

**CEO REGULATORY FOCUS EFFECT ON FIRM INNOVATION MODE**

A Dissertation

by

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## **ABSTRACT**

CEOs face a number of options regarding how to lead their firms in pursuing innovation. Two important modes of innovation are internal innovation through R&D and external innovation through acquisition activity. Past research considering the choice between innovation modes has been scarce, and has primarily considered institutional ownership, boards of directors, and technological and knowledge aspects of firms seeking innovation. Although some scholars have considered the effect of psychological characteristics, such as hubris, on firm innovation investment, little work has considered the effect of psychological and cognitive characteristics of individual decision makers on the choice between different innovation modes.

I address this concern from an upper echelons perspective using regulatory focus theory, specifically how CEO regulatory focus affects firm innovation modes.

Regulatory focus theory considers a promotion focus wherein individuals seek to achieve a desired goal by seeking achievement-oriented activities that will approach the goal, while a prevention focus seeks to avoid negative outcomes through caution and careful planning. Previous work has shown promotion focus and prevention focus to be orthogonal variables rather than ends of a continuum. I theorize that CEO regulatory focus will affect firm innovation mode according to CEO preferences for seeking achievement through high opportunity actions or for avoiding risk and threats through more cautious and controllable actions. In addition, I consider a number of organizational and environmental moderators that theory suggests affect CEO discretion, including institutional ownership, firm performance, and environmental dynamism and

munificence. Previous research shows a link between these variables and innovation decisions, meaning that they may be impactful moderators of CEO preferences.

The context of the study is publicly-traded companies in high technology, specifically the electronic components, computer equipment, and pharmaceutical industries. These industries are largely driven by innovation and are selected to be broad enough to allow for variance in industry climate. Hypotheses are tested using a linear dynamic panel-data estimation model. Although the results fail to support many hypothesized relationships, two primary findings appear. First, firms led by promotion-focused CEOs tend to engage in more external innovation with no corresponding relationship with internal innovation, and second, firms led by prevention-focused CEOs engage in a more stable level of internal innovation while firms led by promotion-focused CEOs tend to vary levels of internal innovation investment.

## **DEDICATION**

I dedicate this work to my wife, Natassia, and to our children, Aislinn, Nathan, Wesley, Benjamin, and Owen. May you always know that your dreams are in reach if you will work hard to pursue them. I love you more than I can say.

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## CHAPTER I

### INTRODUCTION

CEOs can have a significant impact on the innovation pursued by their firms (Balkin, Markman, & Gomez-Mejia, 2000; Galasso & Simcoe, 2011; Makri, Lane, & Gomez-Mejia, 2006; Yadav, Prabhu, & Chandy, 2007). The leadership exercised by CEOs is also an important antecedent to innovation in the strategic entrepreneurship model put forth by Ireland, Hitt, and Sirmon (2003), which is a widely recognized framework for understanding the innovation process within established firms. Pursuing and executing innovation is a vital aspect of an organization's success and survival over time (Anderson, De Dreu, & Nijstad, 2004; Anderson, Potočník, & Zhou, 2014; West, 2002; Zhou & Shalley, 2003). Innovation has long been viewed as a major contributor to firms' ability to create value and contribute to economic advancement in society (Schumpeter, 1934, 1942; Van de Ven, 1986), and has been referred to as the essence of entrepreneurial activity (Drucker, 1993). Innovation may also serve as a foundation for firm-specific competitive advantage that leads to wealth creation (Ireland et al., 2003). Understanding how CEOs influence firm investment in innovation is important given that firms face more opportunities than they have the time or resources to pursue (Bingham & Eisenhardt, 2011). Furthermore, cognitive limitations preclude a full evaluation of available opportunities (Ocasio, 1997; Shane, 2000), which may be even more difficult in uncertain and dynamic environments such as highly innovative technology industries (Davis, Eisenhardt, & Bingham, 2009).

Firms may pursue innovation through different modes, including internally through R&D or externally through mergers or acquisitions of firms that have already

developed products, processes, or markets that are attractive to the acquiring firm (Hitt, Hoskisson, Johnson, & Moesel, 1996; Hoskisson, Hitt, Johnson, & Grossman, 2002).<sup>1</sup> Mergers and acquisitions represent a path to external innovation, wherein CEOs may value innovation that is already well-developed or on the market. Cooperative innovation arrangements, when multiple organizations work together toward developing innovation, may also contribute to innovative potential of firms (Cassiman & Veugelers, 2006; Hagedoorn & Duysters, 2002; Rothaermel & Boeker, 2008). Mode of innovation is an important strategic choice not only because of resource constraints, but also because research has shown varying effects of how particular modes of innovation interact. Some studies have shown that acquisitions may reduce (or replace) both investment in R&D and the internally generated innovative output of firms (Ernst & Vitt, 2000; Hitt, Hoskisson, Ireland, & Harrison, 1991), while others suggest complementarity between external and internal innovation modes (Arora & Gambardella, 1990; Cassiman & Veugelers, 2006; Vega-Jurado, Gutiérrez-Gracia, Fernández-de-Lucio, & Manjarrés-Henríquez, 2008). The purpose of this study is to explore why CEOs would prefer one type of innovation mode over another.

Many factors may impact whether firms pursue innovation through internal or external modes, including both individual and firm characteristics that influence strategic decisions. Drawing on agency theory (Fama & Jensen, 1983b; Jensen & Meckling, 1976), investor preferences and corporate governance structure have helped to explain why some organizations tend toward internal innovation or external innovation modes

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<sup>1</sup> Other modes of innovation may combine internal and external components, including strategic alliances, licensing, and outsourcing (Cassiman & Veugelers, 2006; Hagedoorn & Duysters, 2002). Cooperative strategies are discussed in the literature review section.

depending on the investment time horizon of institutional investors, internal versus external directors, and strategic versus financial controls (Hitt et al., 1996; Hoskisson et al., 2002). In particular, both investor and managerial temporal focus on producing short-term results leads to less internal innovation and a greater tendency to innovate externally through mergers and acquisitions (Cescon, 2002; Demirag, 1995; Hitt et al., 1996; Hoskisson et al., 2002). Hull and Covin (2010) considered the role of learning and technological parity in determining innovation mode choice, as a firm's learning capability may allow it to innovate internally, while acquisitions may open a path into more distant technological areas. Firm diversification has also helped to explain innovation mode, as diversified firms are more likely to acquire when faced with innovative threats (Banker, Watal, & Plehn-Dujowich, 2011). Acquisitions also produce greater innovative output when an acquiring firm already possesses deep or broad knowledge in its focal domain (Prabhu, Chandy, & Ellis, 2005). Large firms show a preference for acquiring R&D-intensive smaller firms rather than investing in internal R&D (Phillips & Zhdanov, 2013); however, large firms are also more likely to pursue both internal and external innovation simultaneously, compared to small firms that may be forced to select one mode or the other (Veugelers & Cassiman, 1999). Finally, transaction cost theory provides another explanation for decisions of whether firms should make, buy, or ally in pursuing organizational objectives (Geyskens, Steenkamp, & Kumar, 2006; Leiblein, Reuer, & Dalsace, 2002).

Some studies have considered the influence of CEOs and top management teams on the decision to acquire or to pursue internal R&D separately (Chatterjee & Hambrick, 2007; Gamache, McNamara, Mannor, & Johnson, 2015; Kor, 2006; Lyon & Ferrier,

2002), but rarely has the specific choice between internal and external innovation modes been addressed (Hull & Covin, 2010). Additionally, despite the importance of innovation in creating firm and societal value, and the potential complementarities in pursuing both internal and external innovation modes (Cassiman & Veugelers, 2006; Hagedoorn & Wang, 2012), little research has considered the factors that may influence CEOs' decisions regarding the mode of innovation a firm will pursue. Although pressure from investors or directors (Hoskisson et al., 2002), incentive alignment (Amihud & Lev, 1981; Devers, McNamara, Wiseman, & Arrfelt, 2008; Hoskisson, Hitt, & Hill, 1993; Matta & Beamish, 2008), or technology (Cassiman & Veugelers, 2006; Hull & Covin, 2010) may influence the likelihood of a particular mode of innovation, how the CEO perceives the potential risk or value of strategic options may also play an important role in determining firm strategic action regarding innovation mode. Regulatory focus theory (Higgins, 1998) considers how individuals differ in motivation and how that affects the way that they pursue goals. The theory suggests that promotion-focused individuals seek accomplishment and gain while prevention-focused individuals seek safety and to fulfill obligations. While one CEO may view one innovation mode as an opportunity to pursue desired firm outcomes, another CEO may perceive the same opportunity to be fraught with risk that may threaten the stability or viability of the firm. The attentional focus of the firm (Ocasio, 1997, 2011) is therefore influenced by CEO regulatory focus.

