0.014* (0.008)	0.027***
	(0.010)		(0.010)
SIZE	-0.036	0.007	-0.029
	(0.056)	(0.035)	(0.057)
MTB	0.062*	0.051*	0.052
	(0.036)	(0.031)	(0.036)
LEV	0.255	0.219***	0.256***
	(0.035)	(0.028)	(0.035)
GROWTH	-0.029	0.009	-0.034
	(0.040)	(0.033)	(0.040)
RET	0.184***	0.100***	0.187***
	(0.051)	(0.036)	(0.051)
CF	0.028	0.014	0.027***
	(0.041)	(0.008)	(0.010)
GIM	0.013		0.031
	(0.012)		(0.040)
BOARD_SIZE	0.030		-0.011
	(0.036)		(0.012)
BOARD_INDEP	0.007		0.045
	(0.030)		(0.036)
INC_STOCKS	0.076**		0.005
	(0.030)		(0.030)
INC_OPTIONS	0.019		0.080**
	(0.034)		(0.033)
CEO_AGE		-0.091***	0.017
		(0.028)	(0.035)
CEO_TENURE		0.051*	-0.109***
		(0.028)	(0.033)

CEO_DUALITY		0.021	0.047
		(0.052)	(0.036)
No of Firms	844	1,090	844
R^2	0.317	0.292	0.328

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panel A displays results using the managerial ability measure *MA*. Model (1) includes corporate governance variables as additional controls. Model (2) includes CEO-level controls. Model (3) includes both corporate governance and CEO-level controls. Panel B displays similar estimations using the managerial ability measure *MA_AV*. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 6. Managerial ability and investments: Specialists versus generalists

	CRISIS_INVESTMENT		
	ALL	**SPECIALISTS**	**GENERALISTS**
PANEL A	**(1)**	**(2)**	**(3)**
MA	0.020**	0.001	0.035***
	(0.009)	(0.012)	(0.013)
SIZE	-0.006	-0.052	0.033
	(0.035)	(0.052)	(0.048)
MTB	0.091***	0.358***	-0.040
	(0.033)	(0.056)	(0.041)
LEV	0.228***	0.278***	0.169***
	(0.029)	(0.045)	(0.039)
GROWTH	-0.018	0.031	-0.051
	(0.036)	(0.053)	(0.048)
RET	0.107***	0.050	0.173***
	(0.037)	(0.054)	(0.050)
CF	0.129***	-0.071	0.152***
	(0.036)	(0.063)	(0.046)
No of firms	1,029	511	518
R^2	0.279	0.433	0.254
PANEL B	**(1)**	**(2)**	**(3)**
MA_AV	0.019**	-0.004	0.033**
	(0.009)	(0.012)	(0.013)
SIZE	-0.007	-0.054	0.031
	(0.035)	(0.052)	(0.048)
MTB	0.091***	0.360***	-0.040
	(0.033)	(0.056)	(0.041)
LEV	0.228***	0.276***	0.168***
	(0.029)	(0.045)	(0.039)
GROWTH	-0.017	0.032	-0.049
	(0.036)	(0.053)	(0.048)
RET	0.109***	0.049	0.179***
	(0.037)	(0.054)	(0.050)
CF	0.128***	-0.073	0.153***
	(0.036)	(0.063)	(0.046)
No of firms	1,029	511	518
R^2	0.278	0.433	0.253

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. The sample consists of firms with available information for the general ability index developed by Custodio et al. (2013). Panels A and B display results using the managerial ability measures *MA* and *MA_AV*, respectively. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 7. Specialists versus generalists and investments: Additional controls

	CRISIS_INVESTMENT					
	SPECIALISTS			GENERALISTS		
Panel A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MA	0.011	-0.001	0.016	0.047***	0.046***	0.049***
	(0.014)	(0.014)	(0.016)	(0.014)	(0.015)	(0.015)
SIZE	-0.012	0.017	0.028	-0.035	0.010	-0.047
	(0.082)	(0.061)	(0.093)	(0.076)	(0.052)	(0.082)
MTB	0.350***	0.283***	0.367***	-0.061	-0.089*	-0.071
	(0.067)	(0.062)	(0.071)	(0.045)	(0.046)	(0.047)
LEV	0.377***	0.318***	0.395***	0.168***	0.212	0.171***
	(0.055)	(0.051)	(0.060)	(0.048)	(0.044)	(0.051)
GROWTH	0.077	0.052	0.105	-0.084*	-0.066	-0.090*
	(0.073)	(0.061)	(0.087)	(0.049)	(0.050)	(0.051)
RET	-0.009	-0.002	0.008	0.354***	0.166***	0.361***
	(0.069)	(0.059)	(0.075)	(0.076)	(0.053)	(0.078)
CF	-0.289***	-0.130*	-0.331***	0.062	0.175***	0.067
	(0.078)	(0.070)	(0.082)	(0.050)	(0.049)	(0.052)
GIM	-0.025		-0.021	-0.000		0.001
	(0.017)		(0.018)	(0.017)		(0.018)
BOARD_SIZE	0.006		0.040	0.030		0.039
	(0.051)		(0.059)	(0.050)		(0.053)
BOARD_INDEP	0.010		0.026	0.030		0.028
	(0.041)		(0.047)	(0.044)		(0.051)
INC_STOCKS	0.149		0.092	0.374		0.466*
	(0.186)		(0.229)	(0.232)		(0.256)
INC_OPTIONS	-0.043		-0.012	0.278		0.321
	(0.259)		(0.292)	(0.261)		(0.278)
CEO_AGE		-0.114**	-0.180***		-0.063	-0.051
		(0.045)	(0.052)		(0.050)	(0.054)
CEO_TENURE		0.097**	0.159***		0.044	
		(0.044)	(0.058)		(0.050)	0.012
						(0.060)
CEO_DUALITY		-0.084	-0.102		0.033	
		(0.089)	(0.103)		(0.085)	0.056
						(0.091)
CEO_EDU		-0.106**	-0.186***		0.061	0.071
		(0.051)	(0.059)		(0.051)	(0.054)
No of firms	392	416	342	425	461	400
R^2	0.447	0.446	0.487	0.326	0.278	0.331

