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Essays on CEO cognitive complexity: Effects on corporate strategy, performance, and survival

by

Jinyong [Daniel] Zying

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APPROVED, THESIS COMMITTEE

Yan Zhang, Chair
Fayez Sarofim Vanguard Professor of Management, Coordinator of the Strategy and Environment Area

Prashant Kale
Associate Professor of Strategic Management

Vikas Mittal
J. Hugh Liedtke Professor of Management and Marketing

Vivian Ho
James A. Baker III Institute Chair in Health Economics and Professor of Economics

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ABSTRACT

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Jinyong [Daniel] Zyung

The Chief Executive Officer’s (CEO’s) job involves a substantial amount of information processing. This dissertation explores the organizational implications of CEOs’ way of processing information, or cognitive style, in multiple contexts. I particularly focus on CEOs’ cognitive complexity, or their degree of differentiation and integration of information, and examine how it influences their corporate strategies and performance outcomes not only in general business settings but also in high-growth environments as well as crisis situations. First, I examine the influence of CEOs’ cognitive complexity on their firms’ growth strategies and how these relationships change as the industry in which they compete grows itself. Second, I focus on a particular research context, the recent financial crisis of 2007-2008, to examine how firm acquisitions prior to the crisis, in part driven by their CEOs’ cognitive complexity, influence acquisitions during the crisis which in turn may affect firms’ subsequent survival. Finally, while maintaining the focus on the recent financial crisis, I broaden the focus on firm strategies to their corporate restructuring activities—i.e., acquisitions and divestitures—to examine how these two strategies unfolded within each course and across each other, by comparing pre- and during-crisis periods. Further, I examine the role of CEOs’ cognitive complexity in these ‘cross-strategy’ effects and the specific impacts of during-crisis restructuring activities on firms’ subsequent performance and survival.
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Wonders will truly never cease. I can’t quite believe that I’m sitting here, at last, writing the final section of a Ph.D. dissertation in Strategic Management at Rice—after leaving my home country South Korea ten years ago with the grand plan of earning a doctoral degree. I have yearned to be a Ph.D. since I was in high school. One of the vivid memories from those years was watching my father read academic articles before going to bed just like he was reading some casual story from a magazine—and I thought that was cool. Constantly learning and accumulating knowledge—that was something that my father taught me to go after. Of course, there were so many other enjoyable things in life that got in the way and tempted me to diverge. After two graduate degrees from two different states, however, here I am, with the amazing grace of God, making the final steps toward my third (and hopefully last) graduate degree. The list of people that I need to thank sincerely for getting me to this point is long, wide, deep, and dense.

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Chapter 1

Introduction
To what extent do chief executive officers (CEOs) of firms inject their way of thinking, or processing information, into their decisions? This question is of great practical significance, as it not only addresses the fact that CEOs’ job involves a substantial load of information processing (Mintzberg, 1973), but also brings to focus the potential importance of executives’ information processing styles in determining the behaviors and their consequences of our large business enterprises. Theoretically, this question also helps to frame a long-standing theoretical tension in the management field that managers may have very little influence over organizational outcomes (Augier & Teece, 2009; Lieberson & O’Connor, 1972) due to inertial and isomorphic constraints (e.g., DiMaggio & Powell, 1983; Hannan & Freeman, 1977), or alternatively, exhibit significant influence over organizational behavior and outcomes through their self-driven interests (Jensen & Meckling, 1976; Eisenhardt, 1989) or personal orientations (Hambrick & Mason, 1984; Hambrick, 2007).

This latter perspective, that executives may vary in their personal orientations, often adopted through the rubric of upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2005), serves as the theoretical basis for this dissertation. The central premise of this view is that, as executives have idiosyncratic personalities, values, experiences, and ways of thinking, we can expect different firm behaviors and outcomes. This dissertation builds on a more specific underpinning that the way in which executives think—how their mind works, or how they gather and process information (Finkelstein, Hambrick, & Cannella, 2009)—can be injected into the strategies and shape further subsequent outcomes of the firms they run. It discusses and examines various ways through which CEOs’ particular way of processing information—namely, their cognitive
complexity—manifest in strategic actions and affect performance outcomes. As cognitive complexity refers to one’s degree of differentiation and integration of information (e.g., Tetlock, 1981), I expect CEOs’ cognitive complexity to have profound impacts on large firms’ strategic activities and performance.

My motivation to examine the implications of CEOs’ cognitive complexity comes from several regards. Foremost, research on senior executives’ cognitive style has been sparse. This paucity of research in the strategic leadership arena contrasts with the fact that decision making of senior executives, particularly CEOs, typically entails high volumes of information processing (Henderson and Fredrickson, 1996; Mintzberg, 1973) – very often more than what they can fully comprehend (Simon, 1947). My focus on cognitive complexity is also driven by the possibility that an agency misalignment may arise between CEOs’ and owners’ interests to the extent that CEOs’ cognitive complexity vary, as it is likely to be relatively unobservable in their hiring process yet may still enter into their actions. As much as cognitive complexity can represent an important attribute of CEOs, it is expected to have important implications across different samples of firms spanning different business environments.

The way in which the organizational environment poses challenges to managers can manifest through various outlets. For example, high rates of growth in the industry environment can open abundant opportunities and challenges for the incumbent executives to grasp and address. Alternatively, a sudden, exogenous, economy-wide impact can render organizations at a loss in dealing with the change and even threaten their continuity and existence. The three essays in this dissertation seek to address these issues by examining how CEOs’ cognitive complexity may independently shape their
strategic decisions and how these influences may change as their firms go through times of high industry growth or even unique situations of extreme turbulence such as in economy-wide crisis situations.

Specifically, the three essays collectively address two key questions: (1) In general, how do CEOs’ cognitive complexity manifest in their strategic decisions? While this first question has already gained some academic attention in the past and has spurred a small body of research (e.g., Calori, Johnson, & Sarnin, 1994; McNamara, Luce, Tompson, 2002; Wally & Baum, 1994), it is this dissertation’s key argument that some presumptions about the implications of this construct may have led to limited understandings of it. I suggest that beyond the normative implications of cognitive complexity, that being more cognitively complex is better, there is also important implications arising from the fact that it is also a cognitive ‘style,’ such that individuals with different levels of cognitive complexity may have different preferences in ways of achieving ultimately similar objectives (e.g., growth). This dissertation also seeks to put cognitive complexity in context, and asks (2) To what extent can heterogeneity in firms’ performance, survival, and strategic actions be attributed to CEOs’ cognitive complexity in times of extreme turbulence in the environment, e.g., economic crisis situations?

**ORGANIZATION OF THIS DISSERTATION**

This dissertation consists of three essays. The first essay, entitled “CEO cognitive complexity and firm growth strategies: Evidence from acquisitions and internal innovations,” discusses the implications of CEOs’ cognitive complexity for firms’ growth strategies. As CEOs with high cognitive complexity tend to perceive and use multiple dimensions in the informational environment and draw intricate connections among
them, I argue that their information processing style aligns with the high information processing need of external firm growth strategies, represented by corporate acquisitions. On the other hand, CEOs with low cognitive complexity tend to have focused attention and use select dimensions of information in understanding issues and draw connections among those few constructs. This information processing style aligns with the information processing needs of internal firm growth strategies, represented by R&D investments and new product developments. As high industry growth creates more opportunities and managerial discretion, the strategic discrepancy between high and low cognitive complexity CEOs is expected to widen as they invest more into their own strategic courses. Using CEOs’ language used in conference earnings calls with securities analysts to capture their cognitive complexity, I find strong support for these predictions.

The second essay, entitled “CEO cognitive complexity, firm acquisitions, and surviving a crisis: Evidence from the 2007-2008 financial crisis,” builds on one of the key conclusions from the first essay and discusses the implications of CEO cognitive complexity and firm acquisitions in the context of the recent financial crisis. As high cognitive complexity CEOs’ strategic tendency manifests in high volumes of acquisitions in general situations, a positive relationship exists between the two prior to the crisis. While the financial crisis represented a period of high consolidation and financial constraint, I predict that those firms that have engaged in significant volumes of acquisitions prior to the crisis accumulate the experience and resources to repeat their course of acquisitions during the crisis, resulting in a positive relationship between pre- and during-crisis acquisitions. High volumes of acquisitions during the financial crisis are expected to allow the firm to capitalize on their accumulated resources and opportunities,
improving its financial performance. Further, the gain of size through acquisitions during the crisis would allow organizations to achieve a status of being “too big to fail,” enhancing their likelihood of surviving the crisis. A series of analysis of the financial sector and their CEOs largely supports these predictions.

The final essay, entitled “Antecedents and consequences of corporate restructuring during a crisis: Evidence from acquisitions and divestitures during the 2007-2008 financial crisis,” draws upon the second essay to examine corporate restructuring activities, represented by firms’ acquisitions and divestitures as they transition from the pre- to during-crisis period, the role of CEOs’ cognitive complexity therein, and their performance and survival implications. Extending the second essay’s findings, the current essay’s findings suggest that acquisitions and divestitures reinforced each other as organizations went through the financial crisis, with CEOs with high cognitive complexity allowing the previously-divesting firms to engage more in acquisitions during the crisis. Interestingly, each of these restructuring activities during the crisis influenced survival differently. Specifically, while both activities improved firms’ financial performance, only acquisitions enhance their chance of survival, while divestitures led to lower chances of survival—confirming the institutional logic that some financial institutions, particularly in this crisis period, were rather “too big to fail,” than “too good to fail.”

CONTRIBUTIONS

This dissertation seeks to offer several contributions to the strategic management literature. First, it revisits the construct of executives’ cognitive complexity and seeks to expand its implications towards organizational outcomes, including growth strategies
(i.e., acquisitions and internal innovations), corporate restructuring activities (i.e., acquisitions and divestitures), and performance outcomes (i.e., financial performance and survival). Through the three essays, this dissertation seeks to offer a more balanced view of cognitive complexity—that important implications can be identified and further explored to the extent that it is viewed as a cognitive ‘style,’ which can lead to behavioral outcomes that span a broad horizon. Such approach extends the more traditional view that individuals and groups led by these individuals may be better off when they have higher levels of cognitive complexity.

Relatedly, but at a broader level, by putting cognitive complexity into context and examining its implications as organizations go through exogenous shocks (e.g., financial crisis), this dissertation contributes to the research domain that explores how decision makers’ personal orientations shape organizational action in response to environmental stimuli. It argues and finds that why firms behave and perform differently in macroeconomic adversities can be in part attributed to their CEOs’ cognitive complexity. As it represents their way of gathering and processing information, it is found to have important implications in situations characterized by vast loads of information flow.

Finally, this dissertation highlights the role of CEOs, more specifically their individual cognitive orientations, in understanding important corporate strategies, such as growth approaches (external/acquisitive, or internal/organic) and portfolio restructuring (acquisitions and divestitures). While studies on these strategic outcomes have emphasized some characteristics of the CEO (e.g., hubris, overconfidence, temporal focus, regulatory focus) in explaining individual modes of growth and restructuring activities (e.g., either acquisition or internal innovation), this dissertation focuses on one
of the most relevant attribute—CEOs’ way of processing information, or specifically their cognitive complexity—and takes a more holistic approach by simultaneously investigating multiple strategic courses within each study.
Chapter 2

CEO Cognitive Complexity and Firm Growth Strategies: Evidence from Acquisitions and Internal Innovations
ABSTRACT

How firms manage the multiple conduits towards growth remains a central topic in management research. In this paper, I examine the role of CEOs’ cognitive style, more specifically, cognitive complexity, in firms’ growth strategies. Specifically, I argue that CEOs with higher cognitive complexity tend to prefer external, acquisitive growth strategies while those with lower cognitive complexity lean more towards internal, organic growth strategies (i.e., R&D investments and new product introductions). I further suggest that this divergence widens when the industry is experiencing a high growth rate. Using a sample of 3,144 large, public U.S. firms in the 2002-2013 period, I find that CEOs’ cognitive complexity, captured by their language use in conference calls, is positively associated with their firms’ acquisitive growth strategies while negatively associated with internal growth strategies. These relationships are found to be more pronounced in high industry growth periods. Further, I find that CEOs with higher cognitive complexity tend to pursue more acquisitions of unrelated targets. Findings from this study highlight the important yet complicated role of CEOs’ cognitive complexity in shaping firm growth strategies.

Keywords: CEO cognitive complexity, firm growth, language use
INTRODUCTION

The primary job of the chief executive officer (CEO) is to make key strategic decisions. As strategic leadership research centers on understanding what factors influence top executives’ strategic decisions (Hambrick & Mason, 1984; Hambrick, 2005), scholars have theorized and examined the influence of various indicators of managerial cognitive characteristics, mostly relying on demographic factors and observable experiences (Carpenter, Geletkanycz, & Sanders, 2004). More recent research has suggested that senior executives’ unobservable psychological factors underlying such observable attributes, or individual preferences, such as personalities (e.g., Nadkarni & Herrmann, 2010), motivations (e.g., Gamache, McNamara, Mannor, & Johnson, 2015), or values (e.g., Chin, Hambrick, & Trevino, 2013), can drive their strategic decisions.

However, research on senior executives’ cognitive style—i.e., how they process information—has been relatively sparse. This paucity of research in the strategic leadership arena contrasts with the fact that decision making of senior executives, particularly CEOs, typically entails high volumes of information processing (Henderson & Fredrickson, 1996; Mintzberg, 1973) – very often more than what they can fully comprehend (Simon, 1947). In this paper, I focus on a particular cognitive style, namely, cognitive complexity—the extent to which one differentiates and integrates informational stimuli—and examine its role in corporate strategies. Recent research on managerial cognitive complexity has primarily assumed that higher cognitive complexity is more beneficial to the firm (e.g., Dow, Cuypers, & Ertug, 2016; Wally & Baum, 1994; Wong, Ormiston, & Tetlock, 2011) because high cognitive complexity allows managers to detect and combine informational cues more effectively. This study seeks to go beyond such a
notion and argues that different levels of cognitive complexity, representing different information processing styles, may have differential influences over firms’ strategies for achieving their goals.

In this study, I examine the relationship between CEOs’ cognitive complexity and their approach to firm growth. Firm growth represents a major corporate strategic goal for CEOs (Penrose, 1959) and multiple ways can be adopted to achieve it (McKelvie & Wiklund, 2010). I focus on two major, yet often contrasting approaches to firm growth—acquisitions and internal innovations. The focus on these two growth modes allows us to examine the possible divergent impacts of CEO cognitive complexity on firm growth strategies.

In essence, I argue that different growth strategies have different information processing requirements and the fit between CEOs’ level of cognitive complexity and a particular growth mode’s information processing requirement may determine the level of emphasis that is given to the particular mode by the CEOs. As acquisitions pose great information asymmetry and high volumes of new information to be processed by CEOs under time pressure, CEOs with higher cognitive complexity may tend to engage more in acquisitions than their counterparts with lower cognitive complexity. In comparison, CEOs with low cognitive complexity may lean towards internal growth through internal innovations such as research and development (R&D) and introduction of new products because these activities build more upon the firm’s existing routines and core competencies, which pose less information processing requirements to CEOs. I further argue that such relationships between CEO cognitive complexity and growth strategies will become more salient when industry growth rate is high, because the ample growth
opportunities in the environment allow the two growth modes to be more reflective of CEOs’ preferences.

I also seek to address the methodological challenge in cognitive complexity research in the strategic leadership domain by relying on an unobtrusive measure. Due to the difficulty in collecting primary data from large firm executives, most studies that intend to capture their cognitive styles rely upon surveying a small, selective sample of top executives, which not only limits the generalizability of their findings but also their theoretical implications. This study uses a language-based measure of cognitive complexity to address this concern (Abe, 2011), based on the notion that language use reflects one’s cognitive style (Tausczik & Pennebaker, 2010). Specifically, I use transcripts of firms’ conference calls from which data on CEOs’ spoken language are available. Using a sample of large, public U.S. firms in 2002-2013, I find that CEOs with higher cognitive complexity tend to pursue more acquisitions (and more unrelated acquisitions) and less internal innovations (i.e., R&D and new product developments), while CEOs with lower cognitive complexity tend to prefer more internal innovations than acquisitions. I also provide some evidence that this divergence between these CEOs is further magnified in faster-growing industries.

These findings can make important contributions to the management literature. First, methodological challenges in capturing cognitive styles of top executives have limited comprehensive work on this important subject (Finkelstein et al., 2009). Adopting a novel approach that identifies people’s cognitive styles through their language use (Pennebaker & King, 1999; Sanford, 1942; Tausczik & Pennebaker, 2010), I address this critical issue by examining how CEOs’ cognitive styles may affect their firms’ growth
strategies. The findings consistently suggest that CEOs’ cognitive styles can have important implications on their firms’ acquisitions and innovation. More important, the findings extend prior literature on managers’ cognitive complexity that has largely equated cognitive complexity to a cognitive ‘ability,’ and assumed that higher cognitive complexity is better. Instead, the findings offer a more balanced view, suggesting that cognitive complexity is a cognitive ‘style’ and various levels of cognitive complexity fit different growth strategies.

Second, the findings of this study extend research on firms’ growth strategies. Penrose (1959) early noted that managerial characteristics play a significant role in firms’ growth. I provide evidence that firm acquisitions and internal innovations can be substantially influenced by CEOs’ cognitive complexity. Given that firms do not necessarily pursue only a single growth mode at a point in time (e.g., Stettner & Lavie, 2014), envisioning and managing the multiplicity of the firm’s growth prospect and strategic paths represents a challenging task for corporate officers. This paper contributes to this literature by highlighting the role of CEOs’ idiosyncratic, dispositional cognitive styles in the configuration of multiple growth strategies, particularly as a response to fast-growing industries.

**THEORY AND HYPOTHESES**

**CEO cognitive complexity**

Upper echelons researchers have shown vast interest in understanding the “black box” of CEOs’ decision-making processes—what they attend to and how they interpret and think of what they see (Finkelstein et al., 2009). Starting from earlier theorizing (Hambrick & Mason, 1984) and hypothesis-testing of the influences of executives’
demographics and observable experiences as proxies for their thoughts and cognitive tendencies, substantial effort has been made for better understanding the strategic choices executives make. Moving beyond the use of the demographic approach, recently researchers have made some headway in more directly tapping on psychological factors of senior executives, for example personalities (e.g., Chatterjee & Hambrick, 2007, 2011; Nadkarni & Herrmann, 2010; Peterson, Smith, Martorana, & Owens, 2003) or values (e.g., Agle, Mitchell, & Sonnenfeld, 1999; Chin, Hambrick, & Trevino, 2013; Simsek, Veiga, Lubatkin, & Dino, 2005). Significantly less attention, however, has been given to corporate leaders’ cognitive styles—namely, how they gather and process information.

While scholars have early recognized that even top executives differ from each other in terms of how they draw upon logic or intuition in perceiving and judging information (Barnard, 1938; Hurst, Rush, & White, 1989; Mintzberg, 1973; Nutt, 1986), a persistent stream of research on CEOs’ cognitive styles has been absent. Given high information processing loads they confront, examining the implications of CEOs’ cognitive complexity is of great importance.

Psychology research suggests that cognitive complexity characterizes a person’s thinking style with two major cognitive components: the degree of differentiation, or the extent of perceiving several dimensions in a stimulus array, and the degree of integration, or the development of connections among the differentiated elements (Bartunek et al., 1983; Calori et al., 1994; Fransella, Bell, & Bannister, 1977, Zimring, 1971). In essence, it represents a typical way of individuals’ processing of information and construal of stimuli (Bieri, 1961). Some research provides evidence of the implications of cognitive complexity in the corporate elite. For instance, Wally and Baum (1994) found from a
survey of local manufacturers that CEOs with high cognitive complexity make faster strategic decisions while Calori et al. (1994) found from interviews with company executives that those with more complex cognitive maps pursue greater geographic and product scope of the firm. McNamara et al. (2002) provide evidence from survey questionnaires that top management teams with higher complexity in their knowledge structures of their competitive environment tend to give rise to greater firm performance. Recent research using Q-sort methodology suggests that top management teams with higher cognitive complexity pursue more corporate social activities and decentralized decision making (Wong, Ormiston, & Tetlock, 2011). In the international context, managers with greater linguistic and religious diversity are found to acquire more linguistically and religiously distant firms, presumably because they have higher levels of cognitive complexity (Dow et al., 2016).

In essence, cognitive complexity can be understood as the idiosyncratic manner in which individuals think and view informational stimuli. More specifically, a CEO with high cognitive complexity tends to be more comfortable with observing and interpreting the multifaceted situations in the environment, tolerant of processing and accepting multiple perspectives, generating the links between them, and understanding the interplays of multiple factors considered to make an organizational decision. Conversely, a CEO with low cognitive complexity tends to draw upon a small number of dimensions in processing information and understanding issues, have more focused ranges of attention and search, and develop fewer links among the select constructs they apply when confronted with multifold situations.
The prior literature tends to imply that higher cognitive complexity of managers is more beneficial to the firm in terms of enhancing performance (McNamara et al., 2002), addressing linguistic and religious distances (Dow et al., 2016), and faster decision making speed (Wally & Baum, 1994). However, this assumption does not provide a complete view of cognitive complexity, as simple heuristics and construal patterns may be more efficient in simple situations (Weick, 1979). Thus, cognitive complexity may be better understood as a ‘style’ of viewing informational stimuli rather than one’s general ability (Kovarova & Filip, 2015). Adopting this ‘style’ perspective, the central premise of this paper is that, as CEOs face situations to manage multiple interdependent options for configuring their firms’ strategic profiles, their cognitive inclinations play an important role in guiding their decisions on how to allocate organizational resources to different strategic alternatives.

The influence of CEOs’ cognitive complexity on firm growth strategies

Firm growth represents a major corporate strategic goal for managers (Penrose, 1959), for the purpose of serving external stakeholders’ interests (Kim, Halebian, & Finkelstein, 2011) and managers’ own incentives (Dalton & Kesner, 1985) or aspirations (Greve, 2008). Growing the firm includes outward expansion and development within the organization (Penrose, 1959). Among the multiple paths to growth, acquisitions and internal innovations represent two major, often substitutable, approaches that firms adopt (Hitt, Hoskisson, Ireland, & Harrison, 1991; Pitts, 1977). As engaging in multiple and simultaneous growth modes may require specific ways of thinking and processing

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1 Hybrid modes (e.g., franchising, alliances, and joint ventures) also form important actions for growing companies (McKelvie & Wiklund, 2010), which merit a separate discussion. The focus of this paper is limited to acquisitive and organic growth, as they represent two distinct paths towards expansion.
information, it is critical that I understand how managers’ idiosyncratic cognitive
tendencies may drive various paths for firm growth. Such notion builds upon the premise
that adopting a holistic view of firms’ growth paths—instead of focusing on individual
growth paths—triggers the need for identifying cognitive sources that help explain the
multi-strategy growth approaches.

Different growth modes may be driven by different proclivities. For example, the
agency theory view suggests that self-interested corporate agents tend to invest in
acquisitions to build their empire and obtain short-term rewards (e.g., Agrawal &
Walkling, 1994; Gomez-Mejia & Wiseman, 1997) than in internal innovations that
require longer-term investments. Individual growth strategy may be associated with
certain psychological attributes of CEOs. For example, CEOs’ hubris (Hayward &
Hambrick, 1997), regulatory focus (Gamache et al., 2015), and overconfidence
(Malmendier & Tate, 2008) have been found to be associated with acquisition decisions,
while CEOs’ attention to technological trends (Eggers & Kaplan, 2009; Kaplan, 2008)
and temporal orientation (Nadkarni & Chen, 2014; Yadav, Prabhu, & Chandy, 2007)
have been found to predict new product introductions.

Most previous studies have focused on explaining a single mode of growth. Not
much has been done to identify why firms, as they engage in multiple growth modes,
choose to put more emphasis on one growth mode over another. It is critical to
understand how different weights on individual courses for growth are determined in the
CEO’s decision calculus. My approach, which focuses on CEO cognitive complexity on
multiple firm growth strategies, thus can offer a more comprehensive understanding of
how the CEO, as a firm’s chief architect (Allaire, 1991; Bigley & Wiersema, 2002), and
“cognizer” (Calori et al., 1994: 438; Nadkarni & Herrmann, 2010), may shape the firm’s pursuit of multiple growth modes. My core argument is that different growth strategies, more specifically acquisitions and internal innovations, require different information processing loads from CEOs; thus, CEOs with different levels of cognitive complexity may prefer different growth strategies.

**CEO cognitive complexity and acquisitions**

First, as acquisitions represent external growth activities that span firm boundaries, they involve high information asymmetry between the acquirer and the external pool of target candidates (e.g., Cuypers, Cuypers, & Martin, 2017; Officer, Poulsen, & Stegemoller, 2009), hence may require intense information processing for the CEO to mitigate such asymmetry. Specifically, CEOs need *ex ante* to discern across multiple candidates and weigh the pros and cons of each candidate; process the corresponding information collected from due diligence; and develop thorough planning during and after the acquisition to address the high uncertainty in post-acquisition phases (Pablo, Sitkin, & Jemison, 1996).

Indeed, firms refer to past acquisition experiences (see Barkema & Schijven, 2008 for a review) in guiding their subsequent acquisition decisions. However, every acquisition deal differs, which implies that, as the CEO signs the deal, there still exists a host of new information about the new entity to be acquired and integrated. Even for acquisitions of related or similar businesses, it is likely that differences exist between the acquirer and target in terms of their respective culture, organizational structure, decision processes, management styles, and operating procedures (Datta, 1991). Such differences
are expected to present complex information bundles to the CEO before signing the deal (Hayward & Hambrick, 1997).

Second, acquisitions involve intense negotiation processes among multiple internal and external parties (Walsh, 1989). As participants’ commitment to the deal escalates, this will put significant amounts of time in doing the deal and present high time pressure to the CEO to make the final decision that best addresses the multiple constituents’ interests (Jemison & Sitkin, 1986). Last, but not the least, when CEOs ‘write the check’ for an acquisition deal, they take utmost responsibility in the decision that involve massive amounts of financial resources (Hayward & Hambrick, 1997). Indeed, failed acquisitions can lead to forced CEO turnovers (Lehn & Zhao, 2006). In all, I suggest that growing firms through acquisitions fits the information processing style of CEOs with high cognitive complexity. In proposing such relationship, I suggest that high cognitive complexity CEOs’ preference towards intensive acquisition activities may be manifested in both the number of acquisition deals made and the amount of financial investment associated with those deals. Formally,

*Hypothesis 1a*: A firm’s CEO’s cognitive complexity is positively related to the firm’s number of acquisitions.