CEO perceptions and preferences for risk are important considerations regarding how they make decisions under conditions of uncertainty. A number of theories have helped explain decisions regarding R&D and acquisition investments. Prospect theory

(Kahneman & Tversky, 1979; Tversky & Kahneman, 1985) considers how losses and gains are viewed by individuals, and predicts that both R&D and acquisition activity will increase in response to underperformance (Markovitch, Steckel, & Yeung, 2005; Park, 2003; Singh, 1986). Agency theory explanations give mixed results, as CEOs with more ownership (Lim & McCann, 2013a) and financial incentives (Hoskisson et al., 1993) pursued less R&D, but those with high stock options were more likely to pursue R&D and acquisitions (Coles, Daniel, & Naveen, 2006; Sanders & Hambrick, 2007).

From a behavioral agency model perspective, CEOs tend to be loss averse and avoid R&D and acquisition activities when their unexercised stock options are in-the-money (Larrazza-Kintana, Wiseman, Gomez-Mejia, & Welbourne, 2007). According to an upper echelons perspective, CEOs with high levels of hubris (Roll, 1986), narcissism (Chatterjee & Hambrick, 2011), and overconfidence (hubris) (Malmendier & Tate, 2005; Simon & Houghton, 2003) pursued more or higher-cost acquisitions. However, these studies are either too broad to address individual differences in risk preferences (prospect theory and agency theory do not address individual-level differences), or to fully explain personality characteristics that lead CEOs to prefer different strategic actions that may carry varying degrees of risk. A greater understanding of CEO influence on the choice between innovation modes requires consideration of CEO characteristics and how they might influence strategic risk taking related to innovation mode.

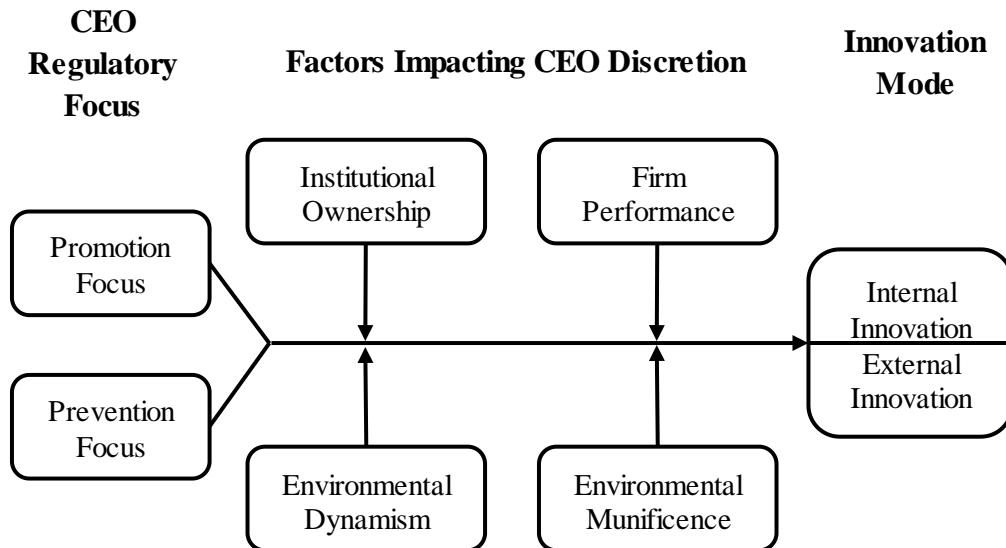
Regulatory focus theory (Higgins, 1998) provides a predictive framework that leads to different strategic preferences based on individual psychological characteristics (Crowe & Higgins, 1997). Regulatory focus refers to an individual's tendency to seek

achievement, growth, and to strive for aspirations, or to seek security, avoid loss, and fulfill obligations (Higgins, 1987, 1997, 1998). A desire for growth and achievement is known as a promotion focus, and preference for security and loss avoidance is known as a prevention focus. Regulatory focus has helped explain CEO influence in other contexts (Das & Kumar, 2011; Gamache et al., 2015), and has shown promise in explaining behaviors related to strategic entrepreneurship (Kammerlander, Burger, Fust, & Fueglistaller, 2015; Worthy, Maddox, & Markman, 2007). Regulatory focus theory is a particularly salient lens through which to consider innovation mode choice because it considers how individuals perceive and value risk and uncertainty (Brockner, Higgins, & Low, 2004). Because regulatory focus theory provides insight into how individuals pursue values such as achievement or security, it can inform the discussion regarding why CEOs may pursue or avoid particular modes of innovation. The orthogonality of CEO regulatory focus, demonstrated in a number of studies (Higgins et al., 2001; Higgins & Silberman, 1998; Lanaj, Chang, & Johnson, 2012; Markovits, 2012), provides for analysis of CEOs who may be high or low in either or both regulatory foci.

Regulatory focus theory has also been applied to organizational studies (Lanaj et al., 2012), considering emotions at work (Brockner & Higgins, 2001), leadership (Kark & Van Dijk, 2007), and entrepreneurship (Brockner & Higgins, 2001). This theory provides a framework with which to predict investment in very different paths that may have the same end goal. The foundation of regulatory focus is the hedonic principle, wherein individuals seek either promotion through approaching pleasure (goals) or prevention through avoiding pain (failure) (Higgins, 1987, 1997). When CEOs pursue goals through investment in innovation, a promotion focus would appear to be associated

with higher investment, and a prevention focus with lower investment. However, the findings of this study show that a prevention focus may not lead to lower investment in all circumstances, and have the potential to lead to greater investment in internal innovation. Figure 1 illustrates the theoretical model to be tested. The primary relationship to be tested in this study is between CEO regulatory focus and innovation mode. Firm and environmental characteristics are expected to moderate that primary relationship in important ways.

**Figure 1: The Impact of CEO Regulatory Focus on Innovation**



While CEO regulatory focus may be an important factor that influences the decision of whether to pursue innovation through R&D, acquisition activity, or through a combination of these modes, other important contingency factors may also impact this relationship. In particular, the research on managerial discretion suggests that a CEO's ability to influence firm direction is, in part, determined by organizational and environmental factors. These factors may impact CEO discretion, perhaps reducing or



strengthening the CEO's impact on firm strategy (Finkelstein & Boyd, 1998; Finkelstein, Hambrick, & Cannella, 2009; Forbes, 2005; Haleblan & Finkelstein, 1993; Hambrick & Abrahamson, 1995; Hambrick & Finkelstein, 1987; Rajagopalan & Finkelstein, 1992).

Ownership constituencies, firm performance, and other factors may impact CEO discretion. For example, conflict may exist between CEO preferences and previously established preferences of institutional shareholders. Institutional ownership has been shown to impact firm-level decisions, largely due to a long-term or short-term investment horizon (Bushee, 1998; Connelly, Tihanyi, Certo, & Hitt, 2010; Hoskisson et al., 2002). When strong institutional investors expect short-term returns, firms tend to make different decisions compared with firms with institutional investors that prefer more patient, long-term strategies. This preference has been shown to impact the choice between internal and external innovation (Hoskisson et al., 2002), suggesting that the influence of institutional ownership may interact with CEO preferences, potentially either strengthening or weakening the relationship between CEO regulatory focus and firm innovation mode.

Expected organizational response to firm performance (Cyert & March, 1963; Kahneman & Tversky, 1979; Tversky & Kahneman, 1985) may conflict with CEO preferences. Past research has shown that firms increase risk-seeking when the firm underperforms (Iyer & Miller, 2008). According to prospect theory (Kahneman & Tversky, 1979), we would expect that underperforming firms will increase investment in risky activity. Underperformance relative to performance aspirations has been shown to lead to increased R&D intensity (the percentage of a firm's sales invested in research and development) (Chen, 2008; Chen & Miller, 2007; Greve, 2003), and also to greater

acquisition behavior (Iyer & Miller, 2008; Park, 2003), but these general patterns do not always hold. Affiliation with a group of related or interdependent businesses alters a firm's aspirations (Vissa, Greve, & Chen, 2010), and cultural context has been shown to completely change firm response to high performance, as a communitarian culture leads to higher rather than lower R&D intensity under conditions of high performance (O'Brien & David, 2014). While we may expect low performance to increase innovation efforts based on previous research, promotion and prevention-focused CEOs may react very differently to that performance level.

Environmental issues, such as industry dynamism and industry munificence (Dess & Beard, 1984; Keats & Hitt, 1988), may also have important moderating effects on the relationship between CEO regulatory focus and innovation mode. An unfavorable or uncertain industry environment may be influenced by instability, change, available resources, and other factors (Dess & Beard, 1984; Keats & Hitt, 1988). Uncertainty related to the environment has implications related to entrepreneurial theorization and opportunity (Alvarez & Barney, 2007; Hoskisson & Busenitz, 2002; Knight, 1921). Uncertainty is difficult to manage, so it has been linked to opportunities that individuals create for themselves as they seek to manage that risk by taking control over their own circumstances. This contrasts with opportunities that are discovered or managed under conditions of quantifiable and manageable risk (Alvarez & Barney, 2007). A munificent environment, characterized by available resources and industry growth (Dess & Beard, 1984; Keats & Hitt, 1988), may also relieve some of the pressure put on CEOs as the firm experiences growth in concentrate with industry trends. The impact of CEO

regulatory focus on firm innovation mode may be altered under different environmental circumstances.