Panel B	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MA_AV	0.005	-0.003	0.010	0.048***	0.044***	0.052***
	(0.014)	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)
SIZE	-0.011	0.016	0.030	-0.039	0.007	-0.052
	(0.083)	(0.062)	(0.093)	(0.076)	(0.052)	(0.082)
MTB	0.353***	0.284***	0.369***	-0.057	-0.086*	-0.067
	(0.067)	(0.062)	(0.071)	(0.045)	(0.046)	(0.047)
LEV	0.376***	0.317***	0.395***	0.166***	0.210***	0.167***
	(0.055)	(0.051)	(0.060)	(0.048)	(0.044)	(0.051)
GROWTH	0.079	0.052	0.108	-0.083*	-0.064	-0.089*
	(0.073)	(0.061)	(0.087)	(0.049)	(0.050)	(0.0505)
RET	-0.011	-0.003	0.005	0.362***	0.174***	0.369***
	(0.070)	(0.059)	(0.076)	(0.076)	(0.053)	(0.078)
CF	-0.292***	-0.130*	-0.335	0.060	0.175***	0.063
	(0.078)	(0.070)	(0.082)	(0.050)	(0.049)	(0.052)
GIM	-0.024		-0.020	0.001		0.003
	(0.017)		(0.018)	(0.017)		(0.018)
BOARD_SIZE	0.004		0.039	0.036		0.045
	(0.051)		(0.059)	(0.050)		(0.053)
BOARD_INDEP	0.009		0.025	0.029		0.026
	(0.041)		(0.048)	(0.044)		(0.051)

INC_STOCKS	0.155		0.096	0.374		0.472*
	(0.186)		(0.229)	(0.231)		(0.255)
INC_OPTIONS	-0.055		-0.029	0.300		0.350
	(0.259)		(0.291)	(0.261)		(0.277)
CEO_AGE		-0.115**	-0.180***		-0.060	-0.050
		(0.045)	(0.053)		(0.050)	(0.054)
CEO_TENURE		0.097**	0.160***		0.042	-0.014
		(0.044)	(0.058)		(0.050)	(0.060)
CEO_DUALITY		-0.084	-0.100		0.040	-0.053
		(0.089)	(0.103)		(0.085)	(0.090)
CEO_EDU		-0.106**	-0.185***		0.066	0.075
		(0.051)	(0.059)		(0.052)	(0.054)
No of firms	392	416	342	425	461	400
R^2	0.447	0.446	0.485	0.329	0.278	0.335

Note.This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panel A display results using the managerial ability measure *MA*. Model (1) includes corporate governance variables as additional controls. Model (2) includes CEO-level controls. Model (3) includes both corporate governance and CEO-level controls. Panel B displays similar estimations using the managerial ability measure *MA_AV*. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 8. Specialist versus generalists and investments: Alternative measures