*Hypothesis 1b*: A firm’s CEO’s cognitive complexity is positively related to the firm’s size of acquisitions.

While I have proposed the relationship between CEOs’ cognitive complexity and acquisitions, I suggest that the strategic proclivity of CEOs with high cognitive complexity towards acquisitions may be further manifested in their penchant for acquisitions of less-related businesses rather than closely-related businesses. Whereas acquisitions of closely-related businesses offer great synergy and easy to integrate due to
high overlap in knowledge bases, (Ahuja & Katila, 2001; Anand & Singh, 1997; Seth, 1990), acquisitions of distant businesses can expand the scope of the acquiring firms’ knowledge bases and product lines (Vermeulen & Barkema, 2001).

As argued earlier, CEOs with low levels of cognitive complexity are more likely to be focused in their strategic lookout of acquisition candidates. When they do come to a decision to acquire a target, it is likely that, compared to those with high cognitive complexity, they attend more to the familiar candidates that operate similar businesses than the unfamiliar ones. Their more focused attention scope and concise decision calculus (e.g., Calori et al., 1994), use of fewer cognitive categories for distinguishing candidates and more attention to the strategic benefits that the acquisition of similar businesses can offer may all lead them to drive their strategic efforts towards acquiring more related businesses. In comparison, CEOs characterized by high levels of cognitive complexity are likely to seek a variety of information (e.g., Tetlock, 2000) and search for potential acquisition targets beyond their firms’ industry boundaries. CEOs with high levels of cognitive complexity may also tend to feel more comfortable in collecting and processing new information to weigh pros and cons of targets outside the industry segments of their firms’ current businesses. As a result, CEOs with high cognitive complexity are more likely to acquire unrelated businesses than their counterparts with low cognitive complexity. CEOs with different levels of cognitive complexity not only differ in their preferences in acquisitions, but also differ in the choices of acquisition targets once they decide to go ahead with the acquisition strategy. Taken altogether, I hypothesize:

Hypothesis 2: A firm’s CEO’s cognitive complexity is positively associated with the firm’s propensity for pursuing acquisitions of less related
businesses.

CEO cognitive complexity and internal innovations

Parallel with my discussion on CEOs’ cognitive complexity and acquisitions, I suggest that the information processing needs of internal growth may better fit the information processing style of CEOs with low cognitive complexity. I present my hypotheses on the association of CEOs’ cognitive complexity with two related fronts of internal innovations—input (R&D investment) and output (new product developments).

A critical engine for promoting internal growth is to make strategic investment in such activity—i.e., research and development (R&D) expenditures. A large literature has suggested that CEOs have significant influence over R&D activities, either driven by financial incentives (e.g., Balkin, Markman, & Gomez-Mejia, 2000; Hoskisson, Hitt, & Hill, 1993; Sanders & Hambrick, 2007), their demographic attributes or experiences (e.g., Barker & Mueller, 2002; Crossland, Zyung, Hiller, & Hambrick, 2014), or their personal dispositions (e.g., Chatterjee & Hambrick, 2007; Li & Tang, 2010). I add to this stream of research by suggesting that CEOs’ cognitive style, i.e., cognitive complexity, can also have important implications on their firms’ R&D investments.

R&D investment is a key organizational vehicle through which internal growth is promoted (Garcia-Majon & Romero-Merino, 2012; Hitt, Ireland, & Palia, 1982; Hitt & Ireland, 1985). As previous research suggests, developing new products involve gradual information gathering and processing that build upon core competencies that have already accumulated within the firm (Danneels, 2002) and may thus entail less information asymmetry and processing for the CEO. Relatedly, internal developments are built upon existing rules and routines (Danneels, 2002) that support the CEO’s decision making and lessen the amount and complexity of information to be processed by the
CEO. As path dependent operations for internal development of new products may simplify the decision calculus for the CEO, those with low cognitive complexity may prefer internal growth through investing more in R&D.

**Hypothesis 3:** A firm’s CEO’s cognitive complexity is negatively associated with the firm’s R&D expenditures.

While R&D spending levels can be largely determined by the CEO, the CEO’s role is often to look at the big picture and bring the overall direction to the table, generate the energy, and procure, manage, and deploy organizational resources that are needed to translate new ideas into products (Van de Ven, 1986). This, in turn, is expected to be manifested in the outputs of R&D investment—i.e., new product developments.

While gradual information gathering and processing that build upon core competencies and routines that have accumulated within the firm characterize internal innovations, such activities are mostly within the lower level individuals’ task domain. The CEO often delegates the decision authority of new product launches to lower level managers who are more directly involved in the development process. As such, multiple decision variables such as managing R&D teams, conducting lab tests, or making optimal use of the R&D budget are rather delegated to the middle managers or R&D personnel (Burgelman, 1983). While time is an important aspect also for new product launches, since new products need to meet market demands on time, grasping customers’ needs is rather mostly done by frontline managers (Burgelman, 1983; Christensen & Bower, 1996), leading the time pressure perceived by the CEO to be less severe.

In all, as internal organic growth focuses on internal developments of new products using the firm’s internal knowledge and core competencies and more likely builds upon path-dependent operations (Danneels, 2002), the information processing
load for the CEO is relatively low and attention and search are rather directed towards the inner sector. Therefore, CEOs with lower cognitive complexity may feel more confident in growing internally and deploy firm resources and attention towards the corresponding activities, bringing new products to fruition. Therefore, I hypothesize:

_Hypothesis 4: A firm’s CEO’s cognitive complexity is negatively related to the firm’s number of new product developments._

The moderating role of industry growth

Industry growth is an environmental feature that has figured prominently in strategic management and organizational theory research (e.g., Caves & Porter, 1978; Datta & Rajagopalan, 1998; Datta, Guthrie, & Wright, 2005; McDougall, Covin, Robinson, & Herron, 1994; Porter, 1980). As industries grow at higher rates, they offer greater market opportunities, increased options for firm growth, and variance in competition (Hambrick & Abrahamson, 1995; Hambrick & Finkelstein, 1987). Industries going through low growth periods, however, offer fewer opportunities, hence less discretion for CEOs to make deliberate strategic decisions.

It follows that, as opportunities for growth increasingly abound in the environment, the discrepancy in strategic focuses between CEOs with different levels of cognitive complexity is expected to become more salient. Indeed, when growth opportunities are sparse, there exists little room for CEOs to willfully exert their strategic focuses (Hambrick & Finkelstein, 1987). Specifically, the growth approaches of CEOs, with high or low cognitive complexity, may not fully realize when they do not have much latitude to pursue their strategic approaches. However, high growth in the industry is likely to increase opportunities of both acquisitions and internal innovations. Therefore, as opportunities to grasp burgeon, the cognitive and strategic tendencies of CEOs with
high and low cognitive complexity are likely to diverge further. Not only would increased strategic leeway support a high cognitive complexity CEO’s penchant for acquisitions, it would also strengthen a low cognitive complexity CEO’s inclination towards internal growth. While CEOs with low cognitive complexity are in general likely to focus on select aspects of the opportunities in the industry, increased stimuli would open room for pursuing greater investment in internal growth (Staw, Sandelands, & Dutton, 1981). As they allocate more of their attention and organizational resources towards internal growth in fast-growing contexts, relatively less focus is expected to be given to external growth.

Taken together, I hypothesize:

*Hypothesis 5a: The positive relationship between CEO cognitive complexity and the number of acquisitions will be strengthened in higher industry growth situations.*

*Hypothesis 5b: The positive relationship between CEO cognitive complexity and the size of acquisitions will be strengthened in higher industry growth situations.*

*Hypothesis 5c: The negative relationship between CEO cognitive complexity and R&D investment will be strengthened in higher industry growth situations.*

*Hypothesis 5d: The negative relationship between CEO cognitive complexity and the number of new product developments will be strengthened in higher industry growth situations.*

**RESEARCH METHODS**

Data and sample

The study was based on a longitudinal sample consisting of 3,144 public U.S. firms, whose quarterly earnings conference call data were available in the years 2002 through 2013. Data on CEOs’ language use were based on companies’ quarterly conference calls collected from Thomson Reuters Street Events database. Firm
acquisition data were collected from *SDC Platinum*, firms’ financial and strategic information from *Compustat*, and CEO compensation data from *Execucomp*. On average, I analyzed 6.37 firm-CEO years per firm panel across a variety of industries, which allowed great generalizability of the findings.

**Independent variable: CEO cognitive complexity**

While cognitive complexity has been a highly studied construct in psychology, as noted earlier, methodological challenges have been present in the management literature. First, studies that have used primary data (e.g., questionnaires, interviews) have mostly been restricted to a relatively small number of CEOs in specific geographical areas or industries (Calori et al., 1994; Hitt et al., 1991; McNamara et al., 2002; Wally & Baum, 1994). As an effort to address these concerns, I adopt an approach that recent psychology research has developed—i.e., to use an unobtrusive measure that relies on individuals’ word usage revealed in text materials to capture their cognitive complexity (e.g., Abe, 2011, 2012). This approach features the advantage of allowing one to study much larger samples over time so long as data on individuals’ language use are available.

For decades, researchers have argued that people’s preferences, perceptions, and personalities are revealed by the words they use in written and verbal communication (e.g., Sanford, 1942; Webb et al., 1966). In essence, “[t]he way we use words reflect how we think” (Pennebaker, Chung, Frazee, Lavergne, & Beaver, 2014: 1). Unobtrusive measures based on language can help eliminate much of the reactivity, demand characteristics, and researchers’ expectations associated with other methods. Studies on the psychometrics of word use have shown that language patterns are remarkably stable across various topics, suggesting that language use is a reliable indicator of individual
differences (Chung & Pennebaker, 2007; Mehl & Pennebaker, 2003; Pennebaker & King, 1999). As such, studies in management have increasingly adopted this method to capture managers’ psychological constructs such as regulatory focus (Gamache et al., 2015), entrepreneurial orientation (Cho & Hambrick, 2006), commitment to status quo (McClelland et al., 2010), and attention (Eggers & Kaplan, 2009) (see Gao, Yu, & Cannella, 2016 for a review of strategy research on public language use).

Based on this stream of research, I collected data on CEOs’ word use through companies’ quarterly earnings conference calls with investors and securities analysts, resulting in an average of 3 transcripts for each CEO annually and 66,024 transcripts in total. The transcripts were content-analyzed through an automated text-analysis software, LIWC (Linguistic Inquiry and Word Count: Pennebaker and Francis, 1996; Pennebaker, Booth, & Francis, 2007). LIWC uses a validated database of over 2,000 words and word stems to code text in terms of 72 different dimensions of language use, which are grouped in four main categories: 1) language composition (e.g., negations, pronouns), 2) psychological processes (e.g., optimism-energy, inhibition), 3) relativity (e.g., temporal references), and 4) current concerns (e.g., physical states). Based on these dimensions, LIWC calculates the percentage of words in a given text that match each dimension.

For each conference call transcript, I extracted all words spoken by the CEO during the call, all of which consisted of two major parts: 1) Prepared remarks, in which

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2 Many studies in the managerial cognition literature have used letters to shareholders in company annual reports to capture various psychological constructs (e.g., Cho & Hambrick, 2006; Eggers & Kaplan, 2009). However, it may be questionable whether the texts from these scripted, formal letters accurately capture CEOs’ cognitive patterns or personality traits. Reflecting this concern, recent accounting and finance research has been increasingly using transcribed texts from various types of conference calls through demonstrating their validity as a useful indicator (e.g., Larcker & Zakolyukina, 2012; Matsumoto, Pronk, & Roelofsen, 2011; Price, Doran, Peterson, & Bliss, 2012).

3 See Pennebaker and Francis (1996), Pennebaker, Booth, and Francis (2007), and Tausczik and Pennebaker (2010) for more detailed information and psychometric properties of LIWC analyses.
the company’s CEO gives a formal presentation on various issues, and 2) *Question and Answer*, in which the company representatives are open to questions from the analysts present at the conference call. Using CEOs’ spoken language from these sessions, ‘function’ words (e.g., conjunctions) that serve as the ‘cement’ to hold content words together (Chung & Pennebaker, 2007: 347) were used to create the index of one’s cognitive complexity, thereby ensuring that the use of these subconsciously used words captured the cognitive styles of CEOs during these speech sessions.

The use of function words builds upon the premise that although conscious attention is seldom paid by the speaker/writer when actually using them, function words are known to have a strong impact on the listener/reader while reflecting a great deal about the speaker/writer (Abe, 2011). Again, these word categories do not contain content—i.e., context- or business-specific nouns (e.g., industry, product) or verbs (e.g., explore, innovate). This exclusive focus on function words and not on content words serves an important purpose. Specifically, it mitigates the concern that the words used in CEOs’ speeches may merely be verbatim descriptions of concurrent or prospective company activities and thus CEOs’ cognitive complexity captured in their language is simply a projection of complex activities in which their firms engage. Rather, this approach assumes and implies that the ways CEOs think are reflected in *how* they speak and not in *what* they say (Chung & Pennebaker, 2007; Pennebaker & King, 1999). In all, CEOs’ way of thinking is expected to be reflected in how they verbally deliver the prepared remarks as well as organize and manage the interactions with others during Q&A sessions.

As discussed earlier, cognitive complexity refers to a combination of two major
components of one’s reasoning: the extent to which one can differentiate between multiple, competing solutions and the extent to which one can integrate among those solutions (Tetlock, 1981). Following this definition, Abe (2011, 2012) employed an index that combines words that used for making precise distinctions and conjoining multiple thoughts together. Specifically, the index comprises four function-word categories—exclusion (e.g., but, without), negations (e.g., no, not, never), tentativeness (e.g., maybe, perhaps), and conjunctions (e.g., and, also, although). For example, exclusion words are used when making distinctions between multiple categories (i.e., differentiate), while conjunctions help bring together multiple thoughts to create a coherent narrative (i.e., integrate) (Graesser, McNamara, Louwerse, & Cai, 2004).

On average, CEOs spoke 2,962 words during the quarterly calls. Such procedure indicates that CEOs’ level of cognitive complexity is measured and updated annually. As psychology research has mostly treated cognitive complexity as an individual trait that stays largely constant over time (e.g., Burleson & Caplan, 1998; Leary & Hoyle, 2009), I show below the stability of the annually measured scores, which supports that one’s cognitive complexity is relatively consistent over time. However, I refrained from using a constant value over the tenure of CEOs in the main analysis since a constant value would imply a strong assumption that a CEO will produce the exact same language-based complexity score whenever measured. Thus, in line with recent research using linguistic measures of psychological variables (e.g., Gamache et al., 2015), I annually updated CEOs’ cognitive complexity scores in the analysis. The results remained consistent when using a constant measure of CEO cognitive complexity, i.e., the mean of cognitive complexity.

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4 We provide in Appendix 1 the full list of words used for each category. For more information, please refer to the LIWC 2007 program which can be found on www.liwc.net.
complexity scores across the CEO’s firm tenure years. Using LIWC, the number of words from each of these categories was counted to compute the extent to which these words were used in proportion to the total amount of words spoken by the CEO. After conducting a LIWC analysis on the transcripts, I ran a factor analysis of the scores (percentages) from the four word categories, which showed that all four word categories loaded on one factor with an Eigenvalue of over 2.56 explaining 64 percent of the variance, all loadings exceeding 0.61. I used the sum of the standardized scores as an index of a CEO’s cognitive complexity.

While there were strong reasons for adopting the language-based measure, I conducted a supplementary study to gauge its correlation with the explicit, self-report measure of cognitive complexity based on Bieri et al.’s (1966) Repertory Grid. I recruited 123 undergraduate students enrolled in a management course. The participants first completed the survey-based measure of cognitive complexity, i.e., the Repertory Grid. In brief, Bieri et al.’s (1966) instrument presents a 10×10 grid where the respondent is asked to evaluate 10 specific persons (e.g., self, mother, person s/he dislikes, friend of opposite sex) on 10 bipolar constructs (e.g., responsible-irresponsible, calm-excitable, outgoing-shy) using a six-point scale, for a total of 100 ratings. From the ratings, the standard deviations of ratings of each person evaluated (10 for each respondent) are computed, which reflect the extent to which the respondent uses different constructs (categories) to evaluate an object. Thus, a higher standard deviation indicates greater degrees of distinction. Then, the standard deviations are averaged across the 10 individuals to represent the overall level of cognitive complexity for each respondent.

Next, the respondents were asked to provide a sample writing to be content-
analyzed using the LIWC software to calculate the language-based cognitive complexity score (e.g., Abe, 2011, 2012). In this writing sample, participants were asked to situate themselves in a situation where multiple personal and occupational identities can collide (e.g., doctors striving to improve patients’ health outcomes vs. hospital’s financial outcomes) and express their thoughts and beliefs on how to address the conflicting situations. Using LIWC, the percentages of the four vocabulary dimensions (i.e., conjunctions, negations, tentativeness, and exclusions) were extracted and standardized to construct the language-based cognitive complexity score. The correlation between the language-based measure and grid-based measure of cognitive complexity was 0.20 (p < 0.05), a magnitude commensurate with previous studies that have used linguistic markers of cognitive constructs (e.g., Pennebaker & King, 1999; see Hofmann, Gawronski, Gschwendner, Le, & Schmitt [2005] for a meta-analysis that reports correlations between implicit measures and explicit self-reported measures).5

A measure of CEO attribute or firm-specific influence? One may argue that some firms have embedded practices that make their CEOs (appear to) possess high or low cognitive complexity. Accordingly, it could be questionable whether the level of cognitive complexity captured in the conference call texts is simply an indicator for the firm’s task contingencies as opposed to the CEO’s personal attribute. I address this concern in two ways. First, using a subset of the sample, I examined whether CEOs showed consistency in their complexity scores over time, regardless of whether they moved across firms. If the CEO’s cognitive complexity was to be highly influenced by the firm, his or her complexity score would change over time, reflecting any firm-specific

5 Hofmann et al. (2005) report that the implicit-explicit correlation in cognitive characteristics (r = 0.18) is often significantly lower than that in affective characteristics (r = 0.28).
influences. Using a well-established stability (or dispersion) measure, I computed the coefficient of variation (CV) in CEOs’ complexity scores over the years observed in the sample (standard deviation over the mean). This yielded a value of 0.03, which indicates high stability (low variance) in CEOs’ cognitive complexity over time. Second, in addition to computing CVs of the sampled CEOs, I focused on the few CEOs who were observed at two different firms (i.e., moved from one firm’s CEO position to another firm’s CEO position within the sample period) to examine the consistency in their cognitive complexity scores across different firms. I found that there was a great degree of consistency for each individual across the successive placements (Pearson’s $r = 0.84$). Taken together, these results provide some evidence that CEOs may indeed have their own ‘styles’ in making corporate decisions (Bertrand & Schoar, 2003: 1170). In essence, the cognitive complexity scores gauged by CEOs’ linguistic use represent more the personal attributes of the CEOs themselves than the task contingencies of their firms.

**Dependent variables**

*Acquisitions.* Three variables that capture the magnitude and nature of acquisitions were collected from the SDC Platinum database. First, *number of acquisitions* was measured as the count of company announcements of acquisitions in a given year. To include only meaningful acquisitions from acquiring firm CEOs’ perspectives, I focus on acquisitions with transaction values over $1 million and in which acquiring firms have taken controlling stakes (Moeller, Schlingemann, & Stulz, 2005). Second, the *size of acquisitions* was measured as the total transaction values (log-transformed) associated with the acquisitions in a given year. *Unrelated acquisition* was
determined based on the 2-digit SIC codes of the acquiring firm and target (Stettner & Lavie, 2014). If the target was classified as operating in a different 2-digit SIC code than that of the acquiring firm, the acquisition was considered as unrelated and was coded one, zero otherwise. The unrelated orientation of acquisition activities in a given year was computed as the number of unrelated acquisitions in proportion to the total number of acquisitions, resulting in a ratio ranging from 0 to 1.

*Internal innovations: R&D investment and new product developments.* The two variables that capture the firm’s internal growth activities, *R&D investment* and *new product developments*, were collected from *Compustat* and the *Key Developments* database of Capital IQ, respectively. First, R&D investment was measured as the actual annual R&D spending as reported in *Compustat*. I use R&D investment instead of R&D intensity (R&D investment scaled by firm size) because the former avoids the potential for spurious associations arising from the correlation among the denominators of both right- and left-side variables (Wiseman, 2009). Second, the number of new product developments was the count of firms’ non-redundant announcements of new product introductions in a given year.

**Moderator: Industry growth**

Following prior research, *industry growth* was measured as the average five-year annual growth rate in industry sales (based on the 2-digit SIC codes) (e.g., Hambrick & Abrahamson, 1995; Datta et al., 2005; Rajagopalan & Datta, 1996).

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7 This database offers structured summaries of key development events that may impact the market value of securities, extracted from sources such as PR Newswire, Business Wire, SEC Form 8Ks, and company press releases. The coverage of this database starts in 2002 and includes corporate events such as firms’ client and product announcements, SEC inquiries, expansions, reorganizations, corporate governance, dividends, and earnings.
Control variables

**CEO-level controls.** As CEOs’ strategic behaviors may change as they age (Hambrick & Mason, 1984), CEO age was controlled for. In addition, as contingent-based pay is expected to affect CEOs’ corporate strategic choices (e.g., Sanders & Hambrick, 2007), I also controlled for CEO options, computed as the percentage of options relative to the total compensation awarded to a CEO. Further, as more powerful CEOs would have greater leeway in exerting their wills into firm actions (Finkelstein, 1992), I also controlled for CEO duality, an indicator variable equaling one if a CEO was also the board chair in a year, zero otherwise.

**Firm-level controls.** As the relative standing of firms has been found to influence managers’ strategic actions (Greve, 1998), I controlled for the performance levels of firms relative to their aspiration levels, measured by firms’ returns of assets (ROA). Specifically, a firm’s relative performance was calculated as the difference between the firm’s actual performance and its aspiration level, which was a weighted index of historical and social components (Cyert & March, 1963; Greve, 2003). Using the spline specification (Greene, 1993), separate variables for over- and underperformance were created. Overperformance was measured as the actual level of performance above the aspiration level while underperformance was actual performance below the aspiration level. Thus, when the actual performance was below (above) the aspiration level, overperformance (underperformance) was coded as zero. As firm resource slack allows greater leeway and triggers certain managerial decisions (Cyert & March, 1963; Greve, 1998), the firm’s current ratio (current assets over current liabilities) and equity/debt ratio (common equity over total debt) were controlled for. Since R&D represents a firm’s input...
for innovation activities and is therefore an important contingency of new product developments (Sidhu, Commandeur, & Volberda, 2007), R&D spending was controlled for in the models predicting new product developments, computed as the firm’s actual R&D expenses. When predicting the number (size) of acquisitions, I controlled for the focal year’s size (number) of acquisitions. Firm size, measured as the natural log of the firm’s total revenues, was controlled for as it can influence the degree of strategic inertia (Dougherty & Hardy, 1996). As more diversified firms are more likely to make acquisitions (e.g., Bergh & Lawless, 1998), total firm diversification was also included, measured using an entropy measure of total product market diversification (Hoskisson et al., 1993; Palepu, 1985). This measure takes into account the number of segments in which a firm participates, and weights each segment based on its respective sales. Finally, because pursuing one growth mode can affect the decision of the other, I controlled for the level of prior year’s other growth activity (e.g., controlled for prior year’s new product development activities when predicting the focal year’s acquisitions).

Industry-level controls. To control for inter-industry variability and temporal factors that may influence the outcome variables of interest, I included industry dummies at the two-digit SIC level and year dummies. In addition, as firms’ learning from peers’ behaviors can affect their stock of knowledge at a given point in time (e.g., Srinivasan, Haunschild, & Grewal, 2007), I controlled for the industry tendencies in growth activities, by including the previous year’s industry means of each growth strategy variable.

Estimation

Due to the different nature of the various dependent variables, I used three
different methodological approaches to test the hypotheses. The first approach was employed to address the count-based nature of acquisitions and new product developments. As these events do not occur frequently, it is common to observe non-occurrences in a given year, resulting in multiple zeros in the distributions of the dependent variables. Therefore, I used zero inflated negative binomial regressions with standard errors clustered at the firm-CEO level to test Hypotheses 1a, 1b, 2a, and 2b. In each model, the Vuong test statistics (1989) indicated that the zero-inflated negative binomial models were more appropriate in fitting the data than the standard negative binomial models. Further, to address the possibility of non-random assignment and selection bias that corporate boards may seek and hire CEOs with high cognitive complexity in certain types of businesses, I employed a propensity score-based weighting and regression method (Guo & Fraser, 2014; Yim, 2013). This involved predicting in the first-stage model the likelihood of a firm having a high cognitive complexity CEO (i.e., 75 percentile) where its inverse is used as sampling weights in the second-stage model. An instrumental variable, the industry mean of CEOs’ cognitive complexity (excluding focal CEOs), in addition to the CEO- and firm-level variables that were used in the second-stage models predicting the volume of acquisitions and internal innovations, was included in this first-stage probit regression. The coefficient of this instrumental variable was statistically significant ($\beta = 0.318$, p < 0.01).

Second, to predict the percentage of unrelated acquisitions, I applied fractional logit regressions. Specifically, I used the “fracglm” command in Stata with specifying a probit link function with robust standard errors. In addition, as examining the relatedness of an acquisition is conditional upon its actual initiation, I used the Heckman two-stage
procedure (Heckman, 1979) to first predict the likelihood of the firm making an acquisition in a year. In the first-stage probit model, I used the same predictors used in the second-stage models in addition to an instrumental variable capturing the state-level number of bids, presuming that the state-level activity of acquisitions may have influence over the likelihood of focal firms’ engagement in acquisitions but not necessarily the unrelated nature of them. The coefficient of this instrumental variable was statistically significant ($\beta = 0.692, p < 0.01$). From this first-stage model, I computed the inverse Mill’s ratio and included it in the second-stage model.