The setting for the study is public firms in the electronic components, computer equipment, and pharmaceuticals industries. These industries are selected due to the dynamic nature of industries for which innovation is critical to organizational outcomes, including performance. Firms in these industries, which invest more in innovation than many other industries, are much more likely to introduce radical innovation (Thornhill, 2006), which has the potential to compete with and potentially replace existing technology (Schumpeter, 1942). This creates competitive pressure for firms to remain innovative in order to avoid losing a market or technological position relative to other firms. Firms that invest in innovation are more likely to experience revenue growth and remain competitive in such an environment, while low-innovation firms that do not experience growth may be most at risk for organizational decline or failure. This creates an ideal setting in which to observe proposed effects on innovation.

Hypotheses are tested using a linear dynamic panel-data estimation model. Contrary to the predicted relationships, statistical findings suggest that promotion-focused CEOs may prefer external innovation as a path to firm success, and are more likely to vary investment in internal innovation. In contrast, prevention-focused CEOs appear to prefer a more stable internal innovation strategy over time. Institutional ownership, firm performance, and environmental characteristics do not meaningfully moderate the primary relationships.

The purpose of this study is to contribute to an understanding of how CEO psychological characteristics, particularly regulatory focus, influence firm-level

innovation mode decisions, and to explore how other contingencies may impact that relationship. The primary theoretical contribution of this study is an understanding of how CEO regulatory focus impacts firm innovation mode. This contributes both to our understanding of strategic entrepreneurship and innovation management, and also to regulatory focus theory and upper echelons theory. We also see evidence that R&D may be viewed as a safer, more cautious path toward innovation relative to acquisitions. The study also informs our understanding of strategic entrepreneurship by illuminating relationships that affect how firms manage resources and pursue innovation. Although past research suggests that promotion-focused individuals will pursue more innovation compared with prevention-focused individuals, a consideration of different innovation modes provides insight into how those innovation modes are perceived by CEOs with different regulatory foci. This may be particularly relevant for prevention-focused CEOs who prefer caution, but lead firms in an industry that requires constant innovation.

## CHAPTER II

### LITERATURE REVIEW

#### *Innovation modes*

Technological advancement has increased worldwide economic growth and competition based on innovation (Fagerberg, Martin, & Andersen, 2013). “Innovation is the process to develop and improve products, processes and markets, with the aim to aggregate value” (Abdi & Senin, 2014: 4). Suggesting its competitive potential, Becker and Whisler (1967: 463) stated that innovation is “the first or early use of an idea by one of a set of organizations with similar goals.” Firms that innovate faster or produce better products, processes, and markets are at an advantage relative to other firms. Innovation is viewed as an important source of competitive advantage (Dess & Picken, 2001; Tushman & O'Reilly, 1996) and entrepreneurial activity (Drucker, 1993). Even firms in mature technological industries such as computer memory must innovate in order to remain technologically and financially competitive (Chang, 2015).

However, the innovation process is fraught with risk; firms must accept some level of expected failure as part of the innovation process (Patel, Kohtamäki, Parida, & Wincent, 2015). Taylor and Greve (2006: 726) described innovation as “characterized by prior uncertainty and posterior variance in performance.” Despite its inherent risks, innovation has been associated with both sustainable competitive advantage (D'Aveni, Dagnino, & Smith, 2010; Garud & Kumaraswamy, 1995; Garud, Tuertscher, & Van de Ven, 2013) and financial performance (Andriopoulos & Lewis, 2009; Calantone, Cavusgil, & Zhao, 2002; Klomp & Van Leeuwen, 2001). Failure to innovate in a competitive environment can lead to obsolescence and loss of a firm's market position

(Derfus, Maggitti, Grimm, & Smith, 2008). We know that declining performance can lead to greater investment in R&D (Chen, 2008; Chen & Miller, 2007; Lim & McCann, 2013b; O'Brien & David, 2014), but organizational decline may either inhibit or enhance innovation (Mone, McKinley, & Barker, 1998). However, how or why some firms are able to innovate across time while others are not is not fully understood.

The challenge of how to continuously innovate is notable considering that pressure on CEOs to produce short-term results may lead to financial controls and market-driven strategies (Hayes & Abernathy, 1980; Hoskisson et al., 2002). Moreover, this pressure to produce immediate financial results has the potential to result in cost-cutting or other myopic actions leading to a failure to innovate and a deterioration in firm competitiveness (Hill, Hitt, & Hoskisson, 1988). CEOs must make choices in how to pursue innovation in order to both leverage and safeguard resources while still effectively competing in a dynamic and changing environment. Firms innovate through two primary modes: internally through organic growth driven by R&D, and externally through the acquisition of knowledge and technology that have already been largely developed, often in smaller companies. The process of innovation by acquisition was described by Mandel and Carew (2011).

Internal and external innovation may be viewed as ends of a continuum, with many alternatives and combinations associated with cooperative strategies in between (see Figure 2). On the internal innovation end of the continuum is R&D, representing a firm's investment in creating and developing innovation. Internal innovation through R&D may take time to generate a return for the firm (Hoang & Rothaermel, 2010), which can be a challenge given that firms that are able to bring innovation to market

faster are at an advantage (Grabowski & Vernon, 1990; Roberts, 1999). Investment through R&D may happen in cooperation with others, and if so will still be captured through R&D measurement. Investment in R&D through cooperative arrangements, hiring talented scientists, etc., may contribute to a firm's innovative output is captured through R&D expense. Regardless of measurement through independent or cooperative R&D investment, the firm faces the same concerns related to uncertainty of outcomes and unknown time to potential payoff associated with internal innovation. Cooperative arrangements could also take other forms, which would clearly be considered internal or external innovation.

On the external innovation end of the continuum is acquisitions of other firms, which may provide a firm with access to innovation already produced by those firms, including new products, established processes, and developed markets. Acquisitions, rather than mergers, are the focus in this study because the acquiring firm more firmly retains control of the organization's future, where the impact of specific individuals in making merger decisions may be different with the combination and restructuring of two firms and their leadership teams. Acquisitions provide acquiring firms access to technology, products, and markets that may already have been partially or fully developed, providing a faster path to marketable innovation, despite potentially higher costs (Nambisan & Sawhney, 2007). The focus on internal innovation through R&D and external innovation through acquisition are chosen for this study due to the contrast of patient investment in R&D with its associated uncertainty, and immediate or accelerated access to innovation available through acquisitions. While certainly relevant paths to innovation, cooperative strategies may be R&D agreements, more closely related to





internal innovation, external innovation through acquisitions, cooperative strategies, and the choice that decision makers have between innovation modes.

### *Internal innovation*

Research and development (R&D) has long been viewed as critical to innovation. Some level of R&D may be necessary for firms to simply monitor and understand field-level advancement, while greater R&D may lead to new developments and innovation that push the firm and industry forward (Cohen & Levinthal, 1989). Early studies showed that high levels of R&D intensity (R&D relative to sales) predicted breakthrough technology (Comanor & Scherer, 1969; Mansfield, 1968; Schmookler, 1966), new technology (McLean & Round, 1978), and a higher rate of technological development (Pavitt & Wald, 1971; Schmookler, 1966). An important relationship between R&D intensity and technological competence has also been demonstrated (Hitt et al., 1991; Kamien & Schwartz, 1975; Wernerfelt, 1984). Firms that invest in R&D create their own opportunities to generate innovation that may result in a competitive advantage (Anderson et al., 2004; Anderson et al., 2014; Ireland et al., 2003). R&D intensity has been noted as an important tool for managers in pursuit of innovation (Crossan & Apaydin, 2010; Parthasarthy & Hammond, 2002). Hoskisson and Busenitz (2002) suggested that internal innovation through R&D activity may be the most appropriate course of action when a firm possesses the knowledge necessary to innovate, but faces market uncertainty. In such a case, the firm can leverage knowledge value that it already has.

R&D is an important predictor of firm survival and success (Kor, 2006; Lee, Wu, & Pao, 2014; Shefer & Frenkel, 2005; Ugur, Trushin, & Solomon, 2016), although there

does appear to be an upper limit to its benefits (Ugur et al., 2016) at which point additional R&D spending can become too costly and result in performance declines. R&D investment provides no guarantee of firm success (Jaruzelski, Loehr, & Holman, 2011). In addition to risk related to uncertain outcomes (Kor, 2006), internal innovation through R&D also carries the risk of an unknown timeline for potential payoff. Lee and O'Neill (2003) noted that it may take years for an R&D investment to generate a profit. As an example of internal innovation failing to yield a positive result, Eastman Kodak remained focused on chemical photography technology and completely missed the digital photography market (Lee et al., 2014), even with high R&D intensity during the 1990s. This notable failure is surprising considering that Eastman Kodak had originally invented digital photography in 1975 (Harris, 2014). Managerial attention to innovation is a critical component of success in an environment characterized by technological advancement (Li, Maggitti, Smith, Tesluk, & Katila, 2013), but where that attention is directed, including potentially toward R&D, can impact the outcome of those activities.