	CRISIS_INVESTMENT											
	SPECIALISTS (CEO holds a PhD)			GENERALISTS (CEO does not hold a PhD)			SPECIALISTS (CEO with specific education)			GENERALISTS (CEO with MBA and/or CPA)		
Panel A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
MA	0.017	0.012	0.021	0.032***	0.024**	0.031***	0.012	0.009	0.012	0.044**	0.038**	0.042**
	(0.036)	(0.026)	(0.037)	(0.011)	(0.010)	(0.011)	(0.012)	(0.012)	(0.012)	(0.019)	(0.016)	(0.019)
SIZE	-0.450***	-0.080	-0.480***	0.017	0.018	0.031	0.031	0.018	0.021	-0.102	-0.000	-0.070
	(0.168)	(0.096)	(0.176)	(0.065)	(0.042)	(0.066)	(0.063)	(0.044)	(0.067)	(0.107)	(0.064)	(0.111)
MTB	-0.020	-0.034	-0.035	0.064	0.045	0.053	-0.087**	-0.060	-0.080**	0.172***	0.141**	0.165**
	(0.146)	(0.104)	(0.152)	(0.040)	(0.036)	(0.040)	(0.043)	(0.040)	(0.043)	(0.064)	(0.056)	(0.064)
LEV	0.312***	0.333***	0.319**	0.274***	0.254***	0.275	0.212	0.181	0.218***	0.362	0.388	0.357
	(0.117)	(0.090)	(0.122)	(0.040)	(0.034)	(0.040)	(0.043)	(0.036)	(0.043)	(0.066)	(0.054)	(0.067)
GROWTH	0.029	0.009	0.024	-0.033	-0.036	-0.039	-0.032	-0.032	-0.040	-0.038	-0.014	-0.036
	(0.089)	(0.077)	(0.091)	(0.049)	(0.040)	(0.049)	(0.047)	(0.039)	(0.047)	(0.078)	(0.067)	(0.079)
RET	-0.072	-0.076	-0.108	0.169***	0.096**	0.180***	0.118	0.038	0.113	0.147*	0.126**	0.157*
	(0.214)	(0.174)	(0.225)	(0.057)	(0.040)	(0.057)	(0.079)	(0.047)	(0.079)	(0.080)	(0.062)	(0.081)
CF	0.192	0.129	0.246	0.012	0.119***	0.014	0.107*	0.278***	0.118**	-0.060	-0.052	-0.060
	(0.224)	(0.115)	(0.239)	(0.044)	(0.040)	(0.044)	(0.058)	(0.049)	(0.058)	(0.065)	(0.058)	(0.065)
GIM	0.055		0.062*	-0.013		-0.010	-0.022		-0.020	-0.014		-0.007
	(0.034)		(0.035)	(0.014)		(0.014)	(0.014)		(0.014)	(0.023)		(0.023)
BOARD_SIZE	0.286***		0.296***	-0.026		-0.009	0.004		0.018	0.066		0.075
	(0.090)		(0.100)	(0.043)		(0.043)	(0.044)		(0.045)	(0.066)		(0.066)
BOARD_INDEP	-0.036		-0.017	0.021		0.027	0.041		0.048	-0.029		-0.021
	(0.083)		(0.088)	(0.036)		(0.037)	(0.036)		(0.037)	(0.060)		(0.062)
INC_STOCKS	0.393		0.469	0.357**		0.355**	0.259*		0.348**	0.382		0.309
	(0.367)		(0.437)	(0.167)		(0.180)	(0.150)		(0.168)	(0.309)		(0.329)
INC_OPTIONS	1.294***		1.341***	0.034		0.026	0.249		0.280	0.018		-0.096
	(0.475)		(0.488)	(0.213)		(0.215)	(0.198)		(0.199)	(0.366)		(0.373)
CEO_AGE		-0.043	0.008		-0.098***	-0.103***		-0.069*	-0.069*		-0.073	-0.100
		(0.084)	(0.106)		(0.035)	(0.039)		(0.037)	(0.040)		(0.053)	(0.064)
CEO_TENURE		0.024	-0.006		0.073**	0.063		0.026	0.000		0.125**	0.117
		(0.066)	(0.096)		(0.034)	(0.043)		(0.034)	(0.040)		(0.055)	(0.074)
CEO_DUALITY		0.122	-0.167		-0.024	-0.092		0.008	-0.094		-0.039	-0.047
		(0.151)	(0.189)		(0.062)	(0.071)		(0.067)	(0.070)		(0.096)	(0.122)
No of firms	97	125	97	672	826	672	398	505	398	371	446	371
R^2	0.627	0.500	0.632	0.311	0.285	0.322	0.410	0.346	0.422	0.333	0.340	0.341
Panel B	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**