Finally, to predict the size of acquisitions (transaction values) and R&D investments, I used random effects Generalized Least Squares (GLS) regressions with standard errors clustered at the firm-CEO level.

**Results**

Table 1 reports descriptive statistics and zero-order correlations of the variables.

[Insert Table 1 about here]

Hypotheses 1a, 1b, 5a, and 5b state that CEO cognitive complexity is positively related to the volume of acquisitions made in a given year, and this relationship is more pronounced when the industry is going through high-growth periods. As shown in Model 3 (full model) of Table 2A, the coefficient for CEO cognitive complexity ($\beta = 0.030, p < 0.01$) and its interaction term with industry growth ($\beta = 0.342, p < 0.05$) are both positive and statistically significant. As Models 2 and 3 of Table 2B indicate, the coefficient for CEO cognitive complexity ($\beta = 0.006, p > 0.10$) and its interaction with industry growth ($\beta = -0.037, p > 0.10$) are not statistically significant. Thus, Hypotheses 1a and 5a are supported while Hypotheses 1b and 5b are not supported. To graphically illustrate the
interactive effect of CEO cognitive complexity and industry growth on the number of acquisitions, I used the “marginsplot” command in Stata. Industry growth was indicated as high (low) by computing the growth scores that were one standard deviation above (below) the mean. As shown in Figure 1, the positive relationship between CEO cognitive complexity and the number of acquisitions is stronger as the industry experiences a higher growth rate.

[Insert Table 2A, 2B, and Figure 1 about here]

Hypothesis 2 states that CEOs with higher cognitive complexity tend to engage in more unrelated acquisitions than those with low cognitive complexity, contingent upon their decision to make an acquisition. As shown in Model 2 of Table 3, the coefficient for CEO cognitive complexity is positive and statistically significant ($\beta = 0.027, p < 0.01$). Therefore, Hypothesis 2 was supported.

[Insert Table 3 about here]

Hypotheses 3 and 4 state that CEO cognitive complexity is negatively related to the firm’s R&D investment and new product developments, respectively. Hypotheses 5c and 5d further propose that these relationships are more pronounced in high-growth industries. As shown in Model 2 of Table 4 in which R&D investment is the dependent variable, the coefficient for CEO cognitive complexity is negative and statistically significant ($\beta = -3.113, p < 0.05$). However, the coefficient for its interaction with industry growth is not statistically significant ($\beta = 8.903, p > 0.10$). Thus, Hypothesis 3 is supported but Hypothesis 5c is not. As shown in Model 3 (full model) of Table 5 in which the number of new product developments is the dependent variable, the coefficients for CEO cognitive complexity ($\beta = -0.039, p < 0.01$) and its interaction term
with industry growth ($\beta = -0.320$, $p < 0.10$) are both negative and statistically significant. Thus, Hypotheses 4 and 5d are supported. The interactive effect of CEO cognitive complexity and industry growth on new product developments is portrayed in Figure 2, using the same approach as above. As shown, the negative relationship between CEO cognitive complexity and the number of new product developments becomes stronger as the industry experiences a higher growth rate.

Robustness checks and supplementary analyses

In order to check the robustness of the main findings, I conducted a series of further analyses. First, as top executives in the top management team other than the CEO may also have significant influence over corporate decisions, I ran a separate analysis controlling for the chief finance officers’ (CFOs’) level of cognitive complexity, measured the same way CEOs’ cognitive complexity was measured (unlike CFOs, who are frequently present in earnings conference calls, data on other senior executives’ participation in conference calls and thus, measures on their cognitive complexity, are limited). Results remained largely similar, and are available upon request.

Second, as the current year’s growth activities may be competing for the same pool of organizational resources, I also conducted separate analyses by controlling for the current year’s acquisitions (new product developments) when predicting new product developments (acquisitions). I found similar results.

Third, I conducted a within-firm analysis by focusing on a subsample of firms that experienced CEO changes in the study period. The logic behind this analysis was that, (1) CEO cognitive complexity may vary much more across CEOs than within CEOs; and (2)
such approach allows us to analyze the effect of CEO cognitive complexity with firm-level fixed effects. This analysis yielded largely similar results—(1) the relationships between CEO cognitive complexity and the number of acquisitions and the proportion of unrelated acquisitions were both positive and statistically significant; (2) the relationships between CEO cognitive complexity and R&D investment and new product developments are both negative and statistically significant.

Fourth, I used R&D intensity (R&D investment over total sales) as an alternative measure of internal growth investment. Consistent with the main analysis using actual R&D spending, results showed that firms run by CEOs with low cognitive complexity display higher R&D intensity compared to those run by CEOs with high cognitive complexity.

**DISCUSSION AND CONCLUSION**

This paper was motivated by the desire to explore the role of CEOs’ cognition in firms’ growth strategies. Specifically, I examine how the fit between a CEO’s cognitive complexity and firm growth approaches (i.e., acquisitions and internal developments) can determine the relative emphasis given to certain growth approaches. I first proposed that the information processing styles of CEOs with higher cognitive complexity are more aligned with external acquisitive growth approach that requires a wider search scope and complex information processing. I further hypothesized that high cognitive complexity CEOs’ tendency to span the boundaries would carry over to pursue acquiring less-related businesses. Conversely, the information processing styles of CEOs with lower cognitive complexity tend to better fit with internal organic growth approach where the decision making replies more upon organizational routines and accumulated organizational
competence. Finally, I argued that in rapidly growing industries, the divergence in strategic tendencies towards acquisitive and internal growth modes would widen between CEOs with high and low cognitive complexity.

An analysis of a sample of large, U.S. firms supported the contention that CEOs with high cognitive complexity, compared to those with low cognitive complexity, show greater tendency to engage in more acquisitions while in less internal developments, where such discrepancy is magnified when the industry experiences high growth. Results also showed that the emphasis of CEOs with low cognitive complexity on internal growth was also manifested in the amount of R&D expenditures. Further, I found evidence that high complexity CEOs’ strategic inclination is manifested in acquiring more of remotely related businesses. In all, this study’s findings consistently support the core argument that firms’ growth strategies reflect their CEOs’ cognitive styles, i.e., cognitive complexity. These findings can offer important contributions to the management literature.

First, the paper contributes to research on managerial cognition and the broader upper echelons research by elaborating on the implications of a particular individual-level construct, cognitive complexity. While the upper echelons perspective has been widely tested using a demographic approach, a closer examination of psychological factors still remains an underexplored domain. More recently, some research has made headway by studying CEOs’ narcissism (e.g., Chatterjee & Hambrick, 2007; Gerstner, Konig, Enders, & Hambrick, 2013), Big Five (e.g., Peterson et al., 2003), affective traits (Delgado-Garcia & De la Fuente-Sabate, 2010), hubris (e.g., Li & Tang, 2010), political ideologies (Chin et al., 2013), and cultural values (Geletkanycz, 1997). With only a few studies that have been sparsely conducted (e.g., Calori et al., 1994; McNamara et al., 2002; Wally &
Baum, 1994), cognitive styles of CEOs have received significantly less attention. This void is significant considering that a large part of CEOs’ job is to process complex and ambiguous information for their strategic decisions. This study contributes to addressing this void by examining the effect of CEO cognitive complexity. While previous research on CEOs’ cognitive complexity has mainly viewed it as a cognitive ability and implied that higher cognitive complexity is better (e.g., Dow et al., 2016; Hambrick & Finkelstein, 1987; McNamara et al., 2002; Wally & Baum, 1994), I suggest that it may have broader implications, as a cognitive ‘style,’ on important firm outcomes, such as growth strategies. Methodologically, I used language markers as indicators of cognitive styles to expand the research sample to large, public companies, thereby addressing one of the major challenges from which prior research on managerial cognition has suffered.

Second, it contributes to the research body on firms’ growth strategies. Given that firms do not necessarily pursue a single growth approach at a point in time (e.g., Stettner & Lavie, 2014), envisioning and managing the multiplicity of the firm’s growth prospect and strategy portfolio represents a challenging task for the firm’s chief decision maker. When the environment poses various demands, the dynamics in firms’ growth strategies are expected to change accordingly (Lawrence & Lorsch, 1967; Thompson, 1967). Thus understanding the determinants of various firm growth strategies is of great importance. This paper contributes to this literature by highlighting the role of CEOs’ idiosyncratic, dispositional cognitive orientations in the configuration of multiple growth strategies. Specifically, the results suggest that CEOs with higher cognitive complexity may focus more on external acquisitive strategy (especially unrelated acquisitions) and less internal growth strategy, whereas CEOs with lower cognitive complexity tend to pursue less
external growth strategy and more internal growth strategy by investing more in R&D and introducing more new products. Further, the divergent strategic patterns among high and low cognitive complexity CEOs are found to become more salient when the industry is growing at a greater pace, showing that the environment plays a significant role in understanding the heterogeneous firm growth approaches.

**Limitations and Future Research**

As with any other empirical project, the current study has limitations, which in turn suggest future research opportunities. First, while there has been strong evidence that top management teams (TMTs) are often stronger indicators of managerial influence on organizational outcomes, capturing the collective cognitive complexity of TMTs through the methodological approach employed here was unachievable due to data availability. However, I do note that expanding cognitive complexity to the top management team (TMT) level would provide richer understanding of “black box” of the senior management-firm action link (Carpenter et al., 2004; Lawrence, 1997). In pursuing this agenda, identifying the mechanisms through which TMT cognitive complexity is achieved should also be a fruitful research agenda. As this dominant coalition is often characterized by politics and bargaining processes in making strategic decisions, further investigating the political dynamics would be a promising avenue for future research. While CEOs may be inclined to seek other top executives who have similar levels of cognitive complexity, the presence of different levels of cognitive complexity at the top management team may complement each other and benefit the firm. It would be interesting to examine how heterogeneity/homogeneity in senior executives’ cognitive styles may affect organizational outcomes as well as personal outcomes of individual
executives. While understanding the political dynamics arising from heterogeneous cognitive styles would be a promising area to pursue, at the same time, it is noteworthy that high cognitive complexity CEOs’ preference towards multiple viewpoints may influence integration within the senior management when making strategic decisions. In essence, the focus on the collective cognitive structure of the corporate office is expected to offer insights that go beyond the implications of the procedural comprehensiveness in decision making processes (e.g., Eisenhardt, 1989; Fredrickson & Mitchell, 1984).

Second, I focused my attention on the independent individual-level impact of CEOs’ cognitive complexity, as individuals’ cognitive styles may work independently of other psychological drivers for strategic decision making. In this regard, future research may examine the interplay between CEOs’ cognitive complexity and other motivational attributes that have been found to affect firms’ growth strategies. For example, what may happen when a CEO has high cognitive complexity but low confidence? Would a hubristic and cognitively complex CEO have an even greater penchant towards acquisitions while disregarding organic growth? What would be the performance consequences in such cases? Exploring this multiplicative impact of motivational and cognitive aspects of CEOs’ decision making merits further attention.

Last, but not the least, the performance implications of CEO cognitive complexity merit further attention, especially in various environmentally stimulating situations. The executive job demands literature (Hambrick, Finkelstein, & Mooney, 2005) suggests that certain managerial characteristics offer differential benefits under certain organizational and environmental situations. In addition, the dynamic managerial capabilities literature (Adner & Helfat, 2003; Helfat & Peteraf, 2015; Kor & Mesko, 2013) implies that some
managers are capable of leading the firm into a more desirable status in uncertain situations. Perhaps, CEOs with various levels of cognitive complexity may be valuable to firms in different industry situations.

**Conclusion**

Understanding how firms grow—what paths they take and how each path is implemented—remains an important agenda in strategic management research (McKelvie & Wiklund, 2010). What is still less understood is how firms’ multiple conduits leading to growth can be attributed to the corporate leaders. This paper suggests that the inherent cognitive styles of CEOs enact certain ways of achieving growth, especially when confronting steep surges in the environment. Given that cognition of CEOs—how they think and process information—may have major influence over the strategic directions of their firms (Dutton & Jackson, 1987), theorizing and empirical testing of the link between idiosyncratic cognitive penchants and corporate actions deserve further scholarly endeavor.
Chapter 3

ABSTRACT

The 2007-2008 financial crisis marked a significant macroeconomic event in the U.S. and across the globe. As the financial industry experienced significant consolidation during the crisis, many financial institutions failed to survive the crisis. This historical context provides a great opportunity to examine why and how some firms survive a major economic crisis while others do not. I propose that heterogeneity in organizational outcomes during a crisis may be attributed to firms’ different acquisition strategies during and prior to the crisis, which can be further attributed to their managerial differences, i.e., CEOs’ levels of cognitive complexity. A series of analyses of 463 financial firms and their CEOs suggests that CEOs’ cognitive complexity played a significant role in shaping their firms’ acquisition activities prior to the crisis (what I label the ‘precondition’), setting a strong ground for subsequent acquisitions during the crisis (a ‘snowball effect’), which eventually influenced their survival during the crisis. I further find that CEO cognitive complexity not only independently improves the likelihood of firm survival but also amplifies the effect of during-crisis acquisitions on firm survival. Important implications of these findings for management theory and practice are discussed.

Keywords: Financial crisis, CEO cognitive complexity, Acquisitions, Firm survival
INTRODUCTION

The 2007-2008 financial crisis marked a significant macroeconomic event in the U.S., with strong ripple effects across the globe. Many firms and industries were affected by the crisis, with the financial industry arguably impacted the most. During this crisis period, the financial industry experienced significant consolidation and many financial institutions did not survive the crisis. According to Federal Deposit Insurance Corporation [FDIC], the number of U.S. commercial banks and savings institutions dropped by 1,011, or 12 percent, between December 2006 and December 2010. Giants in this industry, such as Bear Stearns, Citigroup, Lehman Brothers, and Merrill Lynch, either collapsed or were bailed out by the government during this period. Despite the significance of the recent financial crisis, it has yet attracted much research attention in the strategy field, with only a few studies theorizing (Jacobides & Winter, 2012) or empirically examining the heterogeneity in the extent to which firms were affected (Gartenberg, 2014; Gartenberg & Pierce, 2017).

The financial crisis provides an excellent context to examine heterogeneity in firms’ strategies and survival in turbulent environments. This study seeks to use this context to investigate why some firms are able to survive a major economic crisis while others cannot, with a focus on acquisitions and the CEOs’ cognitive orientation that drives these strategic decisions. Indeed, some financial institutions that were deemed “too big to fail” received government bailouts during the 2007-2008 financial crisis, exacerbating the long-standing controversy on banks gaining such status (e.g., Barth, Prabha, & Swagel, 2012; Hashmall, 2010; Kaufman, 2013). While higher executive pay

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8 https://www5.fdic.gov/hsob/HSOBRpt.asp
and government subsidies can motivate firms to gain size through acquisitions (see DeYoung, Evanoff, & Molyneux, 2009 for a review), this study rather seeks to understand how pre-crisis acquisition behaviors can carry over to during-crisis acquisition behaviors and eventually impact firms’ very survival, and what role CEOs’ cognitive orientations may play in this process.

I propose that the heterogeneity in firms’ survival throughout a crisis period may be attributed to their different acquisition strategies prior to and during the crisis, which can be further explained by their managerial differences. More specifically, I first predict that prior to a crisis, financial firm CEOs with higher levels of cognitive complexity tend to engage in higher volumes of acquisitions. As acquisitions represent a mode of growing the firm through organizational boundary spanning (Kim & Finkelstein, 2009), overcoming high information asymmetry (Officer, Poulsen, & Stegemoller, 2009), and thorough planning through intense negotiation of multiple parties (Jemison & Sitkin, 1986), I argue that CEOs with high cognitive complexity, who process information based on extensive differentiating and integrating of multiple sources (Tetlock, 1981), tend to pursue more acquisitions than their counterparts with low cognitive complexity. I label a firm’s magnitude of acquisitions before the crisis its ‘precondition,’ and propose that a stronger precondition allows the firm to do more acquisitions during the crisis, creating a ‘snowball effect.’ Further, I suggest that the strategic tendency of CEOs with higher cognitive complexity to engage in more acquisitions than their counterparts may also manifest during the crisis.

Finally, I posit that acquisitions during the crisis may improve firms’ subsequent chance of survival by providing opportunities for strengthening their pool of resources
and capabilities (Wan & Yiu, 2009) and increasing in size to demonstrate reliability and garner support from key constituents. By becoming “too big to fail,” these firms are more likely to receive support from key constituents including the government to keep them afloat. As CEOs with high cognitive complexity may be more capable of exploiting the opportunities created through the acquisitions they have made during the crisis, I also expect the influence of during-crisis acquisitions on survival to be magnified when CEOs have high cognitive complexity. In addition, I suggest that high cognitive complexity CEOs’ tendency to seek diverse sources of support and ability to manage various stakeholder interest may engender an independent impact on firms’ survival. Figure 1 illustrates the theoretical framework of this study.

A series of analyses of financial firms (2-digit SIC codes 60-67) and their CEOs over the period of 2004-2011 largely supports these predictions. By capturing CEO cognitive complexity with their language use revealed in their conference calls with securities analysts and investors, I find that higher levels of CEO cognitive complexity are associated with higher volumes of acquisitions prior to the crisis. This precondition is further positively related to the volume of the firm’s acquisitions during the crisis—confirming the ‘snowball effect.’ I also find that the volume of acquisitions done during the crisis is positively related to the chance of firm survival in subsequent quarters. Finally, I find that CEOs’ cognitive complexity not only enhances the likelihood of survival during the crisis in itself, but it also amplifies the impact of during-crisis acquisitions on survival.

These findings can make important contributions to the management literature in
several ways. First, it focuses on a recent, highly important context that had significant impact on firms and the entire U.S. economy, as well as the global economy, and seeks to explain why firms differed in terms of their strategies and survival during the crisis. A number of finance and economics studies burgeoned as soon as the crisis hit the U.S. economy to understand its causes (e.g., see Thakor, 2015 for a recent review) and aftermaths (e.g., Atkinson, Luttrell, & Rosenblum, 2013; Reinhart & Rogoff, 2009). Surprisingly, to date still not much has been done to understand firms’ behaviors and survival from a strategy perspective. The findings suggest that acquisitive growth pursued before and during the crisis, in part driven by CEOs’ cognitive orientations, has been an important mechanism through which some firms were able to survive the crisis while others were not.

Second, by linking such heterogeneity to CEOs’ cognitive complexity, the study highlights the role of managerial differences in shaping firms’ strategy and their very survival in a crisis context. Specifically, the findings of this study provide evidence that, while previous studies have highlighted the cognitive biases and limitations of individuals in contributing to the financial collapse (e.g., Balachandran, Kogut, & Harnal, 2010; Jacobides & Winter, 2012), cognitive orientations of senior-most executives, captured by their cognitive complexity, may have made a nontrivial difference in their firms’ survival, in part through their strategic inclinations towards acquisitive growth, search for diverse sources of support, and effective management of stakeholder interests.

Lastly, it extends our understanding of the dynamics of acquisitions in a crisis period and their implications towards survival. While the influence of acquisitions on firm performance has not been so clear (e.g., Datta, Narayan, & Pinches, 1992; Halebian,
Devers, McNamara, Carpenter, & Davison, 2009), recent research, relevant to the current study, finds that acquisitions made during a crisis period, but not those made before and after the period, can contribute to better financial performance (Wan & Yiu, 2009). However, we know less about how acquisitions influence firms’ survival in crisis situations, what may drive the differences in firms’ acquisition behavior during the crisis, how it is shaped by acquisitions prior to the crisis, and what role CEOs may play in this entire process. The current study shows that acquisitions made prior to the crisis, in part driven by CEOs’ cognitive complexity, can in fact create a strong foundation for subsequent acquisitions during the crisis, that may improve the firm’s chances of survival therein—an effect that can be even furthered by CEOs cognitive complexity.

**RESEARCH CONTEXT: THE 2007-2008 FINANCIAL CRISIS**

The recent financial crisis of 2007-2008 has been regarded as the worst crisis ever since the Great Depression of the 1930s (e.g., Erkens, Hung, & Matos, 2012; Foster & Magdoff, 2009; Hillsenrath, Ng, & Paletta, 2008; Thakor, 2015). Most agree that the crisis originated from the U.S. housing market—as housing prices rose during the years preceding the crisis, lenders offered loans without due diligence of the borrowers’ credit quality, which were then securitized and sold off to the secondary markets. Many financial institutions, believing that households would be able to afford their regular mortgage payments and that housing prices would constantly rise, issued large amounts of debt to invest in mortgage-backed securities (Blackburn, 2008; Reinhart, 2011). However, as the housing price bubble burst after a peak in mid-2006, the default rates of subprime loans rose, accumulating losses on the securities backed by such loans.

As major financial institutions, including government-sponsored enterprises such
as Fannie Mae and Freddie Mac, started to collapse, the U.S. government made substantial attempts to rescue these entities and the financial system, which were nonetheless followed by a global economic downturn and the European debt crisis. As noted earlier, this was a time where substantive consolidation took place, where financial institutions that were already growing in size through consolidation gained even greater size through mega-mergers (see Appendix). Estimates show that the financial crisis cost the U.S. 6 to 14 trillion U.S. dollars, the equivalent of 40% to 90% of one year’s U.S. output, or $50,000 to $120,000 for every household (Atkinson et al., 2013). In addition, Special Inspector General for the Troubled Asset Relief Program (SIGTARP) reports that up to $16.8 trillion was committed by the U.S. federal government to pay for bailouts of major financial institutions that were “too big to fail” (Collins, 2015). In all, this exogenous shock represents a major macroeconomic event, thereby providing a context to understand how the divergence in corporate-level actions before the shock, shaped by managerial differences, can widen during the shock and eventually lead to different survival outcomes. The current study provides evidence that the strategic inclination of CEOs with high cognitive complexity towards acquisitions before the crisis may lead to a diverging level of acquisitions across firms, which in turn contributes to different likelihoods of survival.

**THEORY AND HYPOTHESES**

**Firm acquisitions before a crisis: The role of CEO cognitive complexity**

CEOs are often driven by their cognitive orientations to pursue certain strategies (Finkelstein, Hambrick, & Cannella, 2009). Specifically, I suggest that CEOs differ in their ways of gather and processing information—i.e., their cognitive styles—and their
cognitive styles may have manifested in corporate strategic actions that had significant implications in the financial crisis setting.

While scholars have early recognized that top executives differ from each other in terms of how they draw upon logic or intuition in perceiving and judging information (Barnard, 1938; Mintzberg, 1973), a persistent stream of research on CEOs’ cognitive styles has been absent. I focus on a particular cognitive style, cognitive complexity, which represents a typical way of individuals’ gathering and processing of information and construal of stimuli (Bieri, 1961). Specifically, a CEO with high cognitive complexity tends to be more comfortable with observing and interpreting the multifaceted situations in the environment, tolerant of processing and accepting multiple perspectives, generating the links between them, and understanding the interplays of multiple factors considered to make an organizational decision. Conversely, a CEO with low cognitive complexity tends to draw upon a small number of dimensions in processing information and understanding issues, have more focused ranges of attention and search, and develop fewer links among the select constructs they apply when confronted with multifold situations.

In the management literature, although sparse, studies have suggested that higher cognitive complexity of managers is associated with greater firm performance (McNamara, Luce, & Tompson, 2002), increased geographic and product scope (Calori, Johnson, & Sarnin, 1994), addressing linguistic and religious distances (Dow, Cuypers, & Ertug, 2016), and faster decision making (Wally & Baum, 1994). I examine CEOs’ cognitive complexity in the context of the recent financial crisis and investigate its implications. I argue that, as CEOs of financial institutions are more inclined to
differentiate and integrate the multiple inflows and outflows of information (Tetlock, 1981), they may have engaged in voluminous acquisitions prior to the financial crisis. It is important to note that I do not assume that those CEOs have or could foresee the coming of the financial crisis. Rather, those CEOs’ preference towards high volumes of acquisitions can be understood from the fit between the information processing need posed by acquisitive decisions and the information processing style characterized by cognitive complexity.

First, acquisitions represent external growth activities that span firm boundaries, involving high information asymmetry between the acquirer and the external pool of target candidates (e.g., Cuypers et al., 2017; Officer et al., 2009), hence may require intense information processing for CEOs to mitigate such asymmetry. CEOs need _ex ante_ to evaluate multiple candidates; process the corresponding information collected from due diligence; and address the ample uncertainty in post-acquisition phases (Pablo, Sitkin, & Jemison, 1996). Second, while firms often refer to past acquisition experiences in guiding their subsequent acquisition decisions (see Barkema & Schijven, 2008 for a review), every acquisition deal differs, which implies that, as the CEO signs the deal, there still exists a host of new information about the new entity to be acquired and integrated. It is likely that differences exist between the acquirer and target in terms of their respective culture, organizational structure, decision processes, management styles, and operating procedures (Datta, 1991). Such differences are expected to present complex information bundles to the CEO. Third, acquisitions involve intense negotiation processes among multiple internal and external parties (Walsh, 1989). As participants’ commitment to the deal escalates, this will put significant amounts of time in doing the
deal and present high time pressure to the CEO to make the final decision that best addresses the multiple constituents’ interests (Jemison & Sitkin, 1986). In all, as acquisitions represent high information asymmetry, time pressure, and responsibility for CEOs, they fit the information processing styles of CEOs with high cognitive complexity and are likely to be preferred by such CEOs. Therefore, I hypothesize:

*Hypothesis 1: A firm’s CEO’s cognitive complexity in the pre-crisis period is positively related to the volume of the firm’s acquisitions in the pre-crisis period.*

The “snowball effect” of pre-crisis acquisitions on during-crisis acquisitions

During the financial crisis, ample uncertainty surrounded the U.S. economy, particularly the financial system and the industry members therein. It was a period of intense consolidation (Wheelock, 2011), and those who have not grown in size and accumulated sufficient organizational resources may have not been able to acquire others, but rather be acquired by others. A key notion of this paper is that those firms that have engaged in high volumes of acquisitions prior to the crisis may have accumulated the experience and resources to encourage further acquisition behavior during the crisis. I specifically argue that a greater magnitude of acquisitions before the crisis, or the ‘precondition,’ can constitute a strong foundation for firms to do more acquisitions during the crisis, creating a ‘snowball effect.’