Firm investment toward internal innovation that results from leadership influence may take place for many reasons. Consistent with agency theory (Fama, 1980; Fama & Jensen, 1983a; Jensen & Meckling, 1976), financial incentives are one determinant of R&D spending (Hoskisson et al., 1993), including stock options (Coles et al., 2006; Devers et al., 2008; Larraza-Kintana et al., 2007; Lim, 2015; Martin, Gomez-Mejia, & Wiseman, 2013; Sanders & Hambrick, 2007), equity and cash-based compensation (Devers et al., 2008), and ownership constituencies (Chrisman & Patel, 2012; Latham & Braun, 2009; Lim & McCann, 2013a). Different factors may either increase or decrease the risk tolerance of decision makers. As shown by these studies, CEOs with high levels

of personal wealth tied to the firm tend to make decisions in their own interests, which may lead to either an increase or decrease in internal innovation through R&D spending, depending on the risk tolerance of individual CEOs.

Firm performance relative to aspirations is another contributor to R&D intensity. Firm aspirations may be based on an expectation of maintaining or building on previous successes, or they be more related to social influence, such as the results of peer firms. How firm performance relative to those expectations contributes to decisions that may impact future firm direction has been discussed by a number of authors. Multiple studies have demonstrated that underperformance relative to either past performance or peer firms leads to greater R&D intensity as managers seek to improve performance, while high performance leads to a reduction in R&D investment (Chen, 2008; Chrisman & Patel, 2012; Greve, 2003; Markovitch et al., 2005). The impact of firms' aspirations relative to other firms has shown mixed results, as a communitarian nature of firm ownership (common in Japanese culture) was associated with higher R&D intensity with high performance as successful firms sought to help underprivileged stakeholders through future-oriented R&D (O'Brien & David, 2014), but is moderated by rival firm behavior (Chen & Miller, 2007) and by inertia of the focal firm (Lampel & Jha, 2016). Other factors impacting the relationship between performance aspirations and R&D intensity include a shift from internal to external aspirations for firms affiliated with a business group (Vissa et al., 2010), and high CEO option grants, which led to lower R&D intensity regardless of whether performance was high or low (Lim & McCann, 2013b).

Slack resources, which are resources for which the firm does not have an immediately allocated use, have also been shown to contribute to higher R&D activity (Chen, 2008; O'Brien, 2003; Singh, 1986). For example, firms with extra cash enjoy greater flexibility in pursuing goals relative to those with little cash. Very few studies consider individual characteristics of CEOs as predictors of R&D intensity, with one study looking at CEO tenure, age, functional background, and education as a notable exception (Barker & Mueller, 2002). Consideration of psychological characteristics of CEOs predicting internal innovation through R&D has been generally overlooked. This is an important oversight considering the importance of R&D in many industries, and the direct impact that CEOs may have on firm engagement in R&D.

#### *External innovation*

Although some studies have used R&D intensity as a proxy measure for innovation inputs (Greve, 2003; Katila, 2002; Katila & Ahuja, 2002; Parthasarthy & Hammond, 2002), that only represents a portion of the overall innovation investment of a firm. Large firms often seek to innovate through mergers and acquisitions (Burgelman, 1985; Phillips & Zhdanov, 2013), and may acquire other firms in place of investing in internal R&D (Hitt, Hoskisson, & Ireland, 1990; Hitt et al., 1996; Phillips & Zhdanov, 2013). Technologically-focused acquisitions may lead to increases in innovation output (Ahuja & Katila, 2001; Cloudt, Hagedoorn, & Van Kranenburg, 2006), particularly when the acquirer has a large knowledge base (Ahuja & Katila, 2001), and when the knowledge bases of the acquiring and target firms are both related and complementary (Cloudt et al., 2006; Makri, Hitt, & Lane, 2010). Firm size further moderates these

effects, as larger firms appear to be best positioned to take advantage of potential benefits through acquisitions (Lee & Kim, 2016).

In R&D-intensive industries, the strategy of innovation-by-acquisition can be particularly beneficial to established firms, as they can watch for smaller firms that have already succeeded in developing technology and then acquire them once the concept is proven (Phillips & Zhdanov, 2013). The decision by Google executives to purchase as-yet unprofitable YouTube in 2006 for \$1.65 billion demonstrates the potentially high value of technology-based acquisitions (Finkelstein et al., 2009). YouTube was still very new, and yet was perceived as highly valuable by Google, which could have pursued a video sharing platform internally through R&D. Google instead chose to pursue an acquisition strategy that would yield immediate access to intellectual property and a growing user base. The innovation-by-acquisition strategy of larger firms has also led to a market for smaller firms that invest in R&D with the primary intent of becoming an acquisition target (Phillips & Zhdanov, 2013).

As demonstrated in the example of Google acquiring YouTube (Finkelstein et al., 2009), acquisitions can provide immediate access to new technology (Ahuja & Katila, 2001; Chakrabarti, Hauschildt, & Süverkrüp, 1994), products (Hitt et al., 1996), markets (Ahuja & Katila, 2001; Chakrabarti et al., 1994; Hitt et al., 1996; Hudson, 1994), and knowledge (Ahuja & Katila, 2001; Huber, 1991) that can be exploited and leveraged toward further innovation and marketable products and services. Hoskisson and Busenitz (2002) suggested that acquisitions may be the preferred entrepreneurial entry mode when learning distance (how closely a firm's capabilities align with the capabilities needed to produce desired innovation) is high, but market uncertainty is low. When uncertainty is

low, risk may be more easily managed, so long as the firm can overcome knowledge barriers. Google may well have viewed YouTube as having low market uncertainty due to its growing user base, and recognized that the learning investment necessary to enter the market exceeded what it was willing to invest internally. Despite the potentially high financial costs of securing innovative growth through acquisitions, firms can save on time and learning costs by acquiring and grafting in organizations that have already attained strategically desired competences. Also, acquisitions create a path for the firm to obtain external knowledge that may bring other benefits through broader knowledge search (Katila, 2002; Li et al., 2013).

A number of theories and predictors have explained firm investment in acquisitions, including many of the same predictors of R&D activity. Because most studies of acquisitions and innovation consider the impact of acquisitions on innovation performance (Ahuja & Katila, 2001; Cloudt et al., 2006; Makri, Lane, & Gomez-Mejia, 2006) rather than on predictors of innovation-focused acquisitions (Hitt et al., 1996; Hoskisson et al., 2002), the following discussion of acquisition predictors does not consider only acquisitions undertaken for the sake of technological development. However, it does provide an overview of acquisition predictors in general. Studies predicting acquisitions in general are discussed here because there is not sufficient research on predictors of acquisition as a path to innovation to gain an understanding of why firms engage in innovation-by-acquisition through the literature. Studies of innovation by acquisition are also discussed.

From an agency theory perspective (Fama, 1980; Fama & Jensen, 1983a; Jensen & Meckling, 1976), CEO ownership and compensation structures can predict firm

acquisition behavior. Concentrated ownership by managers can lead firm leaders to diversify firm assets in order to reduce performance variability and manager employment risk (Amihud & Lev, 1981). Stock holdings and options are another predictor of acquisitions, as managers seek high variance in investments (Coles et al., 2006; Sanders & Hambrick, 2007), growth of stock and option value (Coles et al., 2006; Devers et al., 2008; Gamache et al., 2015), or to reduce risk exposure to their own stock or options (Amihud & Lev, 1981; Hoskisson et al., 1993; Matta & Beamish, 2008). CEO career time horizon also impacts the likelihood of acquisitions, as those near retirement appear more reluctant to pursue acquisitions (Matta & Beamish, 2008). While many types of acquisitions may benefit managers, when carried out for the purpose of reducing managerial employment risk or with a focus on CEOs' own wealth position, acquisitions are less likely to provide value to the firm and are more likely to increase risk associated with firm returns (Amihud & Lev, 1981; Sanders & Hambrick, 2007).

Firm performance relative to aspirations is another predictor of acquisition behavior, consistent with the behavioral theory of the firm (Cyert & March, 1963), prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1985), and the behavioral agency model (Larraza-Kintana et al., 2007; Wiseman & Gomez-Mejia, 1998). When performance is below either firm or social aspirations of managers, acquisitions become more likely (Gomez-Mejia, Patel, & Zellweger, 2015; Iyer & Miller, 2008; Kim, Finkelstein, & Haleblian, 2015; Morrow Jr, Sirmon, Hitt, & Holcomb, 2007; Park, 2003), unless the firm is facing bankruptcy, at which point risky behavior is reduced (Iyer & Miller, 2008). Iyer and Miller also found financial slack to moderate the relationship between firm performance and acquisition engagement. Other

considerations regarding firm performance and engagement in acquisitions include acquisition experience and socio-emotional wealth. Kim et al. (2015) found a moderating effect of previous acquisition performance on the relationship between performance relative to aspirations and subsequent acquisition activity. Conflict between financial wealth and socio-emotional wealth within family firms may also lead to different outcomes related to acquisitions. Although family firms are generally less likely to acquire than non-family firms, when they experience poor performance, they engage in more unrelated acquisitions despite potential conflict with socio-emotional wealth concerns (Gomez-Mejia et al., 2015).