MA_AV	0.016	0.007	0.017	0.030***	0.025**	0.030***	0.014	0.012	0.014	0.037**	0.030**	0.035*
	(0.035)	(0.026)	(0.036)	(0.011)	(0.010)	(0.011)	(0.012)	(0.011)	(0.012)	(0.019)	(0.015)	(0.019)
SIZE	-0.447**	-0.085	-0.480***	0.015	0.018	0.030	0.032	0.020	0.022	-0.102	-0.003	-0.071
	(0.171)	(0.096)	(0.179)	(0.065)	(0.042)	(0.066)	(0.062)	(0.044)	(0.064)	(0.108)	(0.064)	(0.111)
MTB	-0.012	-0.027	-0.020	0.065	0.045	0.054	-0.086**	-0.061	-0.093**	0.176***	0.145***	0.168***
	(0.140)	(0.103)	(0.144)	(0.040)	(0.036)	(0.040)	(0.043)	(0.040)	(0.043)	(0.064)	(0.056)	(0.064)
LEV	0.315***	0.332***	0.324***	0.273***	0.256***	0.274***	0.212***	0.182***	0.218	0.361***	0.387***	0.356***
	(0.117)	(0.090)	(0.121)	(0.040)	(0.034)	(0.040)	(0.043)	(0.036)	(0.043)	(0.067)	(0.054)	(0.067)
GROWTH	0.031	0.012	0.027	-0.032	-0.036	-0.038	-0.032	-0.033	-0.041	-0.033	-0.010	-0.030
	(0.088)	(0.077)	(0.091)	(0.049)	(0.040)	(0.049)	(0.047)	(0.039)	(0.047)	(0.079)	(0.067)	(0.079)
RET	-0.077	-0.080	-0.115	0.172***	0.099**	0.183***	0.118	0.040	0.113	0.153*	0.130**	0.162**
	(0.212)	(0.174)	(0.224)	(0.057)	(0.040)	(0.057)	(0.079)	(0.047)	(0.079)	(0.081)	(0.062)	(0.081)
CF	0.178	0.127	0.222	0.009	0.118***	0.011	0.105*	0.277***	0.116**	-0.066	-0.058	-0.065
	(0.219)	(0.115)	(0.231)	(0.044)	(0.040)	(0.044)	(0.058)	(0.049)	(0.058)	(0.065)	(0.058)	(0.065)
GIM	0.056*		0.062*	-0.013		-0.010	-0.021		-0.020	-0.013		-0.005
	(0.034)		(0.035)	(0.014)		(0.014)	(0.014)		(0.014)	(0.023)		(0.023)
BOARD_SIZE	0.285***		0.293***	-0.024		-0.007	0.005		0.019	0.071		0.080
	(0.091)		(0.098)	(0.043)		(0.043)	(0.044)		(0.045)	(0.066)		(0.066)
BOARD_INDEP	-0.037		-0.017	0.022		0.027	0.041		0.048	-0.026		-0.020
	(0.084)		(0.089)	(0.036)		(0.037)	(0.035)		(0.037)	(0.060)		(0.062)
INC_STOCKS	0.398		0.479	0.361**		0.358**	0.257*		0.344**	0.419		0.350
	(0.366)		(0.436)	(0.167)		(0.180)	(0.150)		(0.168)	(0.308)		(0.328)
INC_OPTIONS	1.301***		1.354***	0.035		0.027	0.253		0.283	-0.008		-0.119
	(0.473)		(0.487)	(0.213)		(0.215)	(0.198)		(0.199)	(0.366)		(0.373)
CEO_AGE		-0.042	0.016		-0.098***	-0.105***		-0.067*	-0.068*		-0.076	-0.106*
		(0.084)	(0.106)		(0.035)	(0.039)		(0.037)	(0.040)		(0.053)	(0.064)
CEO_TENURE		0.024	-0.010		0.073**	0.064		0.025	0.001		0.123**	0.115
		(0.066)	(0.096)		(0.034)	(0.043)		(0.034)	(0.040)		(0.055)	(0.074)
CEO_DUALITY		0.124	-0.160		-0.022	-0.090		0.008	-0.094		-0.030	-0.040
		(0.151)	(0.188)		(0.062)	(0.071)		(0.067)	(0.070)		(0.096)	(0.122)
No of firms	97	125	97	672	826	672	398	505	398	371	446	371
R^2	0.627	0.500	0.632	0.311	0.286	0.322	0.411	0.347	0.422	0.331	0.337	0.339

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panel A display results using the managerial ability measure *MA*. Models (1)-(3) and (7)-(8) use firms where the CEO is classified as specialist (CEO holds a PhD and CEO with specific education, respectively) while models (4)-(6) and (10)-(12) use firms where the CEO is classified as generalist (CEO does not hold a PhD and CEO with MBA and/or CPA, respectively). In addition, models (1), (4), (7) and (10) include corporate governance variables as additional controls. Models (2), (5), (8) and (11) include CEO-level controls. Models (3), (6), (9) and (12) include corporate governance and CEO-level controls. Panel B displays similar estimations using the managerial ability measure *MA_AV*. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 1

Table 9. Managerial ability and financing

	CRISIS_CF		CRISIS_RESOURCES		CRISIS_FINCON	
Panel A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MA	0.018***	0.018***	0.018***	0.018***	-0.005***	-0.005***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.002)	(0.002)
SIZE	0.204***	0.184***	0.206***	0.182***	-0.049***	-0.049***
	(0.020)	(0.026)	(0.021)	(0.027)	(0.008)	(0.009)
MTB	0.097***	0.100***	0.064***	0.065***	-0.012**	-0.010*
	(0.019)	(0.019)	(0.019)	(0.020)	(0.005)	(0.005)
LEV	0.129***	0.150***	0.083***	0.092***	-0.014***	-0.012**
	(0.019)	(0.020)	(0.020)	(0.021)	(0.005)	(0.005)
GROWTH	-0.033*	-0.033*	-0.043**	-0.037*	0.032***	0.032***
	(0.018)	(0.019)	(0.020)	(0.021)	(0.005)	(0.005)
RET	0.009	0.020	-0.016	0.002	-0.010**	-0.012**
	(0.018)	(0.020)	(0.019)	(0.021)	(0.005)	(0.005)
ROE	0.063	0.060	0.028	0.021	0.001	-0.007
	(0.053)	(0.053)	(0.025)	(0.025)	(0.006)	(0.006)
CF	0.111**	0.108**				
	(0.052)	(0.053)				
RESOURCES			0.148***	0.152***		
			(0.042)	(0.042)		
FINCON					0.915***	0.923***
					(0.009)	(0.009)
NUM_ANAL		0.008		-0.003		0.002
		(0.023)		(0.024)		(0.006)
RET_STD		-0.015		-0.052**		-0.004
		(0.020)		(0.022)		(0.006)
No of firms	2,748	2,689	2,529	2,471	2,695	2,642
R^2	0.168	0.171	0.147	0.149	0.937	0.939