Several factors may collectively explain such snowballing. In essence, this effect can be understood from both the demand and supply sides of industry-wide acquisition activities. From the demand side, or the perspective of acquirers, it is known that past acquisition experience encourages subsequent acquisitions (Halebian et al., 2009). As the organizational learning literature suggests, the routines and practices that accumulate through recurrent activities are expected to give rise to repeated actions in the subsequent
periods (e.g., Amburgey, Kelly, & Barnett, 1993; Audia, Locke, & Smith, 2000; Gulati, 1995; Kelley & Amburgey, 1991; Miller & Friesen, 1980; Shaver, Mitchel, & Yeung, 1997). Indeed, scholars have found that prior acquisition experience breeds subsequent acquisitions (Baum, Li, & Usher, 2000; Yang & Hyland, 2006), particularly when past experiences had been rewarding (Haleblian, Kim, & Rajagopalan, 2006), but even when outcomes have not been so favorable (Amburgey & Miner, 1992). In this regard, the experience of acquisitions that had been conducted before the financial crisis may have promoted the inclination for financial firms to engage in acquisitions also during the crisis. However, as this period of financial distress have caused many organizations to become rigid (Reinhart & Rogoff, 2008, 2009), the history and experience alone may not be sufficient to explain the influence of the precondition on during-crisis acquisitions.

In addition to the influence of prior acquisition experience, pre-crisis acquisitions may have allowed a great amount of resources for the firm to exploit and build upon during the crisis. As research on firm growth has suggested, larger firms are more visible and more rewarded by the financial market (Kim, Haleblian, & Finkelstein, 2011), which may make the firm more capable of procuring and combining resources (Penrose, 1959; Pfeffer & Salacik, 1978). As previous acquisitions have created slack resources for the firm to exploit, search is facilitated through stronger buffer against risk, and hence, more acquisitions are likely to take place (Iyer & Miller, 2008). Further, as acquiring another firm or business offers a new diverse set of resources and knowledge, the opportunity set of the firm increases (McKelvie & Wiklund, 2010).

An analysis from the supply side, or from the perspective of the pool of potential target firms, supplements the explanations provided by the demand side of acquisitions.
Specifically, a period of extensive industry consolidation represents a setting in which many firms’ vulnerability and weak chance of independent survival is likely to result in an increase of targets to be potentially acquired. During this period of an increased supply of targets, it is likely that the accumulation of experience and resources is perceived favorably by the acquiring firms’ key constituents and stakeholders. In the broader domain of corporate strategy, it has been found that firms that have experience, resources, and knowledge within a strategic domain can send a signal to the external parties of their capability and commitment in carrying out the focal strategic activities (e.g., Gulati, Lavie, & Singh, 2009; Kale, Dyer, & Singh, 2002). Similarly, in the eyes of the key stakeholders—the target firm executives in particular—a firm that has accumulated the expertise and resources through previous acquisition experiences may be perceived as more capable and reliable as a potential acquirer. In all, the snowball effect of pre-crisis acquisitions on during-crisis acquisitions may have been triggered by the demand driven by the acquisition experiences, which was arguably further facilitated by the growth and abundant resources accumulated throughout such experiences as well as the supply of potential targets, whose perceptions and preferences towards potential acquirers may have been shaped by the relevant experience and resources that acquirers possessed. In effect, the initial discrepancy between the strategic approaches towards acquisitive growth taken by CEOs with high vs. low cognitive complexity is expected to widen during the crisis. Therefore, I hypothesize:

**Hypothesis 2:** The volume of a firm’s acquisitions during the crisis period is positively related to the volume of its acquisitions in the pre-crisis period.

Similar to how CEOs’ cognitive complexity may be manifested in their strategic
inclination towards acquisitions in general situations, or here, prior to the crisis, I expect that it will also be reflected in greater volumes of acquisitions in turbulent situations, or during the crisis. Indeed, crises provide a situation in which CEOs’ willingness and ability to seize opportunities and search broadly may make significant difference in terms of firm behavior. Rather than staying rigid in threatful situations (Staw, Sandelands, & Dutton, 1981), CEOs with high cognitive complexity are more likely to widen their search range and seek opportunities while considerable environmental change and uncertainty alters the opportunity set and the competitive landscape (Meyer, Brooks, & Goes, 1990). Indeed, the new opportunity set would indeed have less meaning if senior managers are less inclined to or less capable of perceiving ways to use them (Penrose, 1959). With new opportunities residing in the environment, CEOs with higher cognitive complexity, characterized by the willingness and capability to perceive multiple dimensions in the environment and draw intricate connections among them, are expected to be more capable of understanding and integrating the ways that the newly created market dynamics, hence engage in more acquisitions to span the firm boundaries and seek outside resources. Therefore, consistent with Hypothesis 1, I suggest:

**Hypothesis 3:** A firm’s CEO’s cognitive complexity in the during-crisis period is positively related to the volume of the firm’s acquisitions in the during-crisis period.

**Implications on firm survival**

During periods of radical environmental shifts, as was the case in the 2007-2008 financial crisis, environmental munificence dramatically declines (Wan & Yiu, 2009), often rendering firms’ past strategic courses obsolete (Meyer et al., 1990). Firms are left with few options but to tighten their financial resources and cut down on their scope, and
this particularly so for financial institutions in the recent crisis period (Brauer & Schimmer, 2010; Campello, Graham, & Harvey, 2010). This perhaps indicated their intensified rigidity that resulted from such external threat (Staw et al., 1981). Most recent studies in the financial sector have suggested that good corporate governance mechanisms, either captured at a comprehensive level (e.g., Gartenberg & Pierce, 2017; Peni & Vahamaa, 2012) or specifically indicated by board monitoring (e.g., Aebi et al., 2012) or CEOs’ compensation and incentives (e.g., Fahlenbrach & Stulz, 2011), has allowed some firms to enjoy better performance than others during the financial crisis. Such analysis finds explanation of firm heterogeneity in performance and survival directly from the causes of the financial crisis—that the strength of corporate governance mechanisms for regulating excessive risk taking may have caused such difference.

In this study, I propose that acquiring new businesses may contribute to greater firm survival during the crisis period. Indeed, acquisitions in general represent a high-risk corporate action that not only spans the firm boundaries in search of new knowledge and assets (Kim & Finkelstein, 2009) and involves major resource commitments (Pablo, Sitkin, & Jemison, 1986), but also often hurts firm performance (Cartwright & Scheonberg, 2006) and sometimes results in dismissal of the CEO when failed (Lehn & Zhao, 2006). However, acquisition deals made by firms during a crisis may improve financial firms’ subsequent chance of survival not only by providing greater opportunities for reconfiguration and expansion of resources and capabilities, but also by demonstrating the capability of growing in an era of significant consolidation to key constituents and gaining their support.

As prior research suggests, acquisitions have the benefit of gaining access to new
knowledge and assets that reside outside the firm (Harrison et al., 1991; Kim & Finkelstein, 2009). Indeed, these acquisitions are more likely to create value when the acquirer and target can complement each other’s resources (Harrison et al., 1991) and/or choices of strategies and market (Kim & Finkelstein, 2009). However, during a period in which industry players are majorly going through financial and structural constraint where the lack of necessary resources and experience may pose a major challenge to firms, the possession of a new, enlarged pool of assets may substantially contribute to improving the focal financial institution’s effectiveness. As the prior discussion on the snowball effect of pre-crisis acquisitions on during-crisis acquisitions suggests, it may have been those firms that have already grown in size that had the competitive edge to exploit more opportunities as well as the leeway to further explore other opportunities for improving their efficiency.

Failure to yield good financial performance means poor ability of the firm to maintain its financial resources and operational efficiency. As the financial sector witnessed a period of consolidation during the crisis, firms that were incapable of producing good financial figures were either terminated or acquired by others (Wheelock, 2011). In other words, building upon the signal of better financial performance figures, these firms are more likely to receive support from key constituents, including the government, through their demonstration of their ability to grow in times of extreme condensation. Indeed, the collapse of large firms has the potential of damaging the broader system because of their market dominance and interconnectedness—i.e., because they are “too big to fail” (Stern & Feldman, 2004)—yet the growth they have achieved through acquisitions may allow them to improve their financial operations through more
resources and slack (e.g., Bromiley, 1991), especially in challenging settings (e.g., Tan & Peng, 2003), allowing them to gain more support from major organizational stakeholders. Taken together, I argue that the acquiring firms during the crisis are able to outperform others and enjoy an increased chance of survival. Therefore, I hypothesize:

**Hypothesis 4:** The volume of a firm’s during-crisis acquisitions is positively related to its subsequent survival.

While acquisitions made during the crisis may create a significant edge for enhancing the chance of survival, it is likely that CEOs’ cognitive complexity also has a stand-alone impact on firms’ survival in crisis situations. Indeed, it is known that simply replacing the senior management does not necessarily result in better chances of survival nor promotes shareholder interests in corporate failure situations (Daily, Dalton, & Cannella, 2003; Hambrick & D’Aveni, 1988, 1992). If this is the case, it is perhaps more appropriate to examine the incumbent CEO’s profile to understand his or her role in crisis situations.

In crisis situations, gaining support from key constituents (e.g., regulators) and effectively managing the diverse, intertwined, and often conflicting interests of major stakeholders may become crucial strategic activities for firms. It is likely that CEOs with low cognitive complexity may be focused on the inner sector of the organization to improve internal measures of operational efficiency or on a selected group of constituents to reach for help. In contrast, as noted earlier, CEOs with high levels of cognitive complexity tend to have broader arrays of attention and search, while being inclined to refer to diverse sources of information for decisions (Tetlock, 2000). Indeed, prior research suggests that such behavioral tendency is manifested in their effective management of various groups of stakeholders (Wong, Ormiston, & Tetlock, 2011).
Taken together, I hypothesize:

*Hypothesis 5: The firm’s CEO’s cognitive complexity is positively related to its survival during the crisis.*

Finally, I argue that CEO cognitive complexity may further amplify the effect of during-crisis acquisitions on firm survival. As during-crisis acquisitions set up a foundation for firms to become “too big to fail,” CEOs with high cognitive complexity may have a stronger ability to further exploit this advantageous position and secure support from various sources including regulators to keep the firms afloat. In this sense, I argue that CEOs’ cognitive complexity may play a self-reinforcing role in explaining the influence of during-crisis acquisitions on firm survival. Just as acquisitions prior to the crisis have created more opportunities that can be exploited and that can serve as foundations for further exploration, acquisitions made during the crisis may have enlarged the pool of resources and opportunities for the senior decision maker to draw upon (Hambrick & Finkelstein, 1987). While the expanded course of actions can contribute to a higher likelihood of survival, this effect may be strengthened as CEOs possess higher cognitive complexity.

Compared to those with lower cognitive complexity, who rather tend to be focused in construing the surroundings and processing information, high cognitive complexity CEOs are characterized by an information processing style of perceiving several dimensions of the environment and connecting the dots (Bartunek, Gordon, & Weathersby, 1983)—both of which are critical in facilitating the exploitation of greater munificence within the firm boundaries. Therefore, CEOs with high cognitive complexity having such an expanded array of resources to utilize may contribute to strengthening the survival consequences of acquisitions made during the crisis. This leads to my final
hypothesis:

Hypothesis 6: The positive relationship between a firm’s during-crisis acquisitions and its subsequent survival likelihood will be strengthened when the firm’s CEO’s cognitive complexity is higher.

RESEARCH METHODS

Data and sample

The study was based on a longitudinal sample consisting of 463 U.S. financial firms (2-digit SIC codes 60-67) and their CEOs, in the period of 2004-2011. Data on CEOs’ language use were obtained from companies’ quarterly conference calls collected by Thomson Reuters Street Events database. Firm acquisition data were collected from SDC Platinum, firms’ financial and strategic information and exit data from CRSP-Compustat, and CEO demographic and compensation data from Execucomp.

Measurement

CEO cognitive complexity. Cognitive complexity refers to a combination of two major components of one’s reasoning: the extent to which one can differentiate between multiple, competing solutions and the extent to which one can integrate among those solutions (Tetlock, 1981). Following this definition, Abe (2011, 2012) constructed an index that combines words that used for making precise distinctions and conjoining multiple thoughts together. Specifically, the index comprises four function-word categories—exclusion (e.g., but, without), negations (e.g., no, not, never), tentativeness (e.g., maybe, perhaps), and conjunctions (e.g., and, also, although). For example, exclusion words are used when making distinctions between multiple categories (i.e., differentiate), while conjunctions help bring together multiple thoughts to create a coherent narrative (i.e., integrate) (Graesser, McNamara, Louwser, & Cai, 2004). Using
LIWC, the number of words from each of these categories was counted to compute the extent to which these words were used in proportion to the total amount of words spoken by the CEO. I used the sum of the four standardized scores as an index of a CEO’s cognitive complexity.

For examining the relationship between CEO cognitive complexity and the pre-crisis acquisition activities, I computed the mean cognitive complexity scores in the four quarters of 2004. For examining the role of CEO cognitive complexity as a main independent predictor for during-crisis acquisitions and firm survival as well as the moderator of the relationship between during-crisis acquisitions and firm survival, I used the concurrent quarterly scores of CEOs’ cognitive complexity.

*Volume of acquisitions prior to the crisis (i.e., 2005-2006) and that during the crisis (i.e., 2007-2010).* Two variables that capture the volume of acquisitions in each of the two time periods were collected from the SDC Platinum database. First, *number of acquisitions* was measured as the total count of acquisitions conducted in 2005-2006 for operationalizing pre-crisis acquisitions and as the running sum of quarterly acquisitions done in 2007-2010 for during-crisis acquisitions. Such operationalization can reflect the snowball effect of precondition on the during-crisis acquisitions. Consistent with prior studies, I chose the year of 2007 to mark the onset of the crisis, as prominent signs emerged in early 2007 when the Federal Home Loan Mortgage Corporation (Freddie Mac) announced that it will no longer buy risky subprime mortgages/mortgage-related securities and New Century Financial Corporation filed for bankruptcy (Marshall, 2009; Thakor, 2015), triggering the meltdown of the financial sector (USA Today, 2013). Second, the *size of acquisitions* were measured by the transaction value of acquisitions
(log-transformed) conducted in these time periods, again as the total amount for the pre-crisis period and the running sum for the during-crisis period.

**Firm survival.** To determine firm survival, I first identified whether financial institutions were delisted from the Compustat-CRSP database on a quarterly basis (e.g., Carr, Haggard, Hmieleski, & Zahra, 2010) and created a time-varying binary outcome measure coded 1 during the quarter a firm was delisted and 0 otherwise. I chose to measure firm survival on a quarterly base rather than a yearly base because firm exits occurred more frequently during a crisis than a normal situation.

**Control variables.** I included a set of variables at the CEO- and firm-level to control for alternative explanations for the predicted outcomes. First, I controlled for firm size, which was measured as the logarithm of total assets, as size can influence the extent of strategic inertia (Dougherty & Hardy, 1996). In addition, financial slack, measured as the equity-debt ratio (common equity over total debt) was also controlled for as it can provide buffers for risky strategic actions such as acquisitions (Bourgeois, 1981; Bromiley, 1991; Iyer & Miller, 2008). As the senior-most executives may have greater control over risk and strategic management in holding companies than in individual commercial banks or savings institutions, I also included a binary variable which indicated whether the firm is a holding company, coded 1 if the institution’s 2-digit SIC code equaled 67 and 0 otherwise. As noted earlier, corporate governance has been suggested as a critical factor in explaining financial firms’ performance during the crisis (e.g., Aebi et al., 2012; Gartenberg & Pierce, 2017). In line with this recent research, I also controlled for two corporate governance mechanisms—board independence, measured as the ratio of independent directors on board and CEO duality, coded 1 if the
CEO also assumed chairpersonship and 0 otherwise. Finally, I controlled for CEO shareholdings, measured by the percentage of CEOs’ shares out of the total amount of firm shares, as CEOs’ ownership of the firm can provide financial incentives for undertaking riskier moves, such as acquisitions (Sanders, 2001; Sanders & Hambrick, 2007; Wright, Kroll, Lado, & van Ness, 2002).

When examining the snowball effect, or the effect of a firm’s pre-crisis acquisitions on its during-crisis acquisitions, I controlled for prior period return on assets (ROA) as recent performance can affect strategic behavior (Cyert & March, 1963; Greve, 1998). ROA not only represents the most often used performance measure in management studies (e.g., Reger, Duhaime, & Stimpert, 1992; Deephouse, 1999) and finance studies (e.g., Aebi et al., 2012; Gilbert, 1984; Gorton & Rosen, 1995; Peni & Vahamaa, 2012) of the financial industry, but is also regarded as the best indicator of earnings efficiency (McNamara et al., 2002). Finally, I included binary indicators for each year-quarter to control for the temporal effect in all models except for when testing the cross-sectional relationship between CEO cognitive complexity and pre-crisis acquisitions (Hypothesis 1).

Analyses

Due to the different nature of outcomes and the relationships among them, I took three methodological approaches to test the hypotheses. Hypothesis 1 predicted that CEOs’ cognitive complexity will be positively related to pre-crisis acquisitions (the ‘precondition’). To test this hypothesis, I used cross-sectional negative binomial regression to predict the number of acquisitions and ordinary least squares (OLS) regression to predict their sizes.
Hypotheses 2 and 3 predicted the relationship between CEO cognitive complexity, firms’ pre-crisis acquisitions, and during-crisis acquisitions. These hypotheses were tested through longitudinal Generalized Estimating Equation (GEE) models (Liang & Zeger, 1986). GEE models provide maximum likelihood estimates that account for non-independence of multiple observations from the same firm (Hanley, Negass, Edwardes, & Forrester, 2003). A fixed-effects generalized least squares model would not be appropriate for estimation as the precondition (i.e., a firm’s pre-crisis acquisitions) does not vary over time. In all models, I specified a Gaussian distribution with an identity link function, an autoregressive (one year) within-group correlation structure, and robust standard errors (White, 1982).

Finally, to test Hypotheses 4, 5 and 6, which predicted the influence of during-crisis acquisitions and CEO cognitive complexity on firm survival, I conducted an event history analysis to model the risk of failure (i.e., firm exit, or the reverse of firm survival). Specifically, as each firm had quarterly data for each observation on delisting, I conducted a discrete-time event history analysis to account for the fact that the same firms are observed over multiple time intervals (quarters) (e.g., Agarwal, Sarkar, & Echambadi, 2002; Carr, Haggard, Hmieleski, & Zahra, 2010; Fischer & Pollock, 2004; Jenkins, 2005). I used a random-effects complementary log-log specification (e.g., Agarwal et al., 2002; Baum & Oliver, 1991; Henderson, 1999) that allows for incorporation of time-varying covariates and estimation with standard errors clustered at the firm level to account for the non-independence of observations of the same firm across quarters, or the unobserved heterogeneity, also known as ‘frailty’ (Jenkins, 2005). As the complementary log-log model assumes an asymmetric cumulative distribution
function—which better fit data with relatively rarer events—and builds in a proportional hazards assumption, as does the Cox regression model for analyzing continuous time (Allison, 1982), it was considered appropriate for fitting the data.

Results

Table 1 presents the descriptive statistics and correlations, except for quarter dummies, for the studied variables. There was no serious evidence of multicollinearity, as shown by the maximum Variance Inflation Factor (VIF) of 2.84, which is well below the generally accepted threshold of 10 for indication of multicollinearity (Cohen, Cohen, Aiken, & West, 2013).

Hypothesis 1 proposed a positive relationship between CEO cognitive complexity and a firm’s pre-crisis acquisitions, or the precondition. As shown in Model 2 of Table 2, the number of acquisitions done prior to the crisis (2005-2006) is positively associated with CEO cognitive complexity (2004), as indicated by the statistically significant positive coefficient ($\beta = 0.077, p < 0.05$). However, there was no statistically significant relationship between CEO cognitive complexity and the acquisition sizes prior to the crisis. Therefore, I find partial support for Hypothesis 1.

Hypotheses 2 and 3 proposed a positive relationship between a firm’s pre-crisis and its during-crisis acquisitions, examining the snowball effect, and the role of CEOs’ cognitive complexity on during-crisis acquisitions. As shown in Models 2 and 5 of Table 3, pre-crisis and during-crisis acquisitions are positively related, as indicated by the statistically significant positive coefficient for the number of acquisitions ($\beta = 0.316, p <$
0.01) and the size of acquisitions (\(\beta = 0.017, p < 0.01\)). Thus, Hypothesis 2 was strongly supported. However, Hypothesis 3 was not supported, as I did not find any significant relationship between the concurrent levels of CEOs’ cognitive complexity and during-crisis acquisitions. Perhaps, the impact of high CEO cognitive complexity is already reflected in the level of during-crisis acquisitions through pre-crisis acquisitions so that no salient impact is revealed in the during-crisis period when compared with the strategies of those CEOs with low cognitive complexity.

Hypotheses 4, 5 and 6 proposed a positive relationship between a firm’s during-crisis acquisitions and firm survival and the independent and interactive effect of CEOs’ cognitive complexity on firm survival. As the dependent variable was coded as 1 if the firm was delisted or exited, negative coefficients were predicted for the hypothesized relationships. As shown in Model 3 and 6 (full models) of Table 4, firms that have engaged in more acquisitions during the crisis were less likely to exit, as indicated by the significant and negative coefficient for number (\(\beta = -0.612, p < 0.01\)) and size of acquisitions (\(\beta = -0.471, p < 0.01\)), and these effects were more pronounced when CEOs had higher cognitive complexity (\(\beta_{\text{number}} = -0.109, p < 0.01; \beta_{\text{size}} = -0.036, p < 0.01\)).

Further, the effect of CEO cognitive complexity on firm survival was also positive and significant (\(\beta = -0.314, p < 0.01\) in Model 3; \(\beta = -0.295, p < 0.01\) in Model 6), when controlling for both the number and size of during-crisis acquisitions. As the complementary log-log model assumes that

\[
\log \left[ -\log \left( 1 - h(t) \right) \right] = \alpha + \beta X
\]

where \(X\) represents the vector of explanatory variables and \(h(t)\) the probability of
exit, we can use the negative coefficients of the interaction terms between CEO cognitive complexity and during-crisis acquisitions ($\beta_{\text{number}} = -0.109$ and $\beta_{\text{size}} = -0.036$) to interpret that when holding the number and size of during-crisis acquisitions constant, an increase of one unit in the CEO cognitive complexity index reduces the firm’s chance of exit by 10% ($[\exp(-0.109) - 1] \times 100\%$) and by 3.5% ($[\exp(-0.036)-1] \times 100\%$), respectively. Figure 2 graphically illustrates the comparison between the estimated probabilities (i.e., Kaplan-Meier survival estimates) of financial institutions surviving the crisis in 2007 and onward, depending on their volume of acquisitions done during the crisis.

[Insert Table 4 and Figure 2 about here]

**Robustness checks**

I conducted several additional analyses to check the robustness of the findings. First, as the presence and inputs of chief financial officers (CFOs) may have influence over CEOs’ acquisition decisions, I tested all the models controlling for the CFO’s level of cognitive complexity. The direction and statistical significance of the hypothesized effects remained largely similar, where the only exception was that only the size (but not the number) of during-crisis acquisitions was positively related to firm survival. It is worth noting, however, that CFOs’ cognitive complexity did not have significant impact in these supplementary analyses. Several speculations could be made for such finding. First, although the financial crisis period was a time where CFOs might have had significant roles, it may have been an extreme situation where CEOs took the utmost responsibility and sole voice in making acquisition decisions. Alternatively, CFOs may have had influence over these corporate decisions that involve heavy use of financial resources, yet their cognitive complexity may have been of less significance. This may be
in part due to the homophily tendency of CEOs—i.e., the behavioral tendency of CEOs to surround themselves with or seek out individuals that share key characteristics (e.g., McDonald & Westphal, 2003; McDonald, Khanna, & Westphal, 2008), such as their information processing style, or cognitive complexity.

Second, although the relatively less frequent occurrences of firm delisting (exit) justified the use of contemporary log-log models (Allison, 1982), I checked the robustness of these models by using a random effects logit specification, which is another popular alternative for analyzing discrete-time survival data, again estimated with robust standard errors to incorporate unobserved heterogeneity. In addition, I also estimated with Cox regression models, which is best known for analyzing continuous time data but also suitable for discrete-time event history analysis. This set of analyses yielded largely similar results.

**DISCUSSION AND CONCLUSION**

This paper was motivated by the desire to understand the role of CEOs and their strategic actions in explaining firms’ survival in situations of highly uncertain and radical environmental shifts. Specifically, the current study examines the impact of CEOs’ cognitive complexity on financial firms’ acquisitive growth in the context of the recent financial crisis and how this eventually affected their survival thereafter. Findings suggest that, in pre-crisis periods, CEOs with high cognitive complexity tend to engage in voluminous acquisitions, which may set the ground for further acquisitions during the crisis. The acquisitive growth achieved throughout these periods, are in turn found to contribute to higher chances of survival of the firm. As CEOs with higher cognitive complexity not only have set stronger grounds for growth through acquisitions in the pre-
criterion stage, their tendency to engage in acquisitions to grow the firm is found to strengthen the positive impact of during-crisis acquisitions on firm survival, let alone independently improve the chance of survival.

These findings imply that the strategic inclinations of CEOs with high cognitive complexity to engage in acquisitions can play a meaningful role in understanding firm behaviors during the crisis, while their capability and tendency to further exploit the opportunities created through their past decisions may contribute to higher likelihood of surviving the crisis. Indeed, I intend to interpret the findings with caution. The greater volumes of acquisitions prior to the crisis, may or may not be attributed to high cognitive complexity CEOs’ foresight of the crisis looming. However, there are strong theoretical reasons to believe that CEOs with higher cognitive complexity may be more inclined to pursue greater volumes of acquisitions, and such behavioral tendency may prepare firms to deal with the challenges that spur from the crisis more effectively. Relatedly, and more importantly, while many studies have suggested that financial institutions were aiming to become too large and interconnected for federal governments to simply let them fail (e.g., DeYoung et al., 2008), being able to gain size during crisis periods—while most others are condensing and shrinking—may have in fact allowed them to survive the crisis. With such precaution in mind, I suggest that the findings can collectively offer important contributions to the management literature.