Compared with R&D, many more studies of acquisition behavior have considered leadership characteristics, primarily through an upper echelons perspective (Hambrick & Mason, 1984; Steinbach, Devers, McNamara, & Li, 2016). CEO functional background is one aspect that multiple scholars have observed. CEOs with experience primarily in law, accounting, and finance are more prone to pursue acquisitions (Song, 1982), a finding similar to that of later studies linking financial backgrounds with acquisition activity (Finkelstein, 1992; Jensen & Zajac, 2004). Those with more acquisition-related experience were also more likely to engage in acquisitions (Nadolska & Barkema, 2014). CEOs with low status (as measured by underpayment relative to peers) were found to engage in more acquisitions relative to high-status CEOs (Seo, Gamache, Devers, & Carpenter, 2015), perhaps in an effort to improve their own status and compensation. CEO power is another predictor of acquisition engagement as CEOs with more power were likely to overpay for acquisitions (Finkelstein, 1992), and firms



that retained a previous CEO as board chair, effectively reducing the new CEO's power, were less likely to engage in acquisition activity (Quigley & Hambrick, 2012).

Other upper echelons studies have also considered personality characteristics of leaders as predictors of acquisition activity. Roll (1986) suggested that CEO hubris, or severe overconfidence, predicted overpayment for acquisitions, and narcissistic CEOs were significantly more likely to acquire (Chatterjee & Hambrick, 2011). Similarly, overconfident CEOs were found to be 65% more likely to acquire than non-overconfident CEOs (Malmendier & Tate, 2008). Finally, CEO regulatory focus was found to be associated with both the quantity and size of acquisitions (Gamache et al., 2015). These authors found that CEOs with a promotion focus were more likely to engage in acquisition activity, while those with a prevention focus were less likely to acquire.

These studies of acquisition activity, including the study by Gamache and colleagues (2015) considering CEO regulatory focus, focused primarily on acquisition behavior itself, without consideration of acquisitions with the intent of innovation, or when acquisitions may be used as a substitute for or complement to internal innovation. The addition of internal innovation as a competing alternative to acquisitions that are undertaken with the purpose of pursuing innovation provides a theoretical contribution toward our understanding of how acquisitions may be viewed by CEOs. It is important to compare how CEOs observe both external innovation through acquisitions and internal innovation through R&D as competing options in order to gain a better understanding of CEO selection of innovation mode.

### *Cooperative strategies*

In addition to R&D and acquisition activity, firms may also pursue innovation through alliances, joint ventures, and other cooperative strategies that combine the strengths of multiple firms toward producing innovation (Cassiman & Veugelers, 2006; Hagedoorn & Duysters, 2002; Rothaermel & Boeker, 2008). Cooperative strategies allow multiple firms to combine complementary resources toward innovation (Arora & Gambardella, 1990; Hitt, Dacin, Levitas, Arregle, & Borza, 2000; Kaul, 2013; Kogut, 1991; Rothaermel, 2001), including investment in R&D, that are shared among multiple firms. Sharing investment through cooperative strategies allows firms to share risk related to uncertain innovation potential (Ohmae, 1989). A rapidly evolving and competitive environment has increased firms' dependence on cooperative strategies (Li, Eden, Hitt, & Ireland, 2008; West & Bogers, 2014), as collaboration has impacted the innovation process overall (West & Bogers, 2014). External resources may also be accessed through cooperative strategies (Park, Chen, & Gallagher, 2002).

By combining financial, knowledge, learning ability, technology, environmental advantages, and other assets and capabilities, the allying firms are able to pursue greater innovation than might be achieved alone. The potential benefit of this approach is highlighted by a number of studies. For example, cooperative strategies are more likely to lead to breakthrough innovation (Dunlap-Hinkler, Kotabe, & Mudambi, 2010; Xu, Wu, & Cavusgil, 2013) as the potential for recombination of ideas is increased (Bartel & Garud, 2009; Felin & Zenger, 2009). Dunlap-Hinkler et al. (2010) noted that joint ventures and alliances are more likely to produce impactful products. Furthermore,

friendly partners are more likely to succeed in innovation alliances than are firms that are less familiar with one another (Li et al., 2008).

Searching for new ideas beyond the scope of a firm's current knowledge can enhance the innovation process when internal or local sources of knowledge are tapped into (Katila, 2002; Li et al., 2013), creating an incentive to work with others.

Cooperative innovation engagements can provide a firm with new technology and opportunities that may be developed and exploited (Hitt, Ireland, & Hoskisson, 2012; Milanov & Fernhaber, 2014; Ozcan & Eisenhardt, 2009; Sytch & Tatarynowicz, 2014; Terjesen, Patel, & Covin, 2011). Organizations can ally to collectively manage uncertainty and learn from one another (Hitt et al., 2000; Milanov & Fernhaber, 2014). Overall innovation is enhanced when network communities experience at least some level of turnover, and when the firm itself shifts partners occasionally (Sytch & Tatarynowicz, 2014). Networked organizations may actually serve as innovation hubs within an industry (Powell, Koput, & Smith-Doerr, 1996). Similarly, the cost and quality of manufacturing capabilities, important aspects of innovation in many contexts, are enhanced with diversity in alliances (Terjesen et al., 2011). The likelihood of alliance success can be improved when firm leaders consider not only the complementarity of assets among the focal firms, but also how the alliance itself may fit into the industry (Ozcan & Eisenhardt, 2009), demonstrating the benefit of a long-term strategic outlook regarding how the alliance may impact overall industry dynamics.

Both new and established firms can benefit through the use of cooperative strategies (Beckman, Eisenhardt, Kotha, Meyer, & Rajagopalan, 2012; Eckhardt & Shane, 2011; Hitt et al., 2012). New firms bring fresh ideas to industries (Eckhardt &

Shane, 2011) but may not have the financial resources necessary to invest (Kaul, 2013). Dependence on the resources of others can bring risk- sometimes significant levels of risk. Cooperative strategies carry a risk of loss or leaking of technology to either the partner firm or to others outside the alliance (Jiang, Tan, & Thursby, 2011; Kaul, 2013). Younger and smaller firms that may have the greatest need to access the resources of other firms are also at the greatest risk for knowledge appropriation and opportunistic behavior by the larger firm (Hallen, Katila, & Rosenberger, 2014). Engaging in too many alliances can also be a drawback to innovation success, leading to lower growth (Vandaie & Zaheer, 2014) as the complexity of managing many relationships can reach a tipping point where it is no longer beneficial (Duysters & Lokshin, 2011). Risks associated with cooperative innovation strategies can be managed, to a point, through trust (Jiang et al., 2011), close relationships (Li et al., 2008), and governance structure (Li, 2013; Li et al., 2008).

Although cooperative strategies can bring many benefits to allying firms, the practical conceptualization of cooperative strategies as strategic alternatives can be difficult. Some alliances may combine research efforts, R&D investment, and require the same patience associated with internal innovation efforts. Other alliances may more closely resemble a merger situation, such as one firm sharing its technological capabilities in return for manufacturing capabilities. The combination of assets may allow both firms to benefit, but does so in a very different way than through joint R&D investment. These two hypothetical situations demonstrate the theoretical difficulty of measuring cooperative strategies when comparing internal and external innovation modes. As discussed previously, internal and external innovation may represent ends of

a continuum, with cooperative strategies at varying positions in between. This concern must be addressed empirically to provide a clear view of internal versus external innovation as competing alternatives.

#### *Internal versus external innovation modes*

One of the challenges in distinguishing innovation modes is the potential for a lack of independence among them. While R&D intensity has been used as a measure for a firm's focus on internal innovation (Hitt et al., 1996; Hoskisson et al., 2002), a firm's reported R&D expenditures may be split among wholly internal innovation initiatives and R&D investment in alliances. Observed R&D intensity may be primarily focused on internal or cooperative innovation efforts, but in either case the firm must assume uncertainty related to the unknown outcomes or investment timeline (Kor, 2006), and such investment will be reported in financial disclosures as R&D expense.

Distinguishing between investments allocated to either mode may be difficult, but the concerns related to investing funds toward uncertain outcomes through R&D, and the potential strategic value of resulting innovation, would be very similar whether investment is wholly internal or whether there is some shared aspect. A parallel stream of literature considers whether firms make, buy, or ally in pursuing innovation. Much of this research revolves around transaction cost economics (TCE) (Williamson, 1979), which focuses on which alternative maximizes efficiency of managing contractual relationships among economic actors (Geyskens et al., 2006). A study of the abnormal returns related to these decisions suggested that make and ally announcements yielded higher market payoffs relative to buy announcements in the same firm (Borah & Tellis, 2014), and another study based on TCE supported the theory in both make versus buy

and ally versus buy decisions. Another study showed that financial slack moderated firms' response to poor innovative performance by either expanding or downscoping innovation modes (Lungeanu, Stern, & Zajac, 2016). While these studies do consider making, buying, and allying as competing alternatives available to firms, they do so primarily from an economic efficiency standpoint, without regard to the psychological characteristics of decision makers. The complexity of the make-buy-ally decision was demonstrated by Leiblein et al. (2002), who found that firms' technological performance was affected by governance decisions and contractual hazards, more than by the decision of whether to make or buy.