Panel B	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MA_AV	0.018***	0.018***	0.017***	0.017**	-0.004**	-0.004**
	(0.006)	(0.006)	(0.007)	(0.007)	(0.002)	(0.002)
SIZE	0.203***	0.183***	0.205***	0.180***	0.048***	-0.048***
	(0.019)	(0.026)	(0.020)	(0.027)	(0.008)	(0.009)
MTB	0.098***	0.101***	0.065***	0.067***	-0.012**	-0.011**
	(0.019)	(0.019)	(0.019)	(0.020)	(0.005)	(0.005)
LEV	0.129***	0.150***	0.083***	0.092***	-0.014***	-0.012**
	(0.019)	(0.020)	(0.020)	(0.021)	(0.005)	(0.005)
GROWTH	-0.033*	-0.033*	-0.042**	-0.037*	0.032***	0.032***
	(0.018)	(0.019)	(0.020)	(0.021)	(0.005)	(0.005)
RET	0.011	0.020	-0.014	0.002	-0.011**	-0.012**
	(0.018)	(0.020)	(0.019)	(0.021)	(0.005)	(0.005)
ROE	0.063	0.060	0.030	0.024	0.000	-0.008
	(0.053)	(0.053)	(0.025)	(0.025)	(0.006)	(0.006)
CF	0.112**	0.110**				
	(0.052)	(0.053)				
RESOURCES			0.146***	0.151***		
			(0.042)	(0.042)		
FINCON					0.915***	0.922***
					(0.009)	(0.009)
NUM_ANAL		0.008		-0.002		0.002
		(0.023)		(0.024)		(0.006)
RET_STD		-0.015		-0.051**		-0.004
		(0.020)		(0.022)		(0.006)
No of firms	2,748	2,689	2,529	2,471	2,695	2,642
R^2	0.169	0.171	0.147	0.149	0.937	0.939

Note. This table reports regression coefficient estimates of pre-crisis managerial ability on financing during the crisis period. The financing variable in models (1) and (2) is the crisis period cash flow (*CRISIS_CF*), in models (3) and (4) is the crisis period total financing resources (*CRISIS_RESOURCES*) and in models (5) and (6) is the Whited and Wu (2006) financial constraints index (*CRISIS_ FINCON)*. The financing variables are measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panels A and B display results using the managerial ability measures *MA* and *MA_AV*,

respectively. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 10. Investments and firm value

			LOW–MA	HIGH–MA
	(1)	(2)	(3)	(4)
CRISIS_INVESTMENT	4.729***	3.672***	-5.149***	7.230***
	(0.569)	(1.238)	(1.805)	(1.410)
SIZE	0.226***	0.354	0.875***	-0.545*
	(0.076)	(0.231)	(0.288)	(0.297)
MTB	0.079**	0.103	-0.207**	0.565
	(0.033)	(0.072)	(0.095)	(0.092)
LEV	-2.119***	-0.930	-0.649	2.370
	(0.530)	(1.177)	(1.458)	(1.549)
GROWTH	-0.104	-0.773	0.306	-2.482**
	(0.233)	(0.853)	(1.075)	(1.240)
RD	1.078**	2.325	-4.481*	6.747***
	(0.483)	(1.868)	(2.690)	(2.030)
INVESTMENT	-0.026	0.603	2.862***	-0.974
	(0.059)	(0.742)	(1.055)	(0.915)
GIM		0.026	-0.437	-0.128
		(0.111)	(1.776)	(1.675)
INC_STOCKS		-1.249	1.181	-0.541
		(1.304)	(2.231)	(2.253)
INC_OPTIONS		0.502	-0.066	0.097
		(1.724)	(0.139)	(0.149)
No of firms	2,866	914	503	411
R^2	0.052	0.071	0.061	0.199

Note. This table reports regression coefficient estimates of investment (*CRISIS_INVESTMENT*) on firm value (*CRISIS_Q)* during the crisis period. *CRISIS_INVESTMENT* and *CRISIS_Q* are measured during the fiscal year 2008. The remaining variables are controls and are measured during the fiscal year 2006. All regressions include constants and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Chapter 5

Conclusion

Conclusion

1. Key Findings

This dissertation examines the role of two main managerial traits, namely power and ability on investment levels and efficiency, financing and firm value. CEO duality, signalling managerial power, appears to have an important and at the same time an idiosyncratic nature, making it difficult for firms to adopt a "one size fits all" approach as an act of best practice. In the absence of a clear hierarchical structure, board monitoring weakens (because power is concentrated in the hands of a sole agent) and agency problems, in the form of managerial entrenchment, manifest causing investment inefficiencies and harming overall value at the expense of the firm's shareholders. Nonetheless, through the findings of this dissertation, it appears that the performance consequences of CEO duality are contingent on an array of CEO-specific, firm-specific, and board-specific factors that either attenuate or exacerbate the agency problems in a firm. As such, this dissertation informs strategic literature that whether CEO duality will beget self-interested behavior at the expense of shareholder depends on firm and compensation structure, as well as board and CEO characteristics.