First, the focus on the recent financial crisis sheds light on the importance of studying this macroeconomic event by allowing to understand why firms differ in terms of their strategies and survival during crises situations. While we have seen a number of academic studies in finance and economics (e.g., Atkinson et al., 2013; Reinhart &
Rogoff, 2009; Thakor, 2015) as well as federal reports (e.g., The Financial Crisis Inquiry Report) investigating the causes and consequences of the financial and economic crisis in the U.S., still not much work—both theoretical and empirical—has been done in the strategic management domain to understand the heterogeneity in firms’ behaviors, performance, and survival (cf. Jacobides & Winter, 2012; Gartenberg & Pierce, 2017).

While numerous exogenous shocks have existed throughout the U.S. history, the financial crisis of 2007-2008 has been known for having the severest financial impact not only on the U.S. financial system but also the global economy, ever since the Great Depression in the 1930s (e.g., Thakor, 2015). This period of 2007 onwards marks a time of intensive consolidation of industry members in the financial sector, implying numerous changes in the industry dynamics representing changes in firm boundaries and even decease (Wheelock, 2011). The findings of this current study suggest that acquisitive growth pursued before and during the crisis, in part driven by CEOs’ cognitive orientations, represents an important mechanism through which some firms were able to survive the crisis through improved firm effectiveness.

Second, the findings highlight the role of CEOs’ cognitive orientations—specifically, cognitive complexity—in understanding the heterogeneous firm behaviors before and during the crisis, as well as survival outcomes. Specifically, the findings of this study provide evidence that cognitive complexity of CEOs—the extent to which they differentiate and integration information surrounding them—manifests in strong preference towards acquisitive growth. These acquisitions, done in stable periods before the crisis, are found to lead to even more acquisitions in turbulent periods during the crisis where others rather suffer from resource constraints. This, in turn, is found to
eventually improve their survival odds. Further, high cognitive complexity is found to not only directly improve firm survival, but also magnify the influence of acquisitions on survival. Such findings highlight that, while previous studies have pointed to the cognitive biases and limitations of decision makers in bringing about the financial collapse (e.g., Balachandran et al., 2010; Jacobides & Winter, 2012), some cognitive orientations of the senior-most executives may actually contribute to superior outcomes.

Lastly, the findings enrich our understanding of the implications of acquisitions in crisis periods. Indeed, the existing literature suggests that the influence of acquisitions on firm performance is best understood when examining the contingencies (e.g., Datta, Narayan, & Pinches, 1992; Haleblian et al., 2009; Wan & Yiu, 2009). This study provides evidence that acquisitions made in the preceding period (before the crisis) may have substantial influence over explaining firms’ ultimate survival by creating a strong foundation for subsequent acquisitions during the crisis. As noted earlier, the study further suggests CEOs’ cognitive complexity is an important managerial-level antecedent of these acquisitions made prior to the crisis.

Future research

Several research opportunities related to this study merit further discussion. First, the implications of CEOs’ cognitive complexity can be further explored. While academic attention on managers’ cognitive complexity has stalemated in recent years, contexts such as macroeconomic exogenous shocks, institutional change (e.g., deregulation), or executives’ social surroundings can provide opportunities for revisiting the implications of corporate leaders’ cognitive complexity. Relatedly, while most studies have focused on the differentiation element of cognitive complexity, a careful examination of both
differentiation and integration may offer opportunities for more nuanced understanding of CEOs’ strategic decisions in these unique business settings.

Second, as the financial crisis period can be characterized by significant consolidation, further research can be done on examining financial institutions’ corporate restructuring activities that altered their firm boundaries. Specifically, an interesting opportunity lies in examining the implications of CEOs’ cognitive complexity for their divestiture decisions in the crisis context, as such decisions mirror corporate acquisition activities. One could examine how divestiture decisions, along with or separated from CEOs’ acquisition decisions, can help explain performance outcomes in the during- and post-crisis period.

Last, but not the least, future research in this domain can further investigate government bailouts of large financial firms. As some financial institutions were deemed “too big to fail,” the U.S. and international governments’ decision to support and provide subsidies for such entities has been a topic of heated discussion (e.g., Barth et al., 2012). Not only does government bailouts represent a major performance outcome for financial institutions in this period, it should also be interesting to understand how CEOs with various levels of cognitive complexity acted differently to gain such support from the government. Perhaps, those with high cognitive complexity were inclined to and capable of gathering relevant information comprehensively and to extensively seek out ways for obtaining the status of being too big to fail. Alternatively, as CEOs with different characteristics may have had different penchants for leading their firm, one could examine the implications of (mis)match between the firm’s dominant logic shaped by the senior managers and the institutional logic. As being “too big to fail,” rather than being
“too good to fail,” has represented the institutional logic of this sector, some financial firm CEOs may have chosen to chase the goal of growing the firm rather than bettering the firm, or vice versa, depending on their cognitive orientations.

Conclusion

How firms behave and even survive in contexts of drastic environmental changes has been one of the central questions for management scholars. This paper focuses on the recent financial crisis and finds evidence that senior leaders’ dispositional cognitive differences can in part explain how firm strategies prior to the crisis can vary, how these different strategies can substantiate during the crisis, and how this may all help understand the difference in firms’ survival during the crisis. Given that cognition of CEOs—how they think and process information—may have major influence over the strategic directions of their firms (Dutton & Jackson, 1987), theorizing and empirical testing of the link between idiosyncratic cognitive penchants and corporate actions in extreme business situations merit further scholarly endeavor.
Chapter 4

Antecedents and Consequences of Corporate Restructuring During a Crisis: Evidence from Acquisitions and Divestitures During the 2007-2008 Financial Crisis
ABSTRACT

The financial industry experienced intense acquisitions and divestitures during the recent financial crisis, leading to significant consolidation of the industry. This historical context provides a great opportunity to examine why and how firms take different reconstructing strategies in a crisis context and how their reconstructing strategies affect their performance and survival. I propose that firms’ restructuring strategies during a crisis depend upon their strategies prior to the crisis in a way that not only prior-crisis acquisitions (divestitures) affect during-crisis acquisitions (divestitures), but also prior-crisis acquisitions (divestitures) affect during crisis divestitures (acquisitions)—namely, ‘cross strategy’ effects. As such cross-effects deviate from firms’ path dependence in strategies, they may require great managerial effort, and thus I propose that these cross effects can be moderated by the firms’ CEOs, specifically their cognitive complexity. I further propose that during-crisis acquisitions and divestitures, while both may improve performance, will have divergent impacts on firm survival depending upon the dominant institutional logic of the crisis. Analyses of 463 financial firms during the recent 2007-2008 financial crisis largely support these predictions. Important implications of these findings for management theory and practice are discussed.

Keywords: Financial crisis, Acquisitions, Divestitures, CEO cognitive complexity, Firm performance, Firm survival
INTRODUCTION

The 2007-2008 financial crisis marked a significant macroeconomic event in the U.S., with strong ripple effects across the globe. Many firms and industries were affected by the crisis, with the financial industry arguably impacted the most. During this crisis period, firms in the financial industry engaged in frequent and enormous restructuring strategies, e.g., acquisitions and divestitures, leading to significant consolidation of this industry. According to Federal Deposit Insurance Corporate [FDIC], the number of U.S. commercial banks and savings institutions dropped by 1,011, or 12 percent, between December 2006 and December 2010.\(^9\) Despite the significance of the recent financial crisis as a research context, it has yet attracted much research attention in the strategy field, with only a few studies theorizing (Jacobides & Winter, 2012) or empirically examining the heterogeneity in firms’ restructuring strategies and the impacts of their restructuring strategies (Gartenberg, 2014; Gartenberg & Pierce, 2017).

In turbulent settings, such as in crisis situations, what firms do and how their strategic actions affect their performance and very survival have become important questions for management scholars. This study seeks to use the recent financial crisis context to investigate the antecedents and consequences of firms’ restructuring activities, more specifically, acquisitions and divestitures, during a crisis.

I first discuss the dynamics of firms’ different corporate restructuring strategies prior to and during a crisis. In doing so, I label a firm’s magnitudes of acquisitions and divestitures before the crisis its ‘preconditions,’ and propose that stronger preconditions may encourage and allow the firm to do more within each restructuring activity during

\(^9\) https://www5.fdic.gov/hsob/HSOBRpt.asp
the crisis. More specifically, I expect that a firm’s magnitude of acquisitions (divestitures) prior to a crisis will be positively related to the firm’s magnitude of acquisitions (divestitures) during the crisis. Further, while these activities represent two different courses of altering the scope and structure of the firm (e.g., Bowman & Singh, 1993; Brauer, 2006)—by expanding and contracting, respectively—I argue that each of these strategies may also create opportunities for the other strategy as firms enter the crisis period. That is, a firm’s magnitude of acquisitions (divestitures) prior to a crisis may be positively related to the firm’s magnitude of divestitures (acquisitions) during the crisis, which I label as ‘cross strategy’ effects. These ‘cross-strategy’ effects may be further moderated by firm CEOs’ cognitive orientations—i.e., their cognitive complexity—as breaking the strategic path-dependence may not only be triggered by environmental shocks (e.g., Oliver, 1991), but also by senior managerial actions of processing relevant information and seeking strategic alternatives (e.g., Rajagopalan & Spreitzer, 1997).

Finally, I posit that firms’ acquisitions and divestitures during the crisis may have important implications for the firms’ subsequent performance and survival. While during-crisis acquisitions are likely to provide opportunities for reconfiguring their pool of resources and capabilities for adapting to the new environment (Wan & Yiu, 2009), during-crisis divestitures may strengthen their operational efficiency to achieve a leaner balance sheet (e.g., Markides, 1992), both of which thus may improve performance. However, I predict that these positive performance implications may not necessarily correspond to positive survival outcomes, as the dominant logic of the financial industry in this financial crisis was ‘too big to fail’ rather than ‘too good to fail.’ As such, I expect
that those firms that have gained size through acquisitions throughout the crisis period would have a higher chance of survival because collapses of large financial firms could severely damage the entire economic system (Stern & Feldman, 2004) and thus they would be more likely to garner support from key constituents (e.g., government). In contrast, those that have engaged in significant divestiture activities during the crisis, while having improved their operational performance, have shrunk in size and become less critical to the whole economic system and thus would be less likely to be supported by key constituents (e.g., government). The overall theoretical framework is illustrated in Figure 1.

[Insert Figure 1 about here]

A series of analyses of financial firms (2-digit SIC codes 60-67) over the period of 2004-2011 largely supports these predictions. Results show that the preconditions in acquisitions and divestitures not only induce greater volumes within their strategic courses, but also result in greater volumes across strategic courses, such that pre-crisis acquisitions (divestitures) are positively related to during-crisis divestitures (acquisitions). The results also show that CEOs’ cognitive complexity, captured through their language use during earnings conference calls, promotes the effect of pre-crisis divestitures on during-crisis acquisitions, but does not moderate the effect of pre-crisis acquisitions on during-crisis divestitures. Finally, findings suggest that the volumes of acquisitions and divestitures during the crisis are positively related to subsequent financial performance, yet have differential impacts on the chance of firm survival in subsequent quarters, such that acquisitions enhance the chance of survival, while divestitures dampen it.
These findings can make important contributions to the management literature. First, it focuses on a recent, highly important context that had significant impact on firms and the entire U.S. economy, as well as the global economy, and seeks to explain how firms differed in terms of their strategies and performance/survival during the crisis. A number of finance and economics studies burgeoned as soon as the crisis hit the U.S. economy to understand its causes (e.g., Thakor, 2015) and aftermaths (e.g., Atkinson, Luttrell, & Rosenblum, 2013). Surprisingly, to date still not much has been done to understand firms’ behaviors, performance, and survival from a strategy perspective. The findings suggest that two major corporate restructuring strategies exhibited interesting within- and cross-strategy dynamics before and during the crisis, thereby affecting firms’ survival to various degrees.

Second, it extends our understanding of the dynamics of major corporate restructuring activities represented by acquisitions and divestitures in a crisis period and their implications towards performance and survival. While the impacts of acquisitions and divestitures on firm performance has not been conclusive (e.g., Brauer, 2006; Halebian, Devers, McNamara, Carpenter, & Davison, 2009), recent research shows the importance of contexts and contingencies in proposing performance implications of these strategies (e.g., Lee & Madhavan, 2010; Wan & Yiu, 2009). This study echoes this call and investigates how acquisitions and divestitures done before and during crisis situations can influence firm performance and survival.

**RESEARCH CONTEXT: THE 2007-2008 FINANCIAL CRISIS**

The recent financial crisis of 2007-2008 has been regarded as the worst crisis ever since the Great Depression of the 1930s (e.g., Erkens, Hung, & Matos, 2012; Foster &
Magdoff, 2009; Hillenrath, Ng, & Paletta, 2008; Thakor, 2015). Most agree that the crisis originated from the U.S. housing market—as housing prices rose during the years preceding the crisis, lenders offered loans without due diligence of the borrowers’ credit quality, which were then securitized and sold off to the secondary markets. Many financial institutions, believing that households would be able to afford their regular mortgage payments and that housing prices would constantly rise, issued large amounts of debt to invest in mortgage-backed securities (Blackburn, 2008; Reinhart, 2011). However, as the housing price bubble burst after a peak in mid-2006, the default rates of subprime loans rose, accumulating losses on the securities backed by such loans.

As major financial institutions, including government-sponsored enterprises such as Fannie Mae and Freddie Mac, started to collapse, the U.S. government made substantial attempts to rescue these entities and the financial system, which were nonetheless followed by a global economic downturn and the European debt crisis. As noted earlier, this was a time where substantive consolidation took place, where financial institutions that were already growing in size through consolidation gained even greater size through mega-mergers (see Appendix). Estimates show that the financial crisis cost the U.S. 6 to 14 trillion U.S. dollars, the equivalent of 40% to 90% of one year’s U.S. output, or $50,000 to $120,000 for every household (Atkinson et al., 2013). In addition, Special Inspector General for the Troubled Asset Relief Program (SIGTARP) reports that up to $16.8 trillion was committed by the U.S. federal government to pay for bailouts of major financial institutions that were “too big to fail” (Collins, 2015). In all, this exogenous shock represents a major macroeconomic event, thereby providing a context to understand how the heterogeneity in corporate-level actions before the shock can affect
corporate actions during the shock and eventually lead to different performance outcomes.

**THEORY AND HYPOTHESES**

Acquisitions and divestitures represent two major, distinct ways of corporate renewal through changes in the firm’s scope and structure (Bowman & Singh, 1993). Reflecting their importance, much research has been done to better understand the individual-, firm- or industry-level antecedents and consequences of each activity (see Brauer, 2006; Haleblian et al., 2009 for reviews). While understanding how firms persist with or alter the paths of certain strategies is of much importance to strategy scholars, less understood in the domain of restructuring research, however, is how firms pursue the strategic path of each restructuring activity as they experience economy-wide shocks (cf. Kang, Lee, & Na, 2010; Wan & Yiu, 2009)—whether and how they change their strategic courses. In the following, I first discuss how firms’ acquisitions and divestitures may unfold by comparing periods prior to the crisis with those during the crisis.

**Within-strategy effect: The impact of pre-crisis acquisitions on during-crisis acquisitions**

During the financial crisis, ample uncertainty surrounded the U.S. economy, particularly the financial system and the industry members therein. It was a period of intense consolidation (Wheelock, 2011), and those that have not gained size and accumulated sufficient experience may have not been able to acquire others, but rather be acquired by them. I argue that a greater magnitude of acquisitions before the crisis can constitute a strong foundation for firms to do more acquisitions during the crisis.

Although previous research has often suggested that major changes in the environment triggers firms to accordingly change strategic directions (e.g., Smith & Grimm, 1987),
several factors may collectively explain such ‘snowballing.’

From the perspective of acquirers, it is known that past acquisition experience encourages subsequent acquisitions (Haleblian et al., 2009). As the organizational learning literature suggests, the routines and practices that accumulate through recurrent activities are expected to give rise to repeated actions in the subsequent periods (e.g., Amburgey, Kelly, & Barnett, 1993; Audia, Locke, & Smith, 2000; Gulati, 1995; Kelley & Amburgey, 1991; Miller & Friesen, 1980; Shaver, Mitchel, & Yeung, 1997). Indeed, scholars have found that prior acquisition experience breeds subsequent acquisitions (Amburgey & Miner, 1992; Baum, Li, & Usher, 2000; Haleblian, Kim, & Rajagopalan, 2006; Yang & Hyland, 2006). In this regard, the experience of acquisitions before the financial crisis may have promoted the inclination for financial firms to engage in acquisitions also during the crisis. However, as this period of financial distress have caused many firms to become rigid (Reinhart & Rogoff, 2008, 2009), the history and experience alone may not be sufficient to explain the influence of the precondition on during-crisis acquisitions.

In addition to the influence of prior acquisition experience, pre-crisis acquisitions may have provided the firm with a larger scale that makes them more visible and rewarded by the financial market (Kim, Haleblian, & Finkelstein, 2011), which may in turn make the firm more capable of procuring and combining resources (Penrose, 1959; Pfeffer & Salacik, 1978). Further, as acquiring another firm or business expands the acquiring firm’s scope and offers a new diverse set of resources and knowledge, the opportunity set of the firm’s subsequent acquisitions increases (McKelvie & Wiklund, 2010). Hence, more acquisitions are likely to take place.
An analysis from the perspective of the potential target firms supplements the explanations provided above. Specifically, a period of extensive industry consolidation represents a setting in which many firms’ vulnerability and weak chance of independent survival is likely to result in an increase of targets to be potentially acquired. During this period of an increased supply of targets, it is likely that the accumulation of experience and visibility is perceived favorably by the acquiring firms’ key constituents and stakeholders. In the broader domain of corporate strategy, it has been found that firms that have experience, resources, and knowledge within a strategic domain can send a signal to the external parties of their capability and commitment in carrying out the focal strategic activities (e.g., Gulati, Lavie, & Singh, 2009; Kale, Dyer, & Singh, 2002).

Similarly, in the eyes of the key stakeholders—the target firm executives in particular—a firm that has accumulated the expertise through previous acquisition experiences may be perceived as more capable and reliable as a potential acquirer, in other words, a ‘white knight’ that can save the target firm. In all, the effect of pre-crisis acquisitions on during-crisis acquisitions may have been triggered by the past experiences, which was arguably further facilitated by the increased scale and credibility accumulated throughout such experiences, in conjunction with the increased supply of potential targets, whose preferences towards potential acquirers may have been shaped by the relevant experience and scale that acquirers possessed. Therefore, I hypothesize:

**Hypothesis 1:** The volume of a firm’s acquisitions prior to the crisis is positively related to the volume of its acquisitions during the crisis.

**Within-strategy effect:** The impact of pre-crisis divestitures on during-crisis divestitures

Similar to how past acquisition experience can encourage subsequent acquisitions,
prior divestiture experience can allow a firm to establish routines and knowledge in executing divestments of business units, helping the firm divest business units in subsequent periods when needed (e.g., Allen, 1998; Bergh & Lim, 2008; Shimizu, 2007; Shimizu & Hitt, 2005; Villalonga & McGahan, 2005). As the implementation of divestitures involves a variety of processes including determining the specific mode (e.g., spin-offs, sell-offs, equity carveouts), identifying potential acquirers, and dealing with governance entities such as internal/external owners (e.g., Bergh & Sharp, 2015), boards (e.g., Johnson et al., 1993), corporate and divisional managers (e.g., Ghertman, 1988), in addition to various other administrative processes, having such experience of divestitures helps senior managers better evaluate the costs and benefits of divesting units in the current situation (Shimizu & Hitt, 2005).

Divesting a business or asset involves breaking inertia and a psychological process of departing from the status quo (Staw, 1997). In this sense, it is likely that the experience of breaking the inertia in the past allows the decision makers to feel more comfortable or less painful in divesting additional operating units. On the other hand, lacking such experience may only strengthen the tendency to maintain the status quo (Ross & Staw, 1993). In this case, even when the economic adversity in the crisis period poses a threat to firms, they tend to be strategically rigid and hold on to their business units even when they see negative feedback pointing to the need of divestment (Staw, Sandelands, & Dutton, 1981). While this behavioral tendency may conflict with the industry-wide movement of consolidation and corporate lean-downs during crisis periods, firms may be able to engage in divestitures of business units during the crisis to the extent that they had experience in divestitures before the crisis.
An analysis from the potential acquirers’ perspective also supports such prediction. Potential acquirers in the market are likely to favor firms that have had previous experience in divestitures. As divestitures often involve private transactions and negotiations between the seller and a single buyer, rather than open auctions (Sicherman & Pettway, 1992; Slovin, 1995), the prior experience of the divestiture process may convey a signal to the potential acquirers that such divesting firms are better candidates to transact with since they have such experience in negotiations. Further, as divestitures require cutting the business linkages between the divested units and the divesting firms, potential acquirers tend to favor those firms with prior divesting experience because such firms have experience in business de-integration and thus can accelerate the process of integration of the divested units and the acquiring firms. In all, I hypothesize:

*Hypothesis 2: The volume of a firm’s divestures prior to the crisis is positively related to the volume of its divestures during the crisis.*

While I have thus far argued how firms’ acquisitions and divestitures prior to a crisis may affect the firms’ acquisitions and divestitures during the crisis, respectively, it is important to also discuss how they may influence each other as they represent the two major tools (expansion and contraction) through which firms (re)shape their boundaries. Most studies on corporate strategy have focused on either one of the two; in studies examining both strategic modes together, they have been considered as alternative governance modes (e.g., Villalonga & McGahan, 2005) or two independent outcomes that represent major corporate decisions (e.g., Sanders, 2001; Williams, Paez, & Sanders, 1988) with less focus on how one can influence the other. While some studies have examined how firms decide to divest business units that they have previously acquired (e.g., Bergh, 1997; Capron, Mitchell, & Swaminathan, 2001; Hayward & Shimizu, 2006),
significantly less studies have examined how these strategic activities may impact each other over time, especially when firms go through major crisis situations.

**Cross-strategy effect: The impact of pre-crisis divestitures on during-crisis acquisitions**

As discussed earlier, prior experience in acquisitions and the expanded opportunity pool created through the accumulated size before the crisis can encourage more acquisitions as firms move into the crisis period. However, a continuation of the same strategic course of acquisitions may not be the only path through which firms could do more acquisitions as they go through the crisis period. Specifically, I predict that those that have divested business units prior to the crisis may also be able to engage in more acquisitions during the crisis. While few studies thus far have examined this relationship, I provide two interrelated reasons to support this view.

First, divestitures prior to the crisis improve firms’ operational efficiency through refocusing their corporate portfolios, or discarding negative synergies and assets that are less related or contributive to the core business (e.g., Bergh, 1998; Brauer & Wiersema, 2012; Markides, 1992). Such refocusing can open room for the firm to explore new opportunities that can strengthen the firm’s core business and supplement it through new synergies. From the corporate officers’ perspective, a leaner organizational structure and refocused portfolio would allow them to allocate more attention to opportunities that reside outside the firm, facilitating more search activities for acquisition targets. At the same time, while the crisis period displays an increase in supply of potential targets overall, it is likely that targets outside the focal firm not only seek potential acquirers that are reliable and capable, but also those firms refocused through pre-crisis divestitures that have the relevant experience to recognize the potential synergy created from acquiring
This enlarged opportunity set is supplemented by the fact that divestitures prior to the crisis generate cash proceeds that can allow firms to acquire more during the crisis. Acquisitions often require substantial financial resources, which include considerable search costs for reducing the uncertainty accompanied by acquiring new businesses (Iyer & Miller, 2008). The majority of such financial resources come from debt (Hitt, Hoskisson, & Ireland, 1990; Hoskisson, Hitt, & Ireland, 1994), which may require new cash flows for repayment and reduction of the associated financial risk (Hitt & Smart, 1994). As such, these resource requirements may encourage firms to divest assets for greater cash flow (Hitt, Hoskisson, Johnson, & Moesel, 1996). As the financial crisis period represents a time where firms are heavily constrained financially, generating the cash flow from divestitures may hugely aid in getting in shape for acquiring others. Taken together, I hypothesize:

*Hypothesis 3: The volume of a firm's divestitures prior to the crisis is positively related to the volume of its acquisitions during the crisis.*

While refocusing may in general provide the corporate officers with greater leeway for exploring outside opportunities, crises provide a situation in which CEOs’ willingness and ability to seize opportunities and search broadly may make significant difference in terms of firm behavior (Boin, Hart, Stern, & Sundelius, 2005; Meyer, Brooks, & Goes, 1990). In this regard, I suggest that CEOs’ cognitive complexity may strengthen the firm’s motivation driven from divestitures prior to the crisis to engage in more acquisitions during the crisis.

CEOs’ cognitive complexity refers to the degree to which they differentiate and integrate dimensions of information, representing a cognitive style of gathering and
processing information (Finkelstein, Hambrick, & Cannella, 2009). Those with high levels of cognitive complexity perceive several dimensions in the informational array and have wide ranges of attention and search, drawing multiple connections between the perceived constructs; while those with low cognitive complexity employ fewer constructs in understanding issues and processing information, have more focused attention, and draw linkages among the select dimensions used (Tetlock, Peterson, & Berry, 1993; Tetlock, 2000).