For the purpose of clarity, I focus on just two innovation modes- internally through R&D, which requires acceptance of uncertain outcomes that may take significant time to be realized, and externally through acquisition, which allows the firm to pursue technologies and markets through technologies that are more developed, easier to observe and can be brought to market in less time and with less uncertainty. Innovation by acquisition and innovation through R&D investment represent the two clearest cases of external and internal innovation. Through a firm's focus on R&D, we can capture investment toward internal innovation that requires patience and acceptance of uncertainty over time, while acquisitions provide quicker access to ready-made solutions that may match the needs of a firm. Comparing firm engagement in internal innovation through R&D versus external innovation through acquisition activity as competing innovation modes creates a dichotomous tension between creating innovation through the firm's R&D investment and efforts, and acquiring firms with innovation that is already partially or fully developed, offering faster growth and market opportunities.

The choice between internal and external innovation modes has not been addressed in many studies (Crossan & Apaydin, 2010; Hull & Covin, 2010). The few scholars who have done so considered predictors such as institutional ownership and director influences (Hoskisson et al., 2002), strategic versus financial controls (Hitt et al., 1996), and learning capability of firms (Hull & Covin, 2010). Cooperative strategies were suggested by Hoskisson and Busenitz (2002) as the preferred entry mode when both learning distance and market uncertainty were high. However, these propositions were not empirically tested. None of these studies considered the role or characteristics of the CEO. Additionally, Hull and Covin (2010) did not observe the modes through which the firm initially engaged in innovation efforts, but the products brought to market through internal, external, and cooperative modes. Their study showed the effectiveness of each mode under certain conditions in developing new products, but did so controlling for R&D investment and other risk-taking behavior measured through employee perceptions of project riskiness and aggressiveness. While this approach allows for observation of the effectiveness of each innovation mode, it fails to observe the choice between external and internal innovation, and the magnitude of innovation inputs that the firm invested in each innovation mode.

Another potential strategy for pursuing innovation is a portfolio approach- when firms pursue multiple innovation modes simultaneously. Cassiman and Veugelers (2006) discuss the potential complementarity between internal and external innovation when firms pursue a portfolio strategy. Specifically, firms that rely on basic science (such as provided by universities and research centers) are most able to achieve complementarity between innovation modes. In a previous study, the same authors found that a portfolio

approach is most likely to be pursued by larger firms, while smaller firms are more likely to pursue internal or external innovation more exclusively (Veugelers & Cassiman, 1999). Other scholars indicated that competences developed through internal innovation were most likely to lead to new products, suggesting that internal innovation may be the most effective mode of pursuing innovation. However, despite these studies, firm decision makers still have the potential and responsibility to make the decision whether to pursue innovation internally, externally, or both.

While studies have considered R&D (Coles et al., 2006; Crossan & Apaydin, 2010), or acquisition activity (Gabszewicz & Tarola, 2012; Hudson, 1994; Lee & Kim, 2016) as single innovation modes, there is very little research on the choice between innovation modes. It is important to better understand why CEOs choose between internal and external innovation modes. Of particular importance is the need to understand not only the effect of psychological biases that may be expected according to generalizable theories such as the behavioral theory of the firm or prospect theory, but also how the individual psychological characteristics of CEOs impact those decisions as well. Observation of demographic variables consistent with upper echelons theory (Hambrick & Mason, 1984), and biases related to gains and losses according to prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1975), provide important insight into decision making, but do not allow for observation or consideration of the individual characteristics or psychological differences of CEOs. According to Hambrick, Cho, and Chen (1996), cognitive biases and filters should be particularly relevant under varying uncertain conditions as would be expected with either internal or external innovation activities in high-technology industries.



### *Strategic leadership*

Some debate has considered the extent to which executives matter in determining firm outcomes (Collingwood, 2009; Finkelstein et al., 2009; Fitza, 2014; Quigley & Graffin, 2016). For example, an early study of top executives determined that the impact of CEOs explained between 6.5 and 14.5 percent of performance (Lieberson & O'Connor, 1972), and a more recent study found that the effect of CEOs on performance may be as low as 3.9 to 5 percent (Fitza, 2014). The vast majority of performance variance in Fitza's study came from factors outside of or beyond leadership influence, such as company and industry effects. Reasons for this may include the possibility that both individual CEO characteristics and environmental concerns affect all firms similarly. The degree to which CEOs across multiple firms share similar characteristics (March & March, 1977) may reduce the impact of individual leaders on firm outcomes. On average, executives do tend to be older, well-educated white men that have spent decades in a corporate setting (Finkelstein et al., 2009). As Finkelstein and colleagues pointed out. "If top executives are drawn from a very narrow pool and then subjected to a long period of common socialization, we cannot expect them to exhibit much variety in thought or action." (2009: 21).

Environmental characteristics may also reduce the effectiveness of individual CEOs. Hannan and Freeman (1977) argued that firm outcomes are largely the result of broader characteristics associated with organizational types, to which firms must adapt or be selected out of the population. Unfit organizational types, and by extension, unfit firms, are not likely to survive. They further discussed how the structural inertia of a firm resulting from size, age, and sunk costs constrains its trajectory (Hannan &

Freeman, 1984), casting doubt on the effectiveness of managers to exert much influence on individual firm outcomes. An institutional theory perspective (DiMaggio & Powell, 1983) argues that because firms rely on external legitimacy to obtain resources and achieve organizational objectives, they must conform to industry norms to reduce uncertainty related both to how they are perceived by external actors and what they may expect from external actors in return. The result is a process of mimetic isomorphism that results in homogenous industries (Hambrick, Geletkanycz, & Fredrickson, 1993; Haveman, 1993; Spender, 1989) and leaves little room for managers to have a meaningful impact on firm outcomes.

Despite these views questioning the impact of leadership on firm outcomes due to the potentially overwhelming impact of external forces, a number of studies find evidence in favor of the impact of leadership on firm outcomes. For one, the study by Lieberman and O'Connor (1972) contained notable methodological concerns (Finkelstein et al., 2009), and a response to and replication of the study done by Fitza (2014) suggested a CEO effect of 21.8 percent (Quigley & Graffin, 2016). This is closer to the approximately 15 percent CEO effect found in a number of past studies (Hambrick & Quigley, 2014; Mackey, 2008; Quigley & Graffin, 2016). Despite debate over the “real” CEO effect, sufficient studies have shown that CEOs do matter to justify research into the impact of CEOs on organizational outcomes. Furthermore, the assertion that firms must adapt or be selected out of a population (Hannan & Freeman, 1977) suggests some level of choice. The mere fact that some firms adapt while others do not implies that some individuals or groups of individuals may make different choices than others regarding how they will adapt or react to environmental influences.

A number of studies and works show empirical evidence of individual and group leadership effects on organizational outcomes (e.g. Mackey, 2008; Morten, Francisco, & Daniel, 2007; Quigley & Graffin, 2016; Rowe, Cannella, Rankin, & Gorman, 2005). The evidence in support of executive effects on firm outcomes appears to be substantial. Beyond objective measures of results, executives can have a meaningful impact on firm structure (Hage & Dewar, 1973; Helmich & Brown, 1972; Miller & Dröge, 1986), which is reflected in the activities carried out by the firm. The concept of strategic choice was suggested by Child (1972) as a link between organizational structure, environment, and how the firm will respond. Although leaders do appear to significantly influence firm outcomes, there are a number of factors that impact the extent to which a given CEO will have sufficient discretion to affect firm results, and whether that effect will be positive or negative.

#### *CEO discretion*

CEO discretion is the flexibility with which managers are able to pursue their own strategic preferences. On the two extremes of highest or lowest levels of executive discretion discussed by Hambrick and Finkelstein (1987) are the unconstrained manager and the titular figurehead. The unconstrained manager is granted broad authority over firm decisions, and has both the ability and disposition to carry out a personally-desired firm strategy. This level of CEO discretion may be particularly relevant in dynamic environments where leadership influence can have the greatest impact. In contrast, a titular figurehead may fill the CEO role at a stable firm and within a stable industry. In that situation, strategic change is rare, despite the need for a CEO to oversee daily operations of the firm. Environmental conditions, organizational factors, and individual-

level characteristics impact the level of discretion under which managers operate. Each of these will be discussed in more detail below.