Beyond CEO duality as a structural regime which provides the CEO with legitimate power, this dissertation looks at managerial ability, to suggest that high managerial ability is a vital dimension of firm quality and performance during the crisis period. A firm's managerial ability is valuable to restrain underinvestment problems via gaining access to more resources that enhance firm value. This work overcomes the assumption of homogeneity in the managerial factor evident in past studies and signifies that the impact of managerial ability on firm policies and economic outcomes is fundamental, especially at times when the firm is financially distressed due to liquidity shortages and harsh finance provisions. An important finding in this context is that general managerial skills (compared to specialized managerial skills) appear to be more immune to financially distress conditions, proving that general

knowledge and skills during such times are determinant dimensions of the CEO ability. This finding provides further support to the growing importance of general versus firm-specific skills in the market for CEOs.

2. Limitations

It should, however, be acknowledged that the dissertation is subject to limitations. The first limitation arises in Chapter 2 and Chapter 3 whose analyses rely heavily on segment information for the construction of firm level and segment level measures. Specifically, this relates to the appropriateness of CIS data in reporting segments and industry concentration. Ali et al (2009), document a poor correlation (13%) of CIS data on industry concentration with the equivalent US Census measures that include both public and private firm data. In a different study, Villalonga (2004) utilizes the Business Information Tracking (BITS) database to find a premium in the value of diversified firms in relation to stand alone entities, which highly contradicted the well documented discount found in the value of diversified firms when using CIS data. These results suggest that estimates based on segment data, might yield different results if the analysis considers alternative databases. Furthermore, the reporting of segments by management is at several times inaccurate or prone to change with no notable evidence of a change in operations.

In Chapter 4, the main limitation relates to the construction of firm efficiency score, which requires the usage of accounting values and the preservation of a constant quality in financial reporting. This makes the efficiency score sensitive to the variation in financial reporting quality because of deliberate revenue or earnings management (Demerjian et al., 2011), hence, increasing the potential of inflated perceived efficiency. Additionally, measurement error of the efficiency score may result from the dependence on accounting numbers which were formed based on the measurement rules of the US generally accepted accounting principles (GAAP). Certain problems arise from this; for instance, historical cost appears noncomparable across

industries, R&D and capitalized operating leases measurement relies on researcher assumptions, and important intangibles must be excluded because of data constraints. Demerjian et al. (2012) identify that although these measurement errors do not systematically affect the managerial ability score, they could produce confounding effects on the efficiency score, thus affecting the implications drawn in chapter 4. Still referring to the managerial ability measure, the residual nature of the measure may also entail other factors not necessarily attributable to managerial ability. However, as it has already been mentioned, 67% of CEO fixed-effects in Chapter 4 are statistically significant in explaining managerial ability after controlling for firm fixed effects. Finally, some accounting items of the DEA inputs (e.g. PP&E) are driven by both current and past managers, therefore the score reflects both current and past managerial ability.

3. Future research paths

Considering the findings in this dissertation, the need for a comprehensive understanding of the mechanisms taking place at the apex of the modern firms is still apparent. Provided that this dissertation explores two CEO / managerial traits, namely power and ability, future researchers are urged to examine other managerial attributes based on demographics, human or social capital or even board attributes. Such an assessment may prove valuable because it could inform about how and why certain types of firms attenuate or alleviate investment inefficiencies evident across years or, particularly, in certain periods of economic shortfalls. For instance, managerial prestige may interact with ability to facilitate access to financing; likewise, politically connected managers or boards with directors linked to financial institutions may have a more favourable treatment by lenders.

Furthermore, given that internal capital markets constitute a good point of reference for intra firm investigations of the firm's sensitivity to projects' growth opportunities, future research avenues could also seek for new insights on managerial ability in diversified firms. This will enable an assessment of its role on internal capital or debt service allocation.

Researchers can look at both its direct relation to these outcomes or its moderating effects on the relationship between firm characteristics and firm outcomes. Likewise, it would be interesting to look at the impact of CEO duality on firm outcomes at times when external financing is hard to obtain. It could be argued that, during hardship times, duality becomes beneficial to the firm because of its cohesive nature and speed of decision making which are essential in these settings. Perhaps such an investigation could help explain why an intrusive number of firms continue to maintain the two roles combined, despite the wide proposals against it.