Given the definition of cognitive complexity, I predict that, rather than staying rigid in threatening situations (Staw, Sandelands, & Dutton, 1981), CEOs with high cognitive complexity are more likely to widen their search range and seek opportunities as considerable environmental change alters the opportunity set and the competitive landscape (Meyer et al., 1990). Indeed, although pre-crisis divestitures may create greater efficiency and focus for firms to seek new opportunities, they would indeed have less meaning if senior managers are less inclined to or less capable of identifying those opportunities and evaluating potential targets. With new opportunities residing in the environment, CEOs with higher cognitive complexity, characterized by the willingness and capability to perceive multiple dimensions in the environment and draw intricate connections among them, are expected to be more capable of understanding and integrating the ways for adapting to the newly created market dynamics, hence facilitating more acquisitions to span the firm boundaries and seek outside resources after a period of divestitures. Therefore, I hypothesize:

"Hypothesis 4: The positive relationship between a firm’s pre-crisis divestitures and during-crisis acquisitions is strengthened when the CEO’s cognitive complexity is higher."
Cross-strategy effect: The impact of pre-crisis acquisitions on during-crisis divestitures

The impact of acquisitions on subsequent divestitures has been straightforward in the literature. In general, there would be little motivation for CEOs to contract the firm given that they aspire to run large and growing firms (Donaldson & Lorsch, 1983; Jensen, 1989; Mueller, 1987) and receive big compensation packages for managing them (Hambrick & Finkelstein, 1995). However, firms that grow through acquisitions often eventually experience the need for divestitures (Porter, 1987) as acquisitions do not necessarily result in increased value for the acquiring firm (Haleblian et al., 2009; Jensen, 1988). Further, it is unlikely that every piece of the acquired firm (or business) would fit the acquiring firm’s need. Sometimes, the acquiring firms would need to or have promised regulators to divest some parts of the acquired firms/businesses in order to get regulatory approvals. In line with this stream of research, I expect that firms that have conducted a large amount of acquisitions prior to a crisis will also divest a large amount of businesses as they enter the crisis period.

As noted throughout the paper, crisis situations engender a setting in which firms face considerable financial constraints, which was particularly the case during the financial crisis (e.g., Atkinson et al., 2013). As acquisitions prior to the crisis may provide firms with a broader opportunity set through reconfigurations of their resource bases, they may simultaneously experience during the crisis greater needs to identify and divest the units that are not contributing to increased value. In part, this may be because, compared to the time during the crisis, firms that have engaged in greater volumes of acquisitions in a more munificent pre-crisis period may have overestimated the value of targets and the potential synergy with the targets (Lubatkin & Chatterjee, 1991; Wan &
Yiu, 2009). As achieving a financially healthy status becomes key in crisis situations, firms that engaged in voluminous acquisitions are more likely to experience the need for leaning down and removing parts that are less contributing to firm value. Therefore, I hypothesize:

_Hypothesis 5: The volume of a firm’s acquisitions prior to the crisis is positively related to the volume of its divestitures during the crisis._

Similar to how I discussed CEOs may play a role in influencing the relationship between pre-crisis divestitures and during-crisis acquisitions, I suggest that CEO cognitive complexity may influence how pre-crisis acquisitions affect during-crisis divestitures. Specifically, while firms may have a larger pool of opportunities and options during the crisis created by acquisitions prior to the crisis, I expect that CEOs with lower cognitive complexity may facilitate divestitures of the acquired businesses and assets during the crisis. As noted earlier, compared to those higher cognitive complexity, CEOs with lower cognitive complexity are characterized by their tendency to be more focused in attention and search of information, using fewer constructs to differentiate multiple dimensions of the surrounding situation and drawing select connections among them (Tetlock et al., 1993). As such, they are expected to be more internally focused in understanding and integrating the ways of how the newly acquired diversity of knowledge and resources can complement the existing firm resources. This implies that they would also be more focused on evaluating the synergies created from the new and existing businesses, hence more intensely discerning which ones should be divested, thereby employing a decision calculus that strengthens the firm’s inner core. Therefore, to the extent that their CEOs’ cognitive complexity is lower, firms that have engaged in active acquisitions before the crisis would experience greater likelihood of divestitures as
they can be more focused on assessing the needs and values in the existing and newly acquired assets and businesses. In this regard, I hypothesize:

**Hypothesis 6:** The positive relationship between a firm’s pre-crisis acquisitions and during-crisis divestitures is strengthened when the CEO’s cognitive complexity is lower.

**Implications for firm performance and survival during a crisis**

During periods of radical environmental shifts, environmental munificence dramatically declines (Wan & Yiu, 2009), often rendering firms’ past strategic courses obsolete (Meyer et al., 1990). Firms are left with few options but to tighten their financial resources and cut down on their scope (Brauer & Schimmer, 2010; Campello, Graham, & Harvey, 2010), perhaps indicating their intensified rigidity that resulted from such external threat (Staw et al., 1981). Most recent studies on the financial sector have suggested that good corporate governance, either captured at a comprehensive level (e.g., Gartenberg & Pierce, 2017; Peni & Vahamaa, 2012) or specifically reflected in the level of board monitoring (e.g., Aebi et al., 2012) or CEOs’ incentive alignment (e.g., Fahlenbrach & Stulz, 2011), has allowed some firms to enjoy better performance than others during the financial crisis. Such analysis finds explanation of firm heterogeneity in performance and survival directly from the causes of the financial crisis—that the strength of corporate governance mechanisms for regulating excessive risk taking may explain the differences in performance.

In this study, I propose that both acquisitions and divestitures during crisis situations may contribute to greater firm financial performance. Indeed, prior research suggests that acquisitions, in general, represent a high-risk corporate action that involves major resource commitments (Pablo, Sitkin, & Jemison, 1986), often hurting firm
performance (Cartwright & Schoenberg, 2006) and sometimes resulting in replacing the CEO when failed (Lehn & Zhao, 2006). Divestitures also are often regarded as risky moves (Sanders, 2001), as they often result in negative market reactions (Markides, 1992) or losses in employee morale and key resources relevant to remaining businesses (Freeman & Cameron, 1993; Markides, 1995). However, I suggest crisis situations provide a context in which both strategies may have significant potential for creating value.

Acquisition deals made by firms during a crisis may improve firms’ subsequent performance by enhancing their visibility and market presence which may in turn lead to more opportunities for reconfiguration of resources and capabilities. This altering of resource and capabilities bases is expected to allow the firm to better adapt to the changing environment (Wan & Yiu, 2009). As prior research suggests, acquisitions have the benefit of gaining access to new knowledge and assets that reside outside the firm (Harrison et al., 1991; Kim & Finkelstein, 2009). These acquisitions are more likely to create value when the acquirer and target can complement each other’s resources (Harrison et al., 1991) and/or choices of strategies and market (Kim & Finkelstein, 2009). However, during a period in which industry players are majorly going through financial and structural constraint where the lack of necessary resources and experience may have posed a major challenge to firms, the projection of higher visibility and market dominance may have substantially contributed to improving the focal firm’s effectiveness. As the prior discussions on the effect of pre-crisis acquisitions on during-crisis acquisitions suggest, it may have been those firms that have already grown in size that had the competitive edge to exploit more opportunities as well as the leeway to
further explore other opportunities for improving their efficiency. Therefore, I hypothesize:

**Hypothesis 7:** The volume of a firm’s during-crisis acquisitions is positively related to its subsequent financial performance.

Divestitures during the crisis period are also expected to create value to firms and improve their financial performance. While the impact of divestitures on firm performance has been a popular subject in corporate strategy research, evidence has been mixed (see Brauer, 2006 for a review). First, research from transaction cost economics and resource-based perspective collectively suggest that divestitures can lead to better utilization of resources by eliminating negative synergies or diseconomies of scale and scope across a firm’s portfolio, resulting in better financial performance (e.g., Bergh, 1998; Bergh & Lawless, 1998; Kose, Poulsen, & Stulz, 1995). However, as noted earlier, strong evidence also exists that divestitures sometimes decrease shareholder value (Freeman & Cameron, 1993; Markides, 1992, 1995). In response to these conflicting findings, more recent research has suggested that performance outcomes of divesting firms are much subject to specific contexts and contingencies (Lee & Madhavan, 2010; Mulherin & Boone, 2000).

Building upon such notion, I posit in this study that the recent financial crisis specifically provides a context of extreme financial constraint and environmental resource scarcity in which firms’ divestiture activities resulted in better financial performance. The impact of divestitures on firm financial performance in environmental jolt situations, such as the financial crisis context, can be understood through several aspects. As the crisis reconfigures the opportunity set and competitive landscape, firms are encouraged to devise new ways of competing (Meyer et al., 1990). As adhering to
past business models and the strategies for implementing them may lower firms’ effectiveness during radical environmental shifts (e.g., Audia, Lock, & Smith, 2000), trimming out such inefficiencies and perhaps redundancies can allow firms to improve their management of resources with more focused attention on key business units.

Furthermore, the cash flows generated from selling assets and units will offer critical competitive advantage to the divesting firms in situations of low environmental munificence by creating opportunities for reinvestments and reallocations of these cash proceedings for improving other items of the firm’s balance sheet. In other words, alternative uses of freed resources and the resulting resource reallocation can allow firms to better adapt to an environment that cannot offer much resources itself. At the same time, firms can now allocate energy and resources to seek new ways that address the environmental change and augment the core businesses. As prior research suggests, firms maintaining balance between exploring new opportunities and exploiting existing strengths enjoy enhanced performance (He & Wong, 2004; March, 1991; Stettner & Lavie, 2014). Therefore, I hypothesize:

Hypothesis 8: The volume of a firm’s during-crisis divestitures is positively related to its subsequent financial performance.

Financial performance and survival of firms are often closely related in that firms with better firm performance are more likely to survive (e.g., Delios & Beamish, 2001). This linkage can also be expected for firms during crisis situations. For example, as the financial sector witnessed a period of consolidation during the recent financial crisis, firms that were incapable of yielding good financial performance were either terminated or acquired by others (Wheelock, 2011). However, in this study, while I have proposed that acquisitions and divestitures that firms have conducted during a crisis may both
contribute to better subsequent financial performance, I expect that these two corporate restructuring efforts may have differential impacts on firm survival during the crisis.

First, I expect that firms that have done a larger volume of acquisitions during the financial crisis are more likely to survive the crisis. As recent research has suggested, the collapse of large firms has the potential of damaging the broader financial and economic system because of their market dominance and interconnectedness. In other words, they are “too big to fail” (Stern & Feldman, 2004), and such phenomenon represented the dominant institutional logic of the financial sector, particularly in this crisis period.

This explanation may be further supplemented with a more cognitive view to understand how firms that grew through acquisitions were more likely to survive the crisis than those that engaged less in acquisition activities. As firms engage in acquisitions, the strategic and operational reasons underlying such decisions are often publicly exposed through “road shows” that provide detailed information to investors (Brauer & Wiersema, 2012; Reuer & Shen, 2003). As stakeholders are provided with such information, their perception of firms that have gained size in times of financial hardship may work favorably towards these acquiring firms in the form of greater levels of support. Research on organizational cognition suggests that when faced with abundant stimuli, which was apparently the case during the financial crisis, individuals act as “cognitive misers” (Taylor, 1981) who sort out expected stimuli while paying more attention to stimuli that differ from expectations (Barnett, 2014; Kiesler & Sproull, 1982). Accordingly, the increased size of firms may loom larger to stakeholders in the industrial and economic context of financial shrinkage, resulting in greater support towards them. As a result, these firms are also more likely to receive support from key constituents,
including the government, through the demonstration of their ability to grow in times of extreme condensation. Taken together, I propose that acquisitions conducted by firms during the crisis may increase the chance that firms survive the crisis.

_Hypothesis 9: The volume of a firm’s during-crisis acquisitions is positively related to its subsequent survival._

Regarding divestitures, however, while I have argued that divestitures during the financial crisis can improve subsequent firm financial performance, I expect they will reduce the chance that the firms will survive the crisis. Although firms’ divestitures in a financially constrained setting can improve their operation and financial outcomes, the financial sector was characterized by the institutional logic, as noted earlier, that firms that are extremely large and interconnected with others are less likely to fail or die because their collapse would result in extremely costly damages to a country’s financial system and even its entire economy. In this sense, I posit that although divesting firms may have been able to improve their financial performance, they may experience higher likelihood of exiting—either through decease or being acquired by other acquiring firms. This is because divestitures reduce the size of the divesting firms, thus reducing their importance to and interconnectedness with the country’s entire economy. As a result, divesting firms become less likely to attract support from key stakeholders, especially the government. Moreover, firms that have focused on divesting in the crisis period tend to be perceived by outsiders as failing and declining. This could in part be attributed to the fact, as noted earlier, that information (e.g., selling price) about divestiture transactions are not often disclosed to the public with the strategic and operational rationales behind divestiture decisions left ambiguous to many stakeholder groups (Brauer & Wiersema, 2012). Due to this information asymmetry, garnering stakeholder support for survival
would be extremely difficult when firms are perceived as active divestors, as divestitures may send a false signal to stakeholders that the firm is failing or their managers had made mistakes in the past (e.g., Markides & Singh, 1997). In all, as the dominant institutional logic of this industry, particularly in this period, suggested, some firms were not allowed to fail or die simply because they were too “big”, rather than too “good.” In essence, I suggest that while the operational efficiency of firms and their survival outcomes are often considered to go hand in hand, they can be decoupled to represent two different consequences during crisis situations. This leads to my final hypothesis:

Hypothesis 10: The volume of a firm’s during-crisis divestitures is negatively related to its subsequent survival.

RESEARCH METHODS

Data and sample

The study was based on a longitudinal sample consisting of 463 U.S. financial firms (2-digit SIC codes 60-67) and their CEOs, in the period of 2004-2011. Firm acquisition and divestiture data were collected from SDC Platinum, firms’ financial and strategic information and exit data from CRSP-Compustat. Data on CEOs’ language use were obtained from companies’ quarterly conference calls collected by Thomson Reuters Street Events database, and CEO demographic and compensation data were gathered from Execucomp.

Measurement

CEO cognitive complexity. As noted earlier, cognitive complexity refers to a combination of two major components of one’s reasoning: the extent to which one can differentiate between multiple, competing solutions and the extent to which one can integrate among those solutions (Tetlock, 1981). Following this definition, Abe (2011)
constructed an index that combines words that used for making precise distinctions and conjoining multiple thoughts together. Specifically, the index comprises four function-word categories—exclusion (e.g., but, without), negations (e.g., no, not, never), tentativeness (e.g., maybe, perhaps), and conjunctions (e.g., and, also, although). For example, exclusion words are used when making distinctions between multiple categories (i.e., differentiate), while conjunctions help bring together multiple thoughts to create a coherent narrative (i.e., integrate) (Graesser, McNamara, Louwerse, & Cai, 2004). Using LIWC, the number of words from each of these categories was counted to compute the extent to which these words were used in proportion to the total amount of words spoken by the CEO. I used the sum of the four standardized scores as an index of a CEO’s cognitive complexity.

For examining the relationship between CEO cognitive complexity and the pre-crisis acquisition activities, I computed the mean cognitive complexity scores in the four quarters of 2004. For examining the role of CEO cognitive complexity as a moderator of the relationship between pre-crisis and during-crisis acquisitions and the relationship between during-crisis acquisitions and firm survival, I used the concurrent quarterly scores of CEOs’ cognitive complexity.

*Volume of acquisitions prior to the crisis (i.e., 2005-2006) and during the crisis (i.e., 2007-2010).* Two variables that capture the volume of acquisitions in each of the two time periods were collected from the SDC Platinum database. First, *number of acquisitions* was measured as the total count of completed acquisitions conducted in 2005-2006 for operationalizing pre-crisis acquisitions and as the running sum of quarterly acquisitions done in 2007-2010 for during-crisis acquisitions. Such operationalization can
reflect the effect of precondition on the during-crisis acquisitions. Consistent with prior studies, I chose the year of 2007 to mark the onset of the crisis, as prominent signs emerged in early 2007 when the Federal Home Loan Mortgage Corporation (Freddie Mac) announced that it will no longer buy risky subprime mortgages/mortgage-related securities and New Century Financial Corporation filed for bankruptcy (Marshall, 2009; Thakor, 2015), triggering the meltdown of the financial sector (USA Today, 2013).

Second, the size of acquisitions was measured by the transaction value of acquisitions (log-transformed) conducted in these time periods, again as the total amount for the pre-crisis period and the running sum for the during-crisis period.

Volume of divestitures prior to the crisis (i.e., 2005-2006) and during the crisis (i.e., 2007-2010). Similar to acquisitions, two variables that capture the volume of divestitures in each of the two time periods were collected from the SDC Platinum database. First, number of divestitures was measured as the total count of divestitures conducted in 2005-2006 for operationalizing pre-crisis divestitures and as the running sum of quarterly divestitures done in 2007-2010 for during-crisis acquisitions. Again, such operationalization can reflect the effect of precondition on the during-crisis divestitures. Second, the size of divestitures was measured by the transaction value of acquisitions (log-transformed) conducted in these time periods, again as the total amount for the pre-crisis period and the running sum for the during-crisis period.

Firm performance. Following prior studies on the financial industry, I measured financial firms’ performance using their annual return on assets (ROA) (e.g., McNamara et al., 2002; Mehra, 1996; Simpson & Kohers, 2002). ROA not only represents the most often used performance measure in management studies (e.g., Reger, Duhaime, &
Stimpert, 1992; Deephouse, 1999) and finance studies (e.g., Aebi et al., 2012; Gilbert, 1984; Gorton & Rosen, 1995; Peni & Vahamaa, 2012) of the financial industry, but is also regarded as the best indicator of earnings efficiency (McNamara et al., 2002).

**Firm survival.** To determine firm survival, I first identified whether financial institutions were delisted from the Compustat-CRSP database on a quarterly basis (e.g., Carr, Haggard, Hmieleski, & Zahra, 2010) and created a time-varying binary outcome measure coded 1 during the quarter a firm was delisted and 0 otherwise. I chose to measure firm survival on a quarterly base rather than a yearly base because firm exits occurred more frequently during a crisis than a normal situation.\(^{10}\)

**Control variables.** I included a set of variables at the CEO- and firm-level to control for alternative explanations for the predicted outcomes. First, I controlled for *firm size*, which was measured as the logarithm of total assets, as size can influence the extent of strategic inertia (Dougherty & Hardy, 1996). In addition, *financial slack*, measured as the equity-debt ratio (common equity over total debt) was also controlled for as it can provide buffers for risky strategic actions such as acquisitions (Bourgeois, 1981; Bromiley, 1991; Iyer & Miller, 2008). As the senior-most executives may have greater control over risk and strategic management in holding companies than in individual commercial banks or savings institutions, I also included a binary variable which indicated whether the firm is a *holding company*, coded 1 if the institution’s 2-digit SIC code equaled 67 and 0 otherwise. Since the amount of cash holdings of firms may have influence over firms’ performance during the crisis (e.g., Campello et al., 2010), I

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\(^{10}\) Data indicated that out of the sampled firms that were present in 2007, which marked the onset of the financial crisis, approximately 20% exited the industry at various points of time by 2011 (5% in 2007, 4.7% in 2008, 4.3% in 2009, 3.6% in 2010, and 3.4% in 2011).
controlled for cash holdings when predicting firm performance. In addition, I controlled for each corporate restructuring activity when predicting the other (e.g., controlled for divestitures when examining the impact of pre-crisis acquisitions on during-crisis acquisitions). As noted earlier, corporate governance has been suggested as a critical factor in explaining financial firms’ performance during the crisis (e.g., Aebi et al., 2012; Gartenberg & Pierce, 2017). In line with this recent research, I also controlled for two corporate governance mechanisms—board independence, measured as the ratio of independent directors on board and CEO duality, coded 1 if the CEO also assumed chairpersonship and 0 otherwise. Finally, I controlled for CEO shareholdings, measured by the percentage of CEOs’ shares out of the total amount of firm shares, as CEOs’ ownership of the firm can provide financial incentives for undertaking riskier moves, such as acquisitions (Sanders, 2001; Wright, Kroll, Lado, & van Ness, 2002).

When examining the effect of a firm’s pre-crisis acquisitions and divestitures on during-crisis acquisitions and divestitures, I controlled for prior period return on assets (ROA) as recent performance can affect strategic behavior (Cyert & March, 1963; Greve, 1998). Finally, I included binary indicators for each year-quarter to control for the temporal effect in models using quarterly observations (models predicting during crisis acquisitions and divestitures and firm survival) and binary indicators for each year in models using annual observations (models predicting firm performance).

**Analyses**

Due to the different nature of outcomes and the relationships among them, I took two methodological approaches to test the hypotheses. Hypothesis 1 through 6 predicted the relationship between firms’ pre-crisis acquisitions and divestitures, during-crisis
acquisitions and divestitures, CEO cognitive complexity, and subsequent financial performance. These hypotheses were tested through longitudinal Generalized Estimating Equation (GEE) models (Liang & Zeger, 1986). GEE models provide maximum likelihood estimates that account for non-independence of multiple observations from the same firm (Hanley, Negassa, Edwardes, & Forrester, 2003). A fixed-effects generalized least squares model would not be appropriate for estimation as the precondition (i.e., a firm’s pre-crisis acquisitions) does not vary over time. In all models, I specified a Gaussian distribution with an identity link function, an autoregressive (one year) within-group correlation structure, and robust standard errors (White, 1982).

To test Hypotheses 7 through 10, which predicted the influence of during-crisis acquisitions and divestitures on firm survival, I conducted an event history analysis to model the risk of failure (i.e., firm exit, or the reverse of firm survival). Specifically, as each firm had quarterly data for each observation on delisting, I conducted a discrete-time event history analysis to account for the fact that the same firms are observed over multiple time intervals (quarters) (e.g., Agarwal, Sarkar, & Echambadi, 2002; Carr, Haggard, Hmieleski, & Zahra, 2010; Fischer & Pollock, 2004; Jenkins, 2005). I used a random-effects complementary log-log specification (e.g., Agarwal et al., 2002; Baum & Oliver, 1991; Henderson, 1999) that allows for incorporation of time-varying covariates and estimation with standard errors clustered at the firm level to account for the non-independence of observations of the same firm across quarters, or the unobserved heterogeneity, also known as ‘frailty’ (Jenkins, 2005). As the complementary log-log model assumes an asymmetric cumulative distribution function—which better fit data with relatively rarer events—and builds in a proportional hazards assumption, as does the
Cox regression model for analyzing continuous time (Allison, 1982), it was considered appropriate for fitting the data.

**Results**

Table 1 presents the descriptive statistics and correlations, except for quarter dummies, for the studied variables. There was no serious evidence of multicollinearity, as shown by the maximum Variance Inflation Factor (VIF) of 2.84, which is well below the generally accepted threshold of 10 for indication of multicollinearity (Cohen, Cohen, Aiken, & West, 2013).

[Insert Table 1 about here]

Hypothesis 1 proposed that pre-crisis acquisitions would be positively related to during-crisis acquisitions. As shown in Models 2 and 4 of Table 2, both the number and size of pre-crisis acquisitions are positively related to the number and size of during-crisis acquisitions ($\beta_{\text{number}} = 0.235$, $p < 0.01$; $\beta_{\text{size}} = 0.467$, $p < 0.01$). Thus, Hypothesis 1 is supported. Hypothesis 2 stated that pre-crisis divestitures would be positively related to during-crisis divestitures. As shown in Model 6 of Table 2, the number of pre-crisis divestitures is positively related to during-crisis divestitures ($\beta_{\text{number}} = 0.632$, $p < 0.01$). However, the size of divestitures did not show statistically significant evidence of positive association between pre- and during-crisis divestitures. Therefore, Hypothesis 2 was partially supported.

[Insert Table 2 about here]

Hypotheses 3 proposed a positive relationship between a firm’s pre-crisis acquisitions and its during-crisis divestitures. As shown in Models 2 and 5 of Table 3, pre-crisis acquisitions and during-crisis divestitures are positively related, both in terms
of the number and size of divestments ($\beta_{\text{number}} = 0.271, p < 0.01; \beta_{\text{size}} = 0.065, p < 0.01$).

Thus, Hypothesis 3 was strongly supported. Hypothesis 4 proposed the moderating role of CEO cognitive complexity in this relationship, yet was not supported ($\beta_{\text{number}} = 0.004, p > 0.10; \beta_{\text{size}} = 0.002, p > 0.10$). Hypothesis 5 stated that pre-crisis divestitures would be positively related to during-crisis acquisitions. As shown in Models 9 (full model for number of divestitures) and 11 of Table 3, the number and size of pre-crisis divestitures had significant positive impact on during-crisis acquisitions ($\beta_{\text{number}} = 0.950, p < 0.01; \beta_{\text{size}} = 0.629, p < 0.01$). Furthermore, as Hypothesis 6 proposed, and shown in Model 9 of Table 3, CEOs’ cognitive complexity had a significant moderating role in this relationship, amplifying the positive effect of pre-crisis divestitures on during-crisis acquisitions ($\beta_{\text{number}} = 0.004, p < 0.01$). Thus, Hypothesis 6 was supported. Comparing the results for Hypotheses 4 and 6, it could be the case that making acquisition decisions when firms had engaged in significant divestitures required greater managerial effort than the other way around.

Hypothesis 7 proposed a positive relationship between a firm’s during-crisis acquisitions and its subsequent financial performance. As shown in Models 3 (full model) of Table 4, firms’ number of acquisitions done during the crisis is positively associated with their financial performance going through the crisis period ($\beta_{\text{number}} = 0.001, p < 0.10$). However, the size of during-crisis acquisitions did not show significant influence on performance ($\beta_{\text{size}} = 0.000, p > 0.10$). Therefore, Hypothesis 7 was partially supported.

Hypothesis 8 stated that firms’ during-crisis divestitures would be positively related to their subsequent performance. As shown in Model 6 of Table 4, the size of divestitures
has positive relationship with financial performance during the crisis ($\beta_{\text{size}} = 0.001$, $p < 0.10$). However, the number of divestitures did not have significant influence on performance ($\beta_{\text{number}} = 0.000$, $p > 0.10$). Therefore, Hypothesis 8 was also partially supported.

Hypotheses 9 proposed a positive relationship between during-crisis acquisitions and firm survival. As the dependent variable was coded as 1 if the firm was delisted or exited, a negative coefficient was predicted. As shown in Model 3 of Table 5, firms that have engaged in a greater number of acquisitions during the crisis were less likely to exit, as indicated by the significant and negative coefficient ($\beta_{\text{number}} = -0.666$, $p < 0.01$). However, the size of acquisitions did not significantly increase the chance of firms’ survival ($\beta_{\text{size}} = -0.924$, $p > 0.10$). Thus, Hypothesis 9 was partially supported. Finally, Hypothesis 10 stated that during-crisis divestitures would decrease the likelihood of subsequent firm survival. As also shown in Model 3 of Table 5, firms with a greater number of divestitures were indeed more likely to exit during the crisis ($\beta_{\text{number}} = 0.895$, $p < 0.01$). However, the size of divestitures did not appear to have a significant influence over survival ($\beta_{\text{size}} = 0.444$, $p > 0.10$). Therefore, Hypothesis 10 was also partially supported.