Although some scholars (Fitza, 2014; Lieberman & O'Connor, 1972) have provided empirical evidence doubting the level to which executives impact results, their studies also demonstrated a substantial amount of variance in executive impact on results existing across industries, suggesting that industry effects impact CEO discretion (Finkelstein et al., 2009). Hambrick and Abrahamson (1995) created an index demonstrating varying levels of CEO discretion across seventy industries. Computers, biotechnology, and consumption-oriented industries tended to have greater levels of CEO discretion, likely due to constant change and need for leader direction in those industries. In contrast, utilities, natural resource extraction, and other stable industries had lower CEO discretion scores as the opportunity for leaders to make significant changes in those industries is lower. The environment within which CEOs operate can provide very different effects on the decision-making flexibility of the executive. Some external factors such as competition, industry concentration, and strength of buyers and suppliers (Hambrick & Finkelstein, 1987; Pfeffer & Salancik, 1978; Porter, 1980; Thompson, 1967) can reduce discretion of the manager. However, these studies all predate many studies that consider various macroeconomic influences, particularly related to technological advancement, changes in resource and financing availability, and an evolving global business environment, that affect the current business environment.

Industry munificence, dynamism, and complexity represent additional environmental factors that can impact executive discretion at an industry level (Boyd &

Gove, 2006; Dess & Beard, 1984; Wangrow, Schepker, & Barker, 2015). Munificent environments are those able to support continued market growth (Aldrich, 2008; Dess & Beard, 1984), and which have sufficient resources available for firm growth (Castrogiovanni, 1991; Goll & Rasheed, 2005). In a munificent environment, firms are able to generate more slack resources, providing more strategic flexibility to pursue different alternatives (Finkelstein et al., 2009; Nielsen & Nielsen, 2013). In an environment characterized by high munificence, CEO discretion may be increased due to lower environmental resource constraints. Because the available resources associated with munificence reduce environmental uncertainty (Boyd & Gove, 2006), the firm may have more flexibility to pursue different alternatives.

A dynamic environment generates additional uncertainty as a result of volatility and unpredictability (Aldrich, 2008; Boyd & Gove, 2006; Dess & Beard, 1984). Contributors to environmental dynamism include supply and demand changes, customer preferences, and technological change (Dess & Beard, 1984). CEO discretion is enhanced in uncertain environments due to the unpredictability of competitors (Ferrier, 2001) and generally increased ambiguity (Li & Tang, 2010) that require CEOs to make decisions in a volatile environment. CEOs are granted latitude due to the need for them to carefully plan and make important decisions. Miller and Friesen (1983) and Eisenhardt (1989b) noted the benefits of careful planning in dynamic environments, suggesting a need for greater CEO discretion in dynamic environments. Other important environmental factors affecting CEO discretion include market growth, demand instability, and formal regulation (Hambrick & Finkelstein, 1987).

A number of organizational factors also contribute to CEO discretion. For example, CEOs who simultaneously serve as board chair are assumed to have greater power and therefore enjoy greater discretion than those who do not fill both positions (Finkelstein & D'aveni, 1994; Harrison, Torres, & Kukalis, 1988; Lorsch & MacIver, 1989). Executive compensation, a common outcome of high CEO discretion (Boyd & Salamin, 2001; Finkelstein, 2009; Finkelstein & Boyd, 1998; Rajagopalan & Finkelstein, 1992; Wangrow et al., 2015), may be impacted in part by the influence that the CEO holds relative to the board and ownership constituencies. Powerful CEOs are able to influence the board in favor of their own compensation. Concentrated ownership also affects firm strategy (Hambrick & Finkelstein, 1995; Hoskisson et al., 2002; MacEachern, 1975), as strong stakeholders are able to exercise their voices, effectively reducing the influence of the CEO. Similarly, the influence of the board can impact CEO discretion (Hambrick & Finkelstein, 1987; Hoskisson et al., 2002; Mizruchi, 1983), and ultimately help determine the strategic direction of the firm.

Other firm characteristics also play a role in determining CEO discretion. Inertia related to firm age, size, and ingrained culture can have a strong influence on future firm direction (Hambrick & Finkelstein, 1987; Hannan & Freeman, 1984; Kelly & Amburgey, 1991), reducing the discretionary latitude of the chief executive (Wangrow et al., 2015). Firm inertia, or the difficulty of a firm changing directions, may also be related to firm performance. In firms with high inertia, positive results are expected to increase CEO discretion, while negative results have the opposite effect (Hambrick & Finkelstein, 1987). However, this expectation leaves some question about empirical findings related to firm performance relative to aspirations. When performance falls

below aspiration levels, consistent with both the behavioral theory of the firm (Cyert & March, 1963) and prospect theory (Kahneman & Tversky, 1979), risk-seeking behavior tends to increase (Chen, 2008; Chen & Miller, 2007; Greve, 2003; Iyer & Miller, 2008; Markovitch et al., 2005; Park, 2003; Singh, 1986). While these findings show a relationship between firm performance and firm actions, the influence of individual CEOs on those decisions is unclear.

Individual-level characteristics constitute the last portion of the CEO discretion framework put forth by Hambrick and Finkelstein (1987). They listed individual aspirations, tolerance for ambiguity, cognitive complexity, internal locus of control, and the CEO's power base as positive contributors to discretion, while the individual's commitment to the status quo constrains CEO discretion. As a result of individual personality and cognitive characteristics, CEOs can shape their own level of discretion by identifying and creating opportunities through their own abilities and determination (Finkelstein et al., 2009). Some individuals simply believe that they have control over situations (Simon, Houghton, & Aquino, 2000), and assume greater personal discretion than might otherwise be expected. CEO personality and cognitive characteristics may impact not only the CEO's discretion, but also preferences, expectations, and abilities that impact decisions and effectiveness. The following section discusses relevant research and unknown aspects related to how individual CEO characteristics impact firm actions.

#### *Individual characteristics*

“Numbers just don't speak to me. And, frankly, I'm not wild about conversing with them.” (Finkelstein et al., 2009: 66). This quote from an active CEO illustrates how

certain individuals perceive and process their surroundings differently from others. Individual personality and cognitive characteristics of CEOs may impact how they see their environment, available opportunities, and what they are able to do within a given set of conditions. CEO cognition and personality are important factors affecting the strategy of organizations (Baron, 2004; Hambrick & Mason, 1984; Nadkarni & Herrmann, 2010). When observable, executives' values and motivations illuminate why some leaders pursue very different paths when opportunities and resources may otherwise appear similar. Methodological progress, such as the use of content analysis of either written or spoken communication, has enabled ever-finer detail in observing and analyzing specific aspects of CEO individual characteristics.

Bounded rationality (March & Simon, 1958; Simon, 1972; Williamson, 1985) is an important consideration regarding CEO decisions. No particular individual can or will perceive or evaluate all available options the same as any other person, nor will any two CEOs make all of the same decisions over time. The unique cognitive models of each individual have been referred to as "cognitive maps" (Axelrod, 1976; Weick & Bougon, 1986) and "mindscapes" (Maruyama, 1982). These cognitive models are impacted by experiences, values, beliefs, assumptions, and past business or life experiences (Finkelstein et al., 2009). Expertise such as technological knowledge may be another important factor influencing the decisions and performance of CEOs (Heilmeier, 1993). According to Finkelstein and colleagues (2009), an individual's cognition will affect field of vision, perception of information, information filtering, and ultimately decisions. Because individual cognition can vary widely, decisions, strategies, and results may be expected to vary as well.



Research on CEO personality has included factors related to individuals' belief that they control aspects of their own lives (Anderson, 1977; Miller, De Vries, & Toulouse, 1982; Miller & Toulouse, 1986), self-image (Chatterjee & Hambrick, 2007, 2011; Hiller & Hambrick, 2005; Judge, Locke, Durham, & Kluger, 1998), confidence (Hayward & Hambrick, 1997; Roll, 1986; Russo & Schoemaker, 1992), and regulatory focus (Gamache et al., 2015; Wowak & Hambrick, 2010). These characteristics influence what an individual seeks to do, the extent to which control over a situation is assumed, and the ability to carry out and lead others to perform a chosen set of activities.

A CEO's self-image may have either positive or negative effects on the firm, and some aspects of self-image may be generally viewed as either positive or negative in any given circumstance. Core self-evaluation (Judge, Locke, & Durham, 1997) refers to individuals' overall evaluation of themselves and how they may be able to relate to the environment. Some people view themselves as capable (Bandura, 1977, 1982; Gist & Mitchell, 1992), and as having a high self-worth (Baumeister, Smart, & Boden, 1996). These elements of general self-esteem and self-efficacy are important components of core self-evaluation (Finkelstein et al., 2009). An overinflated view of oneself is referred to as narcissism. Jean-Marie Messier, a French CEO who led an ill-fated transformation of a successful French utilities company toward a failed media and entertainment conglomerate (Cukier, 2000; D, 2001; Fonda, 2002; Montgomery & Turner, 1998), has been discussed as an example of a CEO with a severely over-inflated ego whose narcissism and outlandish focus on high-visibility strategic moves led to the demise of the organization that he was tasked to lead (Finkelstein et al., 2009). Narcissists may make bold moves in order to seek attention and reinforcement of their own self-

admiration (Campbell, Goodie, & Foster, 2004), which can lead to aggressive corporate actions (Chatterjee & Hambrick, 2007, 2011).