Additionally, it is evident that the performance implications of managerial power and ability are contingent on a range of environment, firm, and CEO/manager factors, only some of which have already been identified; thus, future research should examine its implications through the lenses of such moderating or mediating variables. Further, a renewed consideration of more complex interactions and classifications could identify other outcomes than the ones highlighted in this dissertation; for example, instead of looking at the relationship of CEO duality and firm outcomes, its moderating effects could instead be assessed to identify conditions where it strengthens or weakens the effects of firm characteristics on performance outcomes. Given the focus on large public firms of most of studies evaluating both CEO duality and managerial ability, future researchers are also urged to look whether their identified effects hold on small, private, young or entrepreneurial firms. Lastly, it is proposed that instead of only scrutinizing these traits via quantitative investigations, much can be learned qualitatively from executive interviews and narratives in the press or proxy statements. To add on this, conducting in-depth interviews with executives and chairs of boards can prove valuable in identifying the mechanism through which managers operate and the range of approaches evident to their role.

Appendix

Definitions of the Variables

Variables	Definitions
Dependent Variables	
RVA	Relative value added, calculated when firm- and industry-adjusted segment investment are weighted by the difference between the industry median Tobin's q for that segment and the sales-weighted average q for the firm. RINV is the sales-weighted sum of firm- and industry-adjusted investment in high q segments minus the sales-weighted sum of firm- and industry-adjusted investment in low q segments (Rajan *et al.*,2000). RVA is multiplied by 100.
RINV	Relative investment is the sales-weighted sum of firm- and industry-adjusted investment in high q segments minus the sales-weighted sum of firm- and industry-adjusted investment in low q segments. (Ahn and Dennis, 2004). RINV is multiplied by 100.
Marginal Profitability	The spread of value over cost, equal to the total market value of a firm net of book value of its assets divided by the book value of its assets (Fama and French, 1998).
Segment Investment	Industry-adjusted segment investment, defined as the segment's capital expenditure-to-sales ratio minus the capital expenditure-to-sales ratio of the median peer-focused firm operating in the same three-digit SIC industry as the segment (requiring at least five focused firms in the industry).
Crisis Investment	Capital expenditures in fiscal year 2008 divided by lagged net assets .
Crisis CF	Operating income before depreciation in fiscal year 2008 divided by lagged net assets.
Crisis Resources	Issuance of long term debt minus reduction of long term debt plus operating activities in fiscal year 2008 divided by lagged net assets.
Crisis Fincon	A financial constraints measure estimated as in Whited and Wu (2006) for fiscal year 2008.

Crisis Q	Market equity plus total debt plus preferred stock liquidating value minus deferred taxes and investment tax credits all divided by book assets.
Firm- level Independent Variables	
CEO Duality	A dummy variable taking the value of 1 for the firm-years that the CEO is also the chair of the board and 0 otherwise.
Rer Eff 2006	Residual efficiency resulting from a Tobit regression in the spirit of Demerjian et al. (2012) that regresses firm efficiency score on a set of industry and firm-specific variables (see, *RES_EFF* term in Eq. (2) Ch.3). This measure is estimated using data from fiscal year 2006.
Res Eff Av	Residual efficiency resulting from a Tobit regression in the spirit of Demerjian et al. (2012) that regresses firm efficiency score on a set of industry and firm-specific variables (see, *RES_EFF* term in Eq. (2) Ch.3). This measure is estimated using the average residual efficiency, per firm, across the fiscal years 2002-2006.
MA	Assigned a value between 0 and 9 according to the decile ranking of *RES_EFF_2006*.
MA AV	Assigned a value between 0 and 9 according to the decile ranking of *RES_EFF_AV*.
GA	General Ability Index in the spirit of Custodio et al. (2013). It summarizes information on CEOs skills and allows the classification among *generalists* and *specialists*.
Firm Risk	The variance of monthly stock returns of the firm minus the risk-free rate during the fiscal year. The risk-free rate is the US government security with a 1-year yield period.
CEO Own	The proportion of CEO ownership in the firm ownership structure, defined as the ratio of the number of common shares held by the CEO to the total shares outstanding of the firm.
Firm size	The natural logarithm of total sales.
Number of Segments	The number of the firm's discrete segments.

R&D	The firm's industry-adjusted ratio of R&D/Sales, which is equal to R&D expenditures divided by sales revenues.
Investment	The firm's industry-adjusted Capx/Sales, equal to firm's capital expenditure divided by sales revenues.
Tobin's q	The firm's industry-adjusted Tobin's q, equal to the market value of assets divided by the book value of assets.
CEO Tenure	The natural logarithm of the length of time between the date when the person became the CEO and the current fiscal year end.
Institutional Own	The proportion of institutional ownership in the firm ownership structure, defined as the ratio of the number of common shares held by institutional investors to the total shares outstanding of the firm
MTB	The firm's market value divided by book value of equity in the end of fiscal year 2006.
LEV	Book value of debt divided by book value of total assets in the end of fiscal year 2006.
Growth	The difference from 2005 to 2006 in total assets divided by the year 2005 total assets.
RET	The 12-month compounded stock return (excluding dividends) spanning the fiscal year 2006.
ROE	Earnings before interest and taxes in the end of fiscal year 2006 deflated by lagged net assets.
CF	Operating income before depreciation at the end of fiscal year 2006 divided by lagged net assets.
FinCon	A financial constraints measure estimated as in Whited and Wu (2006) for fiscal year 2006.
Resources	Issuance of long term debt minus reduction of long term debt plus operating activities in fiscal year 2006 deflated by lagged net assets.
Investment	Capital expenditures in the fiscal year 2006 divided by lagged net assets.
Num Anal	The natural logarithm of 1 plus the number of analysts covering the firm in the end of fiscal year 2006.