As the complementary log-log model assumes that

$$\log \left[ -\log (1 - h(t)) \right] = \alpha + \beta X$$

where $X$ represents the vector of explanatory variables and $h(t)$ the hazard of exit, we can use the negative coefficient of during-crisis acquisitions and positive coefficient of during-crisis divestitures ($\beta_{\text{acq.}} = -0.666$; $\beta_{\text{div.}} = 0.895$) to interpret that when holding
all else constant, an increase of one acquisition (divestiture) during the crisis reduces (increases) the firm’s chance of exit by 48.6% \((\exp(-0.666) - 1) \times 100\%\) and by 144.7% \((\exp(0.895) - 1) \times 100\%\), respectively. Figure 2 graphically illustrates the comparison between the estimated probabilities (i.e., Kaplan-Meier survival estimates) of financial institutions surviving the crisis in 2007 and onward, depending on their volume of acquisitions and divestitures done during the crisis.

[Insert Table 5 and Figure 2 about here]

**Robustness checks and supplementary analysis**

To further provide evidence of the robustness of the current findings and expand upon the main findings, I conducted several additional analyses. First, as the presence and inputs of chief financial officers (CFOs) may have influence over firms’ strategic decisions in the financial sector, I tested the models predicting the moderating effect of CEOs’ cognitive complexity on the relationship between pre-crisis acquisitions (divestitures) on during-crisis divestitures (acquisitions), controlling for the CFO’s level of cognitive complexity. Consistent with the main analysis, the positive moderating impact of CEOs’ cognitive complexity on the relationship between pre-crisis divestitures and during-crisis acquisitions was supported. It is worth noting, however, that CFOs’ cognitive complexity did not have significant impact in this analysis. Perhaps, CFOs may have had influence over these corporate decisions that involve heavy use of financial resources, yet their cognitive complexity may have been of less significance.

Second, while the role of CEO cognitive complexity in this study has been examined only in the relationship between pre-crisis acquisitions and during-crisis divestitures and vice versa, it is possible that it influences other relationships as well. In a
separate analysis, I found that CEOs’ cognitive complexity has direct, positive relationships with acquisitions and divestitures in the pre-crisis period. Perhaps, the extent of differentiation and integration of information that characterizes CEOs with high cognitive complexity correspond with high volumes of acquisitions and divestitures. Further, it was also found to be positively related to firms’ survival, evidenced by its independent effect as well as by strengthening the positive impact of during-crisis acquisitions and mitigating the negative impact of divestitures. These findings suggest that CEOs’ cognitive complexity may in itself play a nontrivial role in seeking and garnering support from major constituents.

Third, although the relatively less frequent occurrences of firm delisting (exit) justified the use of contemporary log-log models (Allison, 1982), I checked the robustness of these models by using a random effects logit specification, which is another popular alternative for analyzing discrete-time survival data, again estimated with robust standard errors to incorporate unobserved heterogeneity. In addition, I also estimated with Cox regression models, which is best known for analyzing continuous time data but also suitable for discrete-time event history analysis. This set of analyses yielded largely similar results.

**DISCUSSION AND CONCLUSION**

This paper was motivated by the desire to understand how corporate restructuring activities of firms interrelate to each other and eventually influence their performance and survival during situations of highly uncertain and radical environmental shifts. Using the recent financial crisis context, the current study examines the how acquisitions and divestitures done prior to the crisis influence those done during the crisis, both within and
across each strategic activity, and how they eventually affect firms’ performance and survival. Further, it investigates the role of CEOs’ cognitive complexity in firms’ strategic maneuvers for contracting (expanding) prior to the crisis and expand (contract) during the crisis. Analyses of financial firms and their CEOs spanning years prior to and during the recent financial crisis suggests that acquisitions and divestitures done prior to the crisis strengthen not only their own strategic course but also each other during the crisis. In particular, results show that firms’ strategy to divest prior to the crisis and acquire during the crisis is further facilitated when their CEOs have higher cognitive complexity. Further, while increases in acquisitions and divestitures are both found to contribute to improved performance, they exhibit contrasting impacts on firms’ survival—while firms that have grown during the crisis through acquisitions enjoy higher chances of survival, those that have focused on divestments to lean down during the crisis experience higher chances of exit. These findings can offer important contributions to strategic management research.

First, it focuses on a recent, highly important context that had significant impact on firms and the entire U.S. economy, as well as the global economy, and seeks to explain how firms differed in terms of their strategies and performance/survival during the crisis. A number of finance and economics studies burgeoned as soon as the crisis hit the U.S. economy to understand its causes (e.g., Thakor, 2015) and aftermaths (e.g., Atkinson, Lutrell, & Rosenblum, 2013). Surprisingly, to date still not much has been done to understand firms’ behaviors, performance, and survival from a strategy perspective. The findings suggest that two major mechanisms of corporate restructuring exhibited interesting within- and cross-strategy dynamics before and during the crisis,
thereby affecting firms’ survival to various degrees. By doing so, it also confirms the institutional logic of the financial sector, which became particularly salient in the crisis period, that it was those firms that grew bigger that were less likely to fail/die, while those that strengthened their balance sheet through divestitures and refocusing improved performance based on accounting and financial measures but not the chance of their survival.

In the same vein, it extends our understanding of the dynamics of major corporate restructuring activities represented by acquisitions and divestitures in a crisis period and their implications towards performance and survival. While the influence of acquisitions and divestitures on firm performance has not been so clear (e.g., Brauer, 2006; Halebian et al., 2009), recent research points to the importance of context and contingencies in proposing their performance implications (e.g., Lee & Madhavan, 2010; Wan & Yiu, 2009). This study echoes this call and investigates how acquisitions and divestitures done before and during crisis situations can influence firm performance and survival. This study provides evidence that crisis situations, especially those that involve economic adversities, create a context in which firms that grow and gain magnitude through acquisitions enjoy greater performance and chance of survival through garnering more support from key stakeholders while those that contract and shrink through divestitures may be able to improve financial performance, but suffer lower chances of survival as they fail to attract support from external constituents.

**Future research**

Several research opportunities related to this study merit further discussion. First, while this study focused on firms’ acquisitions and divestitures and their performance
implications, it is important to note that governmental interventions were nontrivial drivers in explaining specific acquisition decisions, at least for a subset of firms in this industry. In this regard, how the government’s intervention in firms’ decision of specific acquisition targets influenced the industry dynamics and subsequent firm behavior should be of much interest. Further, bailouts of some institutions by the government were events that had significant practical meaning while creating heated debate among the public, academics, and industry leaders (Thakor, 2015). As such, the level of financial support to financial institutions by governmental forces should be another important outcome to investigate.

Second, and relatedly, exploring the role of the leaders of financial institutions in understanding their relational dynamics with governmental authorities. Specifically, it is likely that the cognitive complexity of financial firm CEOs may shape their tendency and capability of seeking and garnering support from diverse groups of constituents, an extremely influential one being the government. Perhaps, those with higher cognitive complexity may have been more able to seek sources of support for survival and performance improvement, while maintaining the ability to manage the diverse and often conflicting interests of existing stakeholders.

Third, the specific types of businesses that firms decided to acquire or divest—for instance, the extent to which the acquired or divested businesses are outside or within the core business lines of the focal firm—are also worthwhile examining further. Some financial institutions may have certain strategic motivations for acquiring or divesting ones that fall within or outside their major product/service line as firms often have different exploratory and exploitative orientations. Further, it is also possible that
acquisition and/or divestitures of such assets or businesses result in different performance outcomes. Intra- vs. inter-industry may not be the only metric for categorizing the acquired/divested businesses and assets, and further examining the specific nature of these acquisitions and divestitures is worthwhile pursuing.

Conclusion

How firms behave, perform, and even survive in contexts of drastic environmental changes has been one of the central questions for management scholars. This paper focuses on the recent financial crisis and finds evidence that corporate restructuring activities show interesting temporal dynamics within and across strategic courses, which eventually influence firms’ performance and survival during the crisis. It also notes that CEOs, through their cognitive orientations, may play important roles therein. While this study has taken an initiative to understand the antecedents and consequences of major corporate restructuring activities, further examination of the ins and outs of firm behavior in crisis situations remains a fruitful research agenda.


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Appendix B: Figures

Figure 1
CEO cognitive complexity and number of acquisitions in response to industry growth
Figure 2
CEO cognitive complexity and number of new product developments in response to industry growth

![Graph showing the relationship between CEO cognitive complexity and number of new product developments in response to industry growth. The graph includes lines for Low industry growth, Moderate industry growth, and High industry growth.](image_url)
Figure 3
Consolidation of financial institutions, 1990-2009

(Sources: Federal Reserve; Government Accountability Office [GAO])
Figure 4
CEO cognitive complexity, Acquisitions, and Firm effectiveness in the Financial Sector

Financial crisis (2007)

CEO cognitive complexity (pre-crisis) → H1 (+) → Pre-crisis acquisitions (pre-condition) → H2 (+) → During-crisis acquisitions → H4 (+) → Firm survival

CEO cognitive complexity (concurrent) → H3 (+) → During-crisis acquisitions

H5 (+) → Firm survival

H6 (+) → During-crisis acquisitions
Figure 5
Estimated probability of surviving the crisis after 2007, by volume of during-crisis acquisitions
Figure 6
Corporate Restructuring, CEO cognitive complexity, and Firm effectiveness in the Financial Sector

Financial crisis (2007)

Pre-crisis acquisitions

During-crisis acquisitions

Firm financial performance

Pre-crisis divestitures

During-crisis divestitures

Firm survival

CEO cognitive complexity
Figure 7
Estimated probability of surviving the crisis after 2007, by volume of during-crisis acquisitions and divestitures
### Appendix A: Tables

#### Table 1
Descriptive statistics and correlations of variables studied in Chapter 2

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of acquisitions</td>
<td>0.381</td>
<td>0.990</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Size of acquisitions</td>
<td>1.100</td>
<td>2.198</td>
<td>0.738***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Unrelated acquisitions (%)</td>
<td>0.423</td>
<td>0.468</td>
<td>0.083***</td>
<td>0.209</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. R&amp;D investments</td>
<td>84.306</td>
<td>507.756</td>
<td>0.153***</td>
<td>0.182***</td>
<td>0.019</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. Number of new prod. dev.</td>
<td>1.679</td>
<td>6.849</td>
<td>0.141***</td>
<td>0.159***</td>
<td>0.018</td>
<td>0.434***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CEO cognitive complexity</td>
<td>0.045</td>
<td>3.024</td>
<td>0.024***</td>
<td>0.031***</td>
<td>0.013</td>
<td>-0.013***</td>
<td>-0.005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. CEO age</td>
<td>55.766</td>
<td>7.983</td>
<td>0.017***</td>
<td>0.027***</td>
<td>0.011</td>
<td>0.035***</td>
<td>-0.011***</td>
<td>0.044***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. CEO duality</td>
<td>0.143</td>
<td>0.236</td>
<td>-0.002</td>
<td>0.029***</td>
<td>-0.011</td>
<td>0.089***</td>
<td>0.046***</td>
<td>0.013</td>
<td>0.012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. CEO options</td>
<td>0.506</td>
<td>0.500</td>
<td>0.052***</td>
<td>0.055***</td>
<td>0.021</td>
<td>0.030***</td>
<td>0.001</td>
<td>0.083***</td>
<td>0.206***</td>
<td>-0.047***</td>
<td></td>
</tr>
<tr>
<td>10. Over performance</td>
<td>0.027</td>
<td>0.088</td>
<td>-0.038***</td>
<td>-0.049***</td>
<td>-0.034***</td>
<td>0.016***</td>
<td>0.007</td>
<td>-0.04***</td>
<td>-0.025***</td>
<td>0.068***</td>
<td>-0.047***</td>
</tr>
<tr>
<td>11. Under performance</td>
<td>-0.045</td>
<td>0.075</td>
<td>0.054***</td>
<td>0.065***</td>
<td>0.078***</td>
<td>0.031***</td>
<td>0.016***</td>
<td>0.062***</td>
<td>0.039***</td>
<td>-0.024***</td>
<td>0.043***</td>
</tr>
<tr>
<td>12. Firm size</td>
<td>7.027</td>
<td>1.989</td>
<td>0.182***</td>
<td>0.277***</td>
<td>0.061***</td>
<td>0.242***</td>
<td>0.164***</td>
<td>0.11***</td>
<td>0.149***</td>
<td>0.084***</td>
<td>0.141***</td>
</tr>
<tr>
<td>13. Total diversification</td>
<td>0.522</td>
<td>0.568</td>
<td>0.117***</td>
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<tr>
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<td>2.265</td>
<td>-0.077***</td>
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<td>-0.031***</td>
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<td>0.037***</td>
<td>-0.039***</td>
<td>-0.044***</td>
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<td>-0.092***</td>
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<td>-0.077***</td>
<td>-0.02</td>
<td>-0.023***</td>
<td>0.033***</td>
<td>-0.025***</td>
<td>-0.075***</td>
<td>0.043***</td>
<td>-0.061***</td>
</tr>
<tr>
<td>16. Industry mean number of acq.</td>
<td>0.424</td>
<td>0.164</td>
<td>0.101***</td>
<td>0.093***</td>
<td>0.055***</td>
<td>-0.028***</td>
<td>0.025***</td>
<td>0.039***</td>
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<td>-0.031***</td>
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<td>1.100</td>
<td>0.320</td>
<td>0.146***</td>
<td>0.146***</td>
<td>0.087***</td>
<td>-0.005</td>
<td>0.013***</td>
<td>0.02***</td>
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<td>1.410</td>
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<td>-0.003</td>
<td>0.007</td>
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<td>0.167***</td>
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<td>-0.037***</td>
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<td>3.063</td>
<td>0.027***</td>
<td>0.011***</td>
<td>-0.013</td>
<td>0.080***</td>
<td>0.237***</td>
<td>-0.024***</td>
<td>-0.058***</td>
<td>0.046***</td>
<td>-0.033***</td>
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<td>20. Industry growth</td>
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<td>3.348</td>
<td>0.086***</td>
<td>0.010</td>
<td>-0.013</td>
<td>0.010</td>
<td>0.000</td>
<td>-0.004</td>
<td>-0.004</td>
<td>-0.012*</td>
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<td>12. Firm size</td>
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<td>13. Total diversification</td>
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<td>14. Current ratio</td>
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<tr>
<td>19. Industry mean new prod. dev.</td>
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<td>20. Industry growth</td>
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*p < .01, *p < .05, *p < .10; N = 5,570; To conserve space, statistics of industry and year dummies are not shown.
## Table 2
CEO cognitive complexity and number of acquisitions
Zero-inflated negative binomial regressions with clustered standard errors

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<tr>
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<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td></td>
</tr>
<tr>
<td>Over performance</td>
<td>-0.572**</td>
<td>-0.548*</td>
<td>-0.550*</td>
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<td></td>
<td>[0.289]</td>
<td>[0.283]</td>
<td>[0.284]</td>
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<tr>
<td>Underperformance</td>
<td>0.719**</td>
<td>0.706**</td>
<td>0.733**</td>
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</tr>
<tr>
<td></td>
<td>[0.356]</td>
<td>[0.357]</td>
<td>[0.346]</td>
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<tr>
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<td>-0.219***</td>
<td>-0.221***</td>
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<td>[0.018]</td>
<td>[0.018]</td>
<td>[0.018]</td>
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<tr>
<td>Total diversification</td>
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<td>0.037</td>
<td>0.043</td>
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<tr>
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<td>[0.047]</td>
<td>[0.046]</td>
<td>[0.046]</td>
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<td>-0.021</td>
<td>-0.021</td>
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<tr>
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<td>[0.016]</td>
<td>[0.016]</td>
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<td>Equity/Debt ratio</td>
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<td>0.022</td>
<td>0.020</td>
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<td>[0.014]</td>
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<td>[0.003]</td>
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<td>[0.103]</td>
<td>[0.103]</td>
<td>[0.104]</td>
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<tr>
<td>CEO duality</td>
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<td>0.009</td>
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<td></td>
<td>[0.046]</td>
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<td>[0.003]</td>
<td>[0.003]</td>
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<td>Focal year size of acquisitions</td>
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<td>0.603***</td>
<td>0.605***</td>
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<tr>
<td></td>
<td>[0.011]</td>
<td>[0.011]</td>
<td>[0.011]</td>
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<tr>
<td>Industry mean number of acquisitions</td>
<td>-10.172**</td>
<td>-9.900**</td>
<td>-9.421**</td>
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<td>[0.010]</td>
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<td>CEO CC × Industry growth</td>
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<td>3.800*</td>
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<td>[2.325]</td>
<td>[2.262]</td>
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<td>-26,107.572</td>
<td>-26,094.170</td>
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<td>42,934.446</td>
<td>42,961.250</td>
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<td>12,373</td>
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** $p < .01$,  * $p < .05$,  . $p < .10$; two-tailed tests

Standard errors were clustered at the firm-CEO level.

Coefficients for industry and year dummies are not reported.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
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<td>Over performance</td>
<td>0.247**</td>
<td>0.252**</td>
<td>0.252**</td>
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<tr>
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<td>[0.101]</td>
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<tr>
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<td>0.462***</td>
<td>0.460***</td>
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<td>[0.146]</td>
<td>[0.146]</td>
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<td>0.148***</td>
<td>0.148***</td>
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<tr>
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<td>[0.011]</td>
<td>[0.011]</td>
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<td>0.062**</td>
<td>0.061**</td>
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<td>-0.000</td>
<td>-0.000</td>
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<td>[0.007]</td>
<td>[0.007]</td>
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<td>-0.004*</td>
<td>-0.004*</td>
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<td>CEO duality</td>
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<td>0.006</td>
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<td>0.000*</td>
<td>0.000*</td>
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<td>[0.094]</td>
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<td>[0.094]</td>
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<td>CEO cognitive complexity (CC)</td>
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<td>CEO CC \times Industry growth</td>
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\[R^2 \quad | \quad | \quad \]
\[N \quad | \quad | \quad \]

\[^{***}p < .01, \quad ^{**}p < .05, \quad ^{*}p < .10; \quad \text{two-tailed tests}^\]

Standard errors were clustered at the firm-CEO level.

Coefficients for industry and year dummies are not reported.
Table 4
CEO cognitive complexity and unrelated acquisitions
Fractional logit regressions with clustered standard errors

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<th>Unrelated acquisitions (%)</th>
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</tr>
<tr>
<td>Over performance</td>
<td>-0.059</td>
<td>-0.001</td>
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<td>[0.518]</td>
<td>[0.517]</td>
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<tr>
<td>Underperformance</td>
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<td>1.607**</td>
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</tr>
<tr>
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<td>[0.747]</td>
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</tr>
<tr>
<td>Firm size</td>
<td>0.014</td>
<td>0.006</td>
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</tr>
<tr>
<td></td>
<td>[0.066]</td>
<td>[0.066]</td>
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</tr>
<tr>
<td>Total diversification</td>
<td>0.233***</td>
<td>0.232***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.072]</td>
<td>[0.071]</td>
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</tr>
<tr>
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<tr>
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<td>[0.025]</td>
<td>[0.025]</td>
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</tr>
<tr>
<td>Equity/Debt ratio</td>
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<td>-0.004</td>
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<td>[0.026]</td>
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<tr>
<td>CEO age</td>
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<td>-0.010**</td>
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<td>[0.004]</td>
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<td>[0.126]</td>
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<tr>
<td>CEO duality</td>
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<td>0.058</td>
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<td>[0.065]</td>
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<td>[1.606]</td>
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<tr>
<td>CEO cognitive complexity (CC)</td>
<td>0.027***</td>
<td>0.010</td>
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<tr>
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<td>3,909</td>
<td>3,909</td>
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</table>

*** $p < .01$, ** $p < .05$, * $p < .10$; two-tailed tests
Standard errors were clustered at the firm-CEO level.
Coefficients for industry and year dummies are not reported.
<table>
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<th>VARIABLES</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over performance</td>
<td>-29.085</td>
<td>-29.962</td>
<td>-29.838</td>
</tr>
<tr>
<td></td>
<td>[21.375]</td>
<td>[21.444]</td>
<td>[21.454]</td>
</tr>
<tr>
<td>Underperformance</td>
<td>-55.715**</td>
<td>-55.832**</td>
<td>-56.248**</td>
</tr>
<tr>
<td></td>
<td>[28.081]</td>
<td>[28.111]</td>
<td>[28.143]</td>
</tr>
<tr>
<td>Firm size</td>
<td>126.638***</td>
<td>127.775***</td>
<td>127.676***</td>
</tr>
<tr>
<td></td>
<td>[13.325]</td>
<td>[13.452]</td>
<td>[13.446]</td>
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<tr>
<td>Total diversification</td>
<td>0.029</td>
<td>-0.138</td>
<td>-0.259</td>
</tr>
<tr>
<td></td>
<td>[10.940]</td>
<td>[10.946]</td>
<td>[10.959]</td>
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<tr>
<td>Current ratio</td>
<td>-4.481*</td>
<td>-4.344*</td>
<td>-4.321*</td>
</tr>
<tr>
<td></td>
<td>[2.370]</td>
<td>[2.371]</td>
<td>[2.373]</td>
</tr>
<tr>
<td>Equity/Debt ratio</td>
<td>-1.334</td>
<td>-1.360</td>
<td>-1.362</td>
</tr>
<tr>
<td></td>
<td>[2.106]</td>
<td>[2.103]</td>
<td>[2.103]</td>
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<tr>
<td>CEO age</td>
<td>-2.761</td>
<td>-2.772</td>
<td>-2.773</td>
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<tr>
<td></td>
<td>[2.878]</td>
<td>[2.873]</td>
<td>[2.874]</td>
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<tr>
<td>CEO options</td>
<td>16.753</td>
<td>18.009</td>
<td>18.202</td>
</tr>
<tr>
<td></td>
<td>[16.409]</td>
<td>[16.469]</td>
<td>[16.465]</td>
</tr>
<tr>
<td>CEO duality</td>
<td>17.047</td>
<td>18.186</td>
<td>18.172</td>
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<tr>
<td>Number of new product developments</td>
<td>4.559</td>
<td>4.565</td>
<td>4.567</td>
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<tr>
<td></td>
<td>[3.117]</td>
<td>[3.114]</td>
<td>[3.115]</td>
</tr>
<tr>
<td>Size of acquisitions</td>
<td>11.398***</td>
<td>11.371***</td>
<td>11.376***</td>
</tr>
<tr>
<td></td>
<td>[3.612]</td>
<td>[3.603]</td>
<td>[3.603]</td>
</tr>
<tr>
<td>Number of acquisitions</td>
<td>-22.177***</td>
<td>-22.288***</td>
<td>-22.301***</td>
</tr>
<tr>
<td></td>
<td>[8.120]</td>
<td>[8.092]</td>
<td>[8.089]</td>
</tr>
<tr>
<td>Industry mean R&amp;D investments</td>
<td>4.074***</td>
<td>4.046***</td>
<td>3.924***</td>
</tr>
<tr>
<td></td>
<td>[1.345]</td>
<td>[1.346]</td>
<td>[1.393]</td>
</tr>
<tr>
<td>Industry growth</td>
<td>0.109</td>
<td>0.098</td>
<td>24.087</td>
</tr>
<tr>
<td></td>
<td>[2.495]</td>
<td>[2.493]</td>
<td>[22.539]</td>
</tr>
<tr>
<td>CEO cognitive complexity (CC)</td>
<td>-3.113**</td>
<td>-3.910**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[1.552]</td>
<td>[1.614]</td>
<td></td>
</tr>
<tr>
<td>CEO CC × Industry growth</td>
<td>8.903</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[7.849]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1,768.828***</td>
<td>-1,764.399***</td>
<td>-1,714.328***</td>
</tr>
<tr>
<td></td>
<td>[610.850]</td>
<td>[611.027]</td>
<td>[630.733]</td>
</tr>
</tbody>
</table>

| $R^2$                          | 0.336         | 0.337         | 0.337         |
| $N$                            | 10,329        | 10,329        | 10,329        |

***$p < .01$, **$p < .05$, *$p < .10$; two-tailed tests

Standard errors were clustered at the firm-CEO level.
Coefficients for industry and year dummies are not reported.
## Table 6
CEO cognitive complexity and new product developments
Zero-inflated negative binomial regressions with clustered standard errors

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of new product developments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Over performance</td>
<td>1.095***</td>
</tr>
<tr>
<td></td>
<td>[0.301]</td>
</tr>
<tr>
<td>Underperformance</td>
<td>-0.560</td>
</tr>
<tr>
<td></td>
<td>[0.403]</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.340***</td>
</tr>
<tr>
<td></td>
<td>[0.028]</td>
</tr>
<tr>
<td>Total diversification</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>[0.065]</td>
</tr>
<tr>
<td>Current ratio</td>
<td>0.033*</td>
</tr>
<tr>
<td></td>
<td>[0.018]</td>
</tr>
<tr>
<td>Equity/Debt ratio</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>[0.017]</td>
</tr>
<tr>
<td>CEO age</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>[0.006]</td>
</tr>
<tr>
<td>CEO options</td>
<td>0.649***</td>
</tr>
<tr>
<td></td>
<td>[0.149]</td>
</tr>
<tr>
<td>CEO duality</td>
<td>0.040</td>
</tr>
<tr>
<td></td>
<td>[0.080]</td>
</tr>
<tr>
<td>Number of acquisitions</td>
<td>0.017</td>
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<tr>
<td></td>
<td>[0.028]</td>
</tr>
<tr>
<td>Industry mean number of</td>
<td>0.302</td>
</tr>
<tr>
<td>new product developments</td>
<td>[0.235]</td>
</tr>
<tr>
<td>R&amp;D investments</td>
<td>0.000***</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
</tr>
<tr>
<td>Industry growth</td>
<td>-0.101</td>
</tr>
<tr>
<td></td>
<td>[0.177]</td>
</tr>
<tr>
<td>CEO cognitive complexity (CC)</td>
<td>-0.025**</td>
</tr>
<tr>
<td></td>
<td>[0.012]</td>
</tr>
<tr>
<td>CEO CC × Industry growth</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-3.573***</td>
</tr>
<tr>
<td></td>
<td>[0.670]</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-71,657.684</td>
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<tr>
<td>Likelihood Ratio (LR) $\chi^2$</td>
<td>30,455.024***</td>
</tr>
<tr>
<td>$N$</td>
<td>12,317</td>
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</tbody>
</table>

*** $p < .01$, ** $p < .05$, * $p < .10$; two-tailed tests

Standard errors were clustered at the firm-CEO level. Coefficients for industry and year dummies are not reported.
## Table 7
Descriptive statistics and correlations of variables studied in Chapter 3

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Financial performance (ROA)</td>
<td>0.021</td>
<td>0.094</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. During-crisis acquisitions (number)</td>
<td>0.593</td>
<td>1.402</td>
<td>-0.014</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. During-crisis acquisitions (size)</td>
<td>2.056</td>
<td>4.191</td>
<td>-0.015</td>
<td>0.322**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pre-crisis acquisitions (number)</td>
<td>1.134</td>
<td>2.255</td>
<td>-0.021</td>
<td>0.235***</td>
<td>0.054***</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Pre-crisis acquisitions (size)</td>
<td>1.487</td>
<td>2.261</td>
<td>-0.033*</td>
<td>0.179***</td>
<td>0.171***</td>
<td>0.751***</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CEO cognitive complexity</td>
<td>0.008</td>
<td>3.085</td>
<td>0.039**</td>
<td>0.062***</td>
<td>0.047***</td>
<td>0.013</td>
<td>0.011</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Firm size</td>
<td>8.481</td>
<td>1.852</td>
<td>-0.048****</td>
<td>0.204***</td>
<td>0.252***</td>
<td>0.112***</td>
<td>0.347***</td>
<td>0.075***</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Financial slack</td>
<td>0.800</td>
<td>1.789</td>
<td>0.184***</td>
<td>-0.022</td>
<td>-0.037**</td>
<td>-0.068***</td>
<td>-0.079***</td>
<td>0.014</td>
<td>-0.357***</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. CEO shareholdings</td>
<td>0.008</td>
<td>0.021</td>
<td>0.065***</td>
<td>-0.059***</td>
<td>-0.042**</td>
<td>-0.014</td>
<td>-0.065***</td>
<td>0.012</td>
<td>-0.207***</td>
<td>0.067***</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10. CEO duality</td>
<td>0.498</td>
<td>0.500</td>
<td>0.021</td>
<td>-0.008</td>
<td>0.001</td>
<td>0.030*</td>
<td>0.07***</td>
<td>0.098***</td>
<td>0.079***</td>
<td>0.025</td>
<td>0.186***</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>11. Board independence</td>
<td>0.743</td>
<td>0.130</td>
<td>-0.058***</td>
<td>0.041**</td>
<td>-0.009</td>
<td>-0.051***</td>
<td>-0.098***</td>
<td>-0.119***</td>
<td>-0.020</td>
<td>-0.034*</td>
<td>-0.089***</td>
<td>-0.174***</td>
<td>--</td>
</tr>
<tr>
<td>12. Holding company dummy</td>
<td>0.261</td>
<td>0.439</td>
<td>0.035**</td>
<td>0.114***</td>
<td>-0.035**</td>
<td>0.248***</td>
<td>0.152***</td>
<td>0.079***</td>
<td>-0.268***</td>
<td>0.24***</td>
<td>-0.009</td>
<td>-0.027</td>
<td>-0.139***</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01
Table 8
Cross-sectional negative binomial regression and OLS regression with robust standard errors

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Number of acquisitions</th>
<th>Size of acquisitions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.030</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>[0.059]</td>
<td>[0.059]</td>
</tr>
<tr>
<td>Financial slack</td>
<td>-0.143**</td>
<td>-0.138**</td>
</tr>
<tr>
<td></td>
<td>[0.069]</td>
<td>[0.067]</td>
</tr>
<tr>
<td>Board independence</td>
<td>0.461</td>
<td>0.862</td>
</tr>
<tr>
<td></td>
<td>[1.049]</td>
<td>[1.010]</td>
</tr>
<tr>
<td></td>
<td>[8.778]</td>
<td>[9.220]</td>
</tr>
<tr>
<td>CEO duality</td>
<td>0.201</td>
<td>0.196</td>
</tr>
<tr>
<td></td>
<td>[0.244]</td>
<td>[0.237]</td>
</tr>
<tr>
<td>Holding company</td>
<td>0.892***</td>
<td>0.858***</td>
</tr>
<tr>
<td></td>
<td>[0.302]</td>
<td>[0.294]</td>
</tr>
<tr>
<td>CEO cognitive complexity (pre-crisis: 2004): H1 (+)</td>
<td>0.077**</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>[0.036]</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.390</td>
<td>-0.353</td>
</tr>
<tr>
<td></td>
<td>[1.036]</td>
<td>[0.974]</td>
</tr>
<tr>
<td>Chi²</td>
<td>12.24*</td>
<td>18.27**</td>
</tr>
<tr>
<td>R²</td>
<td>0.151</td>
<td>0.151</td>
</tr>
<tr>
<td>N</td>
<td>176</td>
<td>176</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01; two-tailed tests
Table 9
Pre-crisis (2005-2006) and During-crisis (2007-2010) acquisitions a
GEE models with robust standard errors b

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>DV: During-crisis acquisitions (running sum) a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of acquisitions</td>
</tr>
<tr>
<td></td>
<td>Model 1  Model 2  Model 3</td>
</tr>
<tr>
<td>Firm size (quarterly log of total assets)</td>
<td>0.302*** 0.238*** 0.302***</td>
</tr>
<tr>
<td>Financial slack (quarterly)</td>
<td>-0.005  -0.005  -0.005</td>
</tr>
<tr>
<td>Prior quarter ROA (quarterly)</td>
<td>-0.255  -0.215  -0.255</td>
</tr>
<tr>
<td>Holding company</td>
<td>-0.009  -0.302  -0.009</td>
</tr>
<tr>
<td>Precondition: <strong>H2 (+)</strong></td>
<td>0.316*** [0.116]</td>
</tr>
<tr>
<td>CEO cognitive complexity (during-crisis, quarterly): <strong>H3 (+)</strong></td>
<td>0.001 0.000</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.421*** -2.199*** -2.421***</td>
</tr>
<tr>
<td></td>
<td>[0.641] [0.521] [0.641]</td>
</tr>
<tr>
<td>Chi²</td>
<td>94.47** 95.97** 94.47**</td>
</tr>
<tr>
<td>N</td>
<td>2,690 2,690 2,690</td>
</tr>
</tbody>
</table>

p < 0.10, **p < 0.05, ***p < 0.01; two-tailed tests

a measured quarterly

b coefficients of dummies for year-quarters are not reported
Table 10  
During-crisis acquisitions and firm exit (2007-2011) \(^a\) 
Discrete-time event history analysis with clustered standard errors \(^b\)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Number of acquisitions (^b)</th>
<th>Size of acquisitions (^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior quarter ROA</td>
<td>-109.635***</td>
<td>-106.811***</td>
</tr>
<tr>
<td></td>
<td>[4.708]</td>
<td>[5.345]</td>
</tr>
<tr>
<td>Prior quarter financial slack</td>
<td>-6.130***</td>
<td>-6.117***</td>
</tr>
<tr>
<td></td>
<td>[0.308]</td>
<td>[0.323]</td>
</tr>
<tr>
<td>Holding company</td>
<td>3.840***</td>
<td>3.718***</td>
</tr>
<tr>
<td></td>
<td>[0.286]</td>
<td>[0.291]</td>
</tr>
<tr>
<td>During-crisis number of acquisitions (quarterly running sum) (^c): H4 (-)</td>
<td>-0.397***</td>
<td>-0.612***</td>
</tr>
<tr>
<td></td>
<td>[0.057]</td>
<td>[0.080]</td>
</tr>
<tr>
<td>CEO cognitive complexity (during-crisis, quarterly): H5 (-)</td>
<td>-0.304***</td>
<td>-0.314***</td>
</tr>
<tr>
<td></td>
<td>[0.027]</td>
<td>[0.005]</td>
</tr>
<tr>
<td>During-crisis number of acquisitions (^c) × CEO cognitive complexity: H6 (-)</td>
<td>-0.109***</td>
<td>-0.036***</td>
</tr>
<tr>
<td></td>
<td>[0.018]</td>
<td>[0.012]</td>
</tr>
<tr>
<td></td>
<td>[0.153]</td>
<td>[0.165]</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-31.75</td>
<td>-31.00</td>
</tr>
<tr>
<td>(N)</td>
<td>1,482</td>
<td>1,482</td>
</tr>
</tbody>
</table>

\(^a\) \(p < 0.10, \,** p < 0.05, \,** * p < 0.01\); two-tailed tests  
\(^a\) coefficients of dummies for year-quarters are not reported  
\(^b\) measured quarterly  
\(^c\) lagging 2, 3, and 4 quarters all yielded similar results
Table 11
Descriptive statistics and correlations of variables studied in Chapter 4

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Financial performance (ROA)</td>
<td>0.012</td>
<td>0.028</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. During-crisis acquisitions (number)</td>
<td>0.257</td>
<td>1.962</td>
<td>-0.006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. During-crisis acquisitions (size)</td>
<td>0.426</td>
<td>2.484</td>
<td>-0.023</td>
<td>0.510</td>
<td></td>
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</tr>
<tr>
<td>4. Pre-crisis acquisitions (number)</td>
<td>1.360</td>
<td>2.666</td>
<td>-0.067</td>
<td>0.124</td>
<td>0.215</td>
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<tr>
<td>5. Pre-crisis acquisitions (size)</td>
<td>1.531</td>
<td>2.292</td>
<td>-0.105</td>
<td>0.133</td>
<td>0.218</td>
<td>0.772</td>
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<tr>
<td>6. During-crisis divestitures (number)</td>
<td>0.062</td>
<td>0.510</td>
<td>-0.020</td>
<td>0.386</td>
<td>0.519</td>
<td>0.144</td>
<td>0.233</td>
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<tr>
<td>7. During-crisis divestitures (size)</td>
<td>0.172</td>
<td>1.359</td>
<td>-0.026</td>
<td>0.321</td>
<td>0.501</td>
<td>0.111</td>
<td>0.201</td>
<td>0.815</td>
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<td>8. Pre-crisis divestitures (number)</td>
<td>0.124</td>
<td>0.575</td>
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<td>0.305</td>
<td>0.252</td>
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<td>9. Pre-crisis divestitures (size)</td>
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<tr>
<td>10. CEO cognitive complexity</td>
<td>0.141</td>
<td>3.048</td>
<td>0.006</td>
<td>0.122</td>
<td>0.100</td>
<td>0.049</td>
<td>0.052</td>
<td>0.06</td>
<td>0.041</td>
<td>0.134</td>
</tr>
<tr>
<td>11. Firm size</td>
<td>7.489</td>
<td>2.112</td>
<td>-0.203</td>
<td>0.190</td>
<td>0.248</td>
<td>0.184</td>
<td>0.361</td>
<td>0.235</td>
<td>0.221</td>
<td>0.309</td>
</tr>
<tr>
<td>12. Financial slack</td>
<td>1.247</td>
<td>4.771</td>
<td>0.184</td>
<td>-0.024</td>
<td>-0.029</td>
<td>-0.069</td>
<td>-0.070</td>
<td>-0.028</td>
<td>-0.028</td>
<td>-0.042</td>
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<tr>
<td>13. Cash holding</td>
<td>0.095</td>
<td>0.154</td>
<td>0.360</td>
<td>-0.047</td>
<td>-0.084</td>
<td>-0.119</td>
<td>-0.170</td>
<td>-0.065</td>
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<td>14. Holding company</td>
<td>0.481</td>
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<td>0.178</td>
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<td>-0.063</td>
<td>0.167</td>
<td>0.107</td>
<td>-0.080</td>
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<tr>
<td>15. Board independence</td>
<td>0.739</td>
<td>0.130</td>
<td>-0.130</td>
<td>0.032</td>
<td>0.015</td>
<td>-0.024</td>
<td>-0.074</td>
<td>-0.004</td>
<td>0.019</td>
<td>-0.061</td>
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<tr>
<td>16. CEO shareholdings</td>
<td>0.009</td>
<td>0.020</td>
<td>0.135</td>
<td>-0.057</td>
<td>-0.075</td>
<td>-0.033</td>
<td>-0.076</td>
<td>-0.078</td>
<td>-0.068</td>
<td>-0.085</td>
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<tr>
<td>17. CEO duality</td>
<td>0.504</td>
<td>0.500</td>
<td>0.052</td>
<td>0.033</td>
<td>-0.021</td>
<td>0.015</td>
<td>0.044</td>
<td>0.042</td>
<td>0.027</td>
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<th>13</th>
<th>14</th>
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<th>16</th>
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<tr>
<td>10. CEO cognitive complexity</td>
<td>0.128</td>
<td>***</td>
<td></td>
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<td></td>
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<tr>
<td>11. Firm size</td>
<td>0.217</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Financial slack</td>
<td>-0.035</td>
<td>***</td>
<td>-0.010</td>
<td>-0.258</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Cash holding</td>
<td>-0.105</td>
<td>***</td>
<td>-0.090</td>
<td>-0.415</td>
<td>***</td>
<td>-0.217</td>
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<td></td>
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<tr>
<td>14. Holding company</td>
<td>-0.030</td>
<td>0.038</td>
<td>-0.176</td>
<td>0.271</td>
<td>-0.08</td>
<td>0.037</td>
<td>0.006</td>
<td>0.016</td>
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<tr>
<td>15. Board independence</td>
<td>-0.092</td>
<td>-0.100</td>
<td>-0.025</td>
<td>-0.001</td>
<td>0.021</td>
<td>-0.157</td>
<td></td>
<td></td>
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<tr>
<td>16. CEO shareholdings</td>
<td>-0.060</td>
<td>0.008</td>
<td>-0.225</td>
<td>0.061</td>
<td>0.091</td>
<td>-0.010</td>
<td>-0.076</td>
<td>0.075</td>
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<tr>
<td>17. CEO duality</td>
<td>0.021</td>
<td>0.091</td>
<td>0.070</td>
<td>0.051</td>
<td>0.020</td>
<td>-0.030</td>
<td>-0.168</td>
<td>0.182</td>
</tr>
</tbody>
</table>

*p < 0.10, ** p < 0.05, *** p < 0.01
Table 12
Within-strategy effects: Pre-crisis (2005-2006) and During-crisis (2007-2010) acquisitions and divestitures a
GEE models with robust standard errors b

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>DV: During-crisis acquisitions (running sum) a</th>
<th>DV: During-crisis divestitures (running sum) a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Size</td>
</tr>
<tr>
<td>Firm size (quarterly)</td>
<td>0.191***</td>
<td>0.146***</td>
</tr>
<tr>
<td>Financial slack (quarterly)</td>
<td>-0.006</td>
<td>-0.006</td>
</tr>
<tr>
<td>Prior quarter ROA (quarterly)</td>
<td>0.320</td>
<td>0.531*</td>
</tr>
<tr>
<td>Holding company (quarterly)</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>CEO cognitive complexity (quarterly)</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>Pre-crisis divestitures</td>
<td>1.158***</td>
<td>0.993***</td>
</tr>
<tr>
<td>Pre-crisis acquisitions</td>
<td>0.235***</td>
<td>0.467***</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.769***</td>
<td>-1.586***</td>
</tr>
<tr>
<td>(\chi^2)</td>
<td>122.3</td>
<td>141.4</td>
</tr>
<tr>
<td>(N)</td>
<td>2,690</td>
<td>2,690</td>
</tr>
</tbody>
</table>

* p < 0.10, ** p < 0.05, *** p < 0.01; two-tailed tests
a measured quarterly
b coefficients of dummies for year-quarters are not reported
Table 13
GEE models with robust standard errors

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>DV: During-crisis acquisitions (running sum)</th>
<th>DV: During-crisis divestitures (running sum)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number Size</td>
<td>Number Size</td>
</tr>
<tr>
<td></td>
<td>M1  M2  M3  M4  M5  M6</td>
<td>M7  M8  M9  M10  M11  M12</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.186*** 0.113** 0.114** 0.347** 0.258** 0.259**</td>
<td>0.046** 0.193*** 0.191*** 0.269*** 0.035* 0.034*</td>
</tr>
<tr>
<td></td>
<td>[0.055] [0.046] [0.046] [0.140] [0.122] [0.122]</td>
<td>[0.020] [0.070] [0.070] [0.090] [0.020] [0.020]</td>
</tr>
<tr>
<td>Financial slack</td>
<td>-0.005 -0.006 -0.006 -0.020 -0.021 -0.021</td>
<td>0.001 0.005 0.004 0.005 0.001 0.001</td>
</tr>
<tr>
<td></td>
<td>[0.007] [0.007] [0.007] [0.024] [0.023] [0.023]</td>
<td>[0.001] [0.005] [0.005] [0.005] [0.001] [0.001]</td>
</tr>
<tr>
<td>ROA</td>
<td>-0.064 -0.077 -0.083 -1.463 -1.499 -1.512</td>
<td>-0.231 0.432 0.421 0.436 -0.231 -0.238</td>
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<tr>
<td></td>
<td>[0.403] [0.383] [0.382] [1.400] [1.386] [1.384]</td>
<td>[0.155] [0.483] [0.480] [0.491] [0.156] [0.156]</td>
</tr>
<tr>
<td>Holding company</td>
<td>-0.159 -0.301 -0.301 0.532 -0.320 -0.317</td>
<td>-0.252*** -0.898** -0.899** -0.634** -0.310** -0.309**</td>
</tr>
<tr>
<td></td>
<td>[0.301] [0.280] [0.280] [0.661] [0.666] [0.666]</td>
<td>[0.119] [0.359] [0.358] [0.321] [0.124] [0.123]</td>
</tr>
<tr>
<td>CEO cognitive complexity</td>
<td>0.001 0.001 0.001 -0.003 -0.003 -0.007</td>
<td>0.000 0.011* 0.005 0.011* 0.000 -0.002</td>
</tr>
<tr>
<td>(quarterly)</td>
<td>[0.002] [0.002] [0.002] [0.008] [0.008] [0.008]</td>
<td>[0.002] [0.006] [0.005] [0.006] [0.002] [0.002]</td>
</tr>
<tr>
<td>Pre-crisis acquisitions</td>
<td>0.246** 0.167** 0.166** 0.648*** 0.457** 0.457**</td>
<td>0.271** 0.271** 0.065** 0.065**</td>
</tr>
<tr>
<td></td>
<td>[0.117] [0.069] [0.069] [0.250] [0.184] [0.184]</td>
<td>[0.114] [0.114] [0.026] [0.026]</td>
</tr>
<tr>
<td>Pre-crisis divestitures</td>
<td>0.957*** 0.950*** 0.629*** 0.622***</td>
<td>0.796*** 0.205** 0.204** 0.242** 0.746*** 0.743***</td>
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<tr>
<td></td>
<td>[0.256] [0.256] [0.172] [0.177]</td>
<td>[0.191] [0.090] [0.089] [0.101] [0.188] [0.187]</td>
</tr>
<tr>
<td>Pre-crisis acquisitions x CEO</td>
<td>0.004**</td>
<td>0.003</td>
</tr>
<tr>
<td>cognitive complexity</td>
<td>[0.004]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Pre-crisis divestitures x CEO</td>
<td>0.004**</td>
<td>0.003</td>
</tr>
<tr>
<td>cognitive complexity</td>
<td>[0.002]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.659*** -1.190*** -1.190*** -3.376*** -2.714** -2.716**</td>
<td>-0.492*** -1.862*** -1.844*** -2.237*** -0.448*** -0.430***</td>
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<td></td>
<td>[0.501] [0.374] [0.374] [1.282] [1.056] [1.057]</td>
<td>[0.173] [0.618] [0.618] [0.751] [0.163] [0.162]</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>93.82 118.5 124.5 68.66 101.6 158.0</td>
<td>47.35 56.27 57.66 53.57 57.12 61.42</td>
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</table>

p < 0.10, **p < 0.05, ***p < 0.01; two-tailed tests
*a* measured quarterly
b coefficients of dummies for year-quarters are not reported
<table>
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<th>VARIABLES</th>
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<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
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<tr>
<td>Firm size</td>
<td>-0.001***</td>
<td>-0.001***</td>
<td>-0.002***</td>
<td>-0.002***</td>
<td>-0.002***</td>
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<tr>
<td></td>
<td>[0.001]</td>
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<td>Financial slack</td>
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<td>0.000</td>
<td>0.000</td>
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<td></td>
<td>[0.001]</td>
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<td>[0.001]</td>
<td>[0.001]</td>
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<tr>
<td>Prior year ROA</td>
<td>0.843***</td>
<td>0.843***</td>
<td>0.843***</td>
<td>0.845***</td>
<td>0.842***</td>
<td>0.844***</td>
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<tr>
<td></td>
<td>[0.039]</td>
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<td>[0.039]</td>
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<td>0.028**</td>
<td>0.028**</td>
<td>0.028**</td>
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<tr>
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<td>Holding company</td>
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<td>0.002</td>
<td>0.002</td>
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<td>[0.004]</td>
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<tr>
<td>CEO shareholdings</td>
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<td>-0.078</td>
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<td>-0.077</td>
<td>-0.080</td>
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<td>[0.093]</td>
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<td>[0.092]</td>
<td>[0.092]</td>
<td>[0.092]</td>
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<tr>
<td>CEO duality</td>
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<td>0.003*</td>
<td>0.003*</td>
<td>0.003*</td>
<td>0.003*</td>
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<td>[0.002]</td>
<td>[0.002]</td>
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<tr>
<td>During-crisis divestitures</td>
<td>0.001*</td>
<td>0.000</td>
<td>0.001*</td>
<td>0.001**</td>
<td>0.001*</td>
<td>0.001*</td>
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<td>(annual running sum)</td>
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<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>During-crisis acquisitions</td>
<td>0.001*</td>
<td>0.001*</td>
<td>0.000*</td>
<td>0.000*</td>
<td>0.000*</td>
<td>0.000*</td>
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<tr>
<td>(annual running sum)</td>
<td>[0.001]</td>
<td>[0.001]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
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</tr>
<tr>
<td>Constant</td>
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</tr>
<tr>
<td>$\chi^2$</td>
<td>1.611</td>
<td>1.596</td>
<td>1.640</td>
<td>1.803</td>
<td>1.580</td>
<td>1.838</td>
</tr>
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<td>N</td>
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<td>1.052</td>
<td>1.052</td>
<td>1.052</td>
<td>1.052</td>
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</table>

*p < 0.10, **p < 0.05, ***p < 0.01; two-tailed tests

*a measured annually

*b coefficients of dummies for years are not reported
Table 15
During-crisis acquisitions/divestitures and firm exit (2007-2011) a
Discrete-time event history analysis with clustered standard errors b

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>IV: Number of acquisitions and divestitures b</th>
<th>IV: Size of acquisitions and divestitures b</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M1</td>
<td>M2</td>
</tr>
<tr>
<td>Prior quarter ROA</td>
<td>-114.468***</td>
<td>-113.931***</td>
</tr>
<tr>
<td></td>
<td>[15.701]</td>
<td>[15.892]</td>
</tr>
<tr>
<td></td>
<td>[2.842]</td>
<td>[3.368]</td>
</tr>
<tr>
<td>Holding company</td>
<td>4.126***</td>
<td>3.778***</td>
</tr>
<tr>
<td></td>
<td>[1.378]</td>
<td>[1.442]</td>
</tr>
<tr>
<td>CEO cognitive complexity</td>
<td>-0.372***</td>
<td>-0.316***</td>
</tr>
<tr>
<td>(quarterly)</td>
<td>[0.079]</td>
<td>[0.078]</td>
</tr>
<tr>
<td>During-crisis divestitures (quarterly running sum) c</td>
<td>0.495***</td>
<td>0.895***</td>
</tr>
<tr>
<td></td>
<td>[0.137]</td>
<td>[0.215]</td>
</tr>
<tr>
<td>During-crisis acquisitions (quarterly running sum) c</td>
<td>-0.425**</td>
<td>-0.666***</td>
</tr>
<tr>
<td></td>
<td>[0.191]</td>
<td>[0.241]</td>
</tr>
<tr>
<td></td>
<td>[0.768]</td>
<td>[0.762]</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-30.76</td>
<td>-31.06</td>
</tr>
<tr>
<td>N</td>
<td>1,482</td>
<td>1,482</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01; two-tailed tests

a coefficients of dummies for year-quarters are not reported

b measured quarterly

c lagging 2, 3, and 4 quarters all yielded similar results
Appendix C:
Full list of words used for creating the cognitive complexity index

Conjunction: also, although, and, as, altho, because, but, cuz, how, however, if, nor, or, otherwise, plus, so, then, tho, though, til, till, unless, until, when, whenever, whereas, whether, while,

Discrepancy: besides, could, couldn't, couldn't, could've, desir*, expect*, hope, hoped, hopeful, hopefully, hopefulness, hopes, hoping, ideal*, if, impossib*, inadequa*, lack*, liabilit*, mistak*, must, mustn't, must've, need, needed, needing, neednt, needn't, needs, normal, ought, oughta, oughtnt, ought'n, oughtn't, oughtve, ought've, outstanding, prefer*, problem*, rather, regardless, regret*, should, shouldn't, shouldn't, should's, should've, undesire*, undo, unnecess*, unneed*, unwant*, wanna, want, wanted, wanting, wants, wish, wished, wishes, wishing, would, wouldn't, would've, yearn


Exclusion: but, either, except, exclu*, if, just, not, or, rather, really, something*, sometime, unless, versus, vs, whether, without