Ret Std	Standard deviation of daily returns spanning the fiscal year 2006.
GIM	The index constructed by Gompers et al. (2003) for year 2006 (Andrew Metric's website).
Board Size	The number of members in a firm's board of directors.
Board Independence	The percentage of outside directors in a firm's board of directors.
Inc Stocks	The CEO stock holdings incentives ratio estimated as in Bergstresser and Philippon (2006).
Inc Options	The CEO option holdings incentives ratio estimated as in Bergstresser and Philippon (2006).
CEO Age	The natural logarithm of the CEO age.
CEO Edu	A categorical variable that takes the value of 0 when the CEO has no university education, the value of 1 when the CEO has a bachelor degree, the value of 2 when the CEO also holds a master degree and a value of 3 when the CEO holds a PhD degree.
RD	Research and development expense in the fiscal year 2006 divided by lagged net assets.
Segment-level Independent Variables	
Segment Size	The natural logarithm of the sales of the segment.
Relative Segment Size	Segment's sales divided by the sum of sales across all segments of the firm.
Segment CF	Industry-adjusted operating income to sales ratio for the corresponding segment (requiring at least five peer-focused firms in the industry).
Other Segment CF	Industry-adjusted operating income to sales ratio for the firm's remaining segments (requiring at least five peer-focused firms in the industry).
Industry Tobin's q	The Tobin's q of the median peer-focused firm in the three-digit SIC industry for the corresponding segment, with Tobin's q being equal to the market value of assets

	divided by the book value of assets (requiring at least five peer-focused firms in the industry).
High-q Segment	A dummy variable set equal to one if the Tobin's *q* of the median peer-focused firm in the segment's three-digit SIC industry is greater than the sales-weighted Tobin's *q* for the firm as a whole, and zero otherwise (requiring at least five peer-focused firms in the industry).
Moderating Variables	
Incentive ratio	CEO's equity-based incentive ratio is estimated as in Bergstresser and Philippon (2006). The incentive measure is calculated such that it that captures the share of a given CEO's total compensation that would result from a 1% increase in the value of the equity of his or her company. Specifically, *Incentive Ratio* = ONEPCT / (ONEPCT + SALARY + BONUS), where ONEPCT = 0.01*PRICE × (SHARES + OPTIONS); PRICE is the firm share price; SHARES is the number of shares held by the CEO; OPTIONS is the number of options held by the CEO; and SALARY and BONUS are the CEO salary and bonus, respectively.
Delta	A CEO's equity portfolio price sensitivity is estimated as the change in the risk-neutral value of the executive's portfolio for a 1% change in the price of the underlying stock. The parameters of the Black and Scholes formula follow the definitions as in Core and Guay (2002).
FCF	Free cash flows calculated as income before extraordinary items plus depreciation expense scaled by total assets
Staggered Board	In a given year, a firm has a staggered board if not all members of the board are elected at the same time.
Complex Firm	The sales concentration ratio, which declines with the number and variety of firm activities
Managerial Ability	An index developed by Demerjian *et al.* (2012). The measure results from the use of data envelopment analysis (DEA), which calculates unit-specific relative efficiency to produce an estimate of how efficiently managers use their firms' resources. Because the efficiency measure generated by the DEA estimation is attributable to both the firm and the manager,

	Demerjian *et al.* (2012) purge the DEA-generated firm efficiency measure of key firm-specific characteristics that are expected to aid (firm size, market share, positive free cash flow, and firm age) or hinder the management's efforts (complex multi-segment and international operations). The residual efficiency resulting from a Tobit regression in the spirit of Demerjian *et al.* (2012) is the efficiency attributable to the management team of the firm.
Internally Promoted CEO	This dichotomous variable identifies firms with CEOs that are internally (or externally) promoted. Founder CEOs, and appointed CEOs who have tenure of at least 365 days in the firm are classified as internal. If the date of joining the firm is not available, then the CEO must have executive directorship tenure of at least one year to be classified as internally promoted.
Long-lived Business Segment	This dichotomous variable identifies business segments with a long (or short) life-span in the firm. Following Adelino *et al.* (2017), the cut-off point of five years is used, to differentiate between long-lived and short-lived business segments. The age of the segment is the number of years the segment has been listed on the Compustat Industrial Segment (CIS) database.

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