Self-efficacy, an individual's view of self-capability (Gist & Mitchell, 1992), can also reach levels of concern for organizations. Overconfidence (Russo & Schoemaker, 1992) has been shown to lead to aggressive corporate investing activities. Roll (1986) discussed hubris, or excessive overconfidence, as an explanation for large acquisitions despite evidence that most such deals fail to deliver expected value. Li and Tang (2010) found that hubris was positively associated with investing in risky projects. The concept of hubris was also linked to acquisition premiums paid by firms whose CEOs expected to be able to deliver higher-than-expected results (Hayward & Hambrick, 1997), perhaps because they expected to overcome challenges through their own abilities. Hubris and narcissism may be intertwined and inflated elements of an individual's self-view (Judge, LePine, & Rich, 2006).

Locus of control refers to the extent to which a CEO expects to be able to have an impact on the organization, or the degree to which an individual expects to be able to control outcomes (Carpenter & Golden, 1997). Locus of control also represents an element of core self-evaluation (Judge et al., 1997). Some people are simply more likely than others to assume personal responsibility and to believe in their own ability to determine desired outcomes. An understanding of the psychological characteristics of CEOs is important because these characteristics represent a set of factors not determined by the environment or organization (Wangrow et al., 2015), and therefore are important contributors to the individual factors of CEO discretion and performance.

Characteristics such as hubris and narcissism may result in leaders disregarding risk, either because they focus on satiating their own egos or because they overinflate their own abilities. However, egos and confidence levels do not address how CEOs perceive or prefer risk as it relates to their own personal or organizational goals. Regulatory focus theory addresses this shortcoming by focusing on whether an individual seeks to approach risk as a path to achieving goals, or to avoid risk and threats to goal attainment due to a preference for security. This contrasts with a narcissistic CEO's desire to pursue activities that may bring praise, or an overconfident CEO whose skewed view of personal abilities leads to poor decisions. Contrasting regulatory foci provide insight not into how CEOs view themselves, their motivations, and how they seek to accomplish their goals. A more detailed review of regulatory focus and its application in organizational environments follows below.

Regulatory focus refers to what an individual values in the pursuit of goals (Higgins, 1997, 1998). While some people value advancement and growth, others prefer security and to safely fulfill their duty, avoiding risks that may lead to failure. Regulatory focus has explained various elements of CEO behavior, including opportunism (Das & Kumar, 2011), acquisition behavior (Gamache et al., 2015), and entrepreneurial orientation (Simsek, Heavey, & Veiga, 2010). Regulatory focus theory provides a lens through which to observe risk preferences and values of individuals, and may therefore provide a valuable contribution toward understanding decisions related to corporate innovation mode.

Understanding individual psychological and cognitive differences may be particularly important in industries dominated by innovation. CEOs' motivations relative

to innovation may primarily be observable through cognitive differences (Ahuja, Lampert, & Tandon, 2008). Personal biases, schemas, and cognitive traps are most relevant under conditions of uncertainty (Hambrick et al., 1996), and as demonstrated through environmental antecedents to CEO discretion such as R&D, an environment rich with innovation may also be where individual CEO characteristics will have the greatest impact on firm-level results. In situations with unknown outcomes, the outlook and preferences of leadership should be important predictors of firm direction and ultimately of firm results (Wu, Levitas, & Priem, 2005). In an environment characterized by uncertainty, such as in innovative industries, entrepreneurial leadership may contribute to a CEO's effectiveness as a leader.

#### *Entrepreneurial leadership*

Entrepreneurship within an organization often involves elements of entrepreneurial activities such as R&D and an acceptance of risk as an integral part of firm strategy. Both of these areas are considered potentially risky activities over which firm leaders have meaningful influence (Hoskisson, Chirico, Zyung, & Gambeta, 2017). Determinants of managerial risk-taking that constitute one portion of entrepreneurial leadership have been explained through many theoretical lenses, including agency theory, behavioral theory of the firm, behavioral agency model, prospect theory, and upper echelons theory (Hoskisson et al., 2017). Ensley, Hmieleski, and Pearce (2006) suggested that leaders who empower others in their organizations will be most effective at achieving strong growth, and Covin and Slevin (2002) noted that an entrepreneurial dominant logic is helpful to engage in and inspire others to engage in entrepreneurial behaviors. To be considered entrepreneurial leadership, the application of

entrepreneurial activities and risk acceptance must extend beyond the individual and be disseminated throughout the firm. Entrepreneurial leadership “creates visionary scenarios that are used to assemble and mobilize a ‘supporting cast’ of participants who become committed by the vision to the discovery and exploitation of strategic value creation” (Gupta, MacMillan, & Surie, 2004: 242).

Top managers in a firm play an integral role in firm innovation direction (Elenkov & Manev, 2005). Managerial attention toward both the intensity with which a firm searches for new ideas and where that search focuses on finding new ideas impacts the introduction of new products (Li et al., 2013). Entrepreneurial leaders are likely to encourage innovation throughout their firms (Hornsby, Kuratko, Shepherd, & Bott, 2009; Kuratko, Ireland, Covin, & Hornsby, 2005), and may be more likely to avoid competitive blind spots (Ng, Westgren, & Sonka, 2009). Characteristics that impact how CEOs perceive risk are particularly relevant to managerial attention, acceptance of risk associated with innovation, and how opportunities are recognized and evaluated.

Entrepreneurial leaders may also be more prone to investing slack resources toward innovation (De Carolis, Yang, Deeds, & Nelling, 2009; Holcomb, Holmes Jr, & Connelly, 2009; Kuratko et al., 2005) and encourage both exploration and exploitation behaviors in the firm (Ireland et al., 2003; Plambeck & Weber, 2010; Qing, Maruping, & Takeuchi, 2006). Exploration refers to seeking novel opportunities for future growth while exploitation includes harvesting the value of current capabilities (Choi, Lévesque, & Shepherd, 2008; Kammerlander et al., 2015; Lavie, Stettner, & Tushman, 2010). Entrepreneurial leaders can have a positive impact on firm innovation (Elenkov, Judge, & Wright, 2005; Elenkov & Manev, 2005). Because of variance in CEOs narcissism,

core self-evaluation, regulatory focus, and other individual characteristics, the impact of specific psychological characteristics may play an important role in entrepreneurial leadership that leads to these outcomes.

Psychological differences can influence entrepreneurial leadership (Baum, Frese, & Baron, 2014), such as through a promotion or prevention focus (Hmieleski & Baron, 2008a), self-efficacy (Hmieleski & Baron, 2008b), or optimism (Hmieleski & Baron, 2009). Mental models can help make up for incomplete situational knowledge (Gary & Wood, 2011), and self-perceptions can influence the likelihood of leaders acting on opportunities (Mitchell & Shepherd, 2010). Specifically related to leaders' regulatory focus, Hmieleski and Baron (2008a) connected the concepts of a promotion and prevention focus to creation and discovery-based entrepreneurship (Alvarez & Barney, 2007) within a context of new ventures facing a dynamic environment. They found that in dynamic environments characterized by uncertainty, a promotion focus is associated with positive outcomes, and a prevention focus was negatively associated with performance. However, in stable environments there was no significant correlation between entrepreneurs' regulatory focus and new firm performance (Hmieleski & Baron, 2008a). No studies considered the impact of CEO regulatory focus on innovation in established firms, or regarding the choice of innovation mode.

### ***Regulatory focus***

While psychological characteristics such as hubris and narcissism may lead CEOs to make risky decisions resulting from overconfidence or ego, they do not address how CEOs might perceive or value risk and uncertainty related to strategic decisions. Regulatory focus theory addresses this shortcoming by addressing not how an individual perceives self, but whether they seek to strive for goal attainment through action and growth or seek a more cautious approach to avoid failure by avoiding potential pitfalls. Both seek to achieve goals, but do so in different ways.

Regulatory focus theory is based on the hedonic principle of approaching pleasure and avoiding pain (Higgins, 1998). Self-regulation is “the process of bringing oneself into alignment with one’s standards and goals” (Brockner et al., 2004: 203). Individuals seek to achieve goals through self-regulation by either approaching, or striving for, an ideal state of being by pursuing hopes, wishes, and aspirations, or by holding to duties, obligations, and responsibilities that help the individual avoid failure and protect against potential threats to achieving one’s goal (Higgins, 1987, 1989). These contrasting foci lead individuals to actions that help to achieve those desired outcomes, through the mechanisms of seeking matches with desired end goals, or avoiding mismatches with desired end goals. Regulatory focus theory suggests that individuals may hold to a promotion focus, a prevention focus, or to a combination of both promotion and prevention foci (Higgins, 1998). Any individual could be simultaneously high or low in both a promotion and a prevention focus, or show a preference for one or the other. Regulatory focus theory gives insight into the goals,

motivations, and values of the individual, and has been referred to as “one of the most comprehensive motivational theories” (Kark & Van Dijk, 2007: 503).

### *Promotion focus*

A promotion focus is derived from an individual’s tendency to approach an ideal state of being (Higgins, 1998). An individual with promotion-focused self-regulation seeks advancement, growth, and accomplishment (Higgins, 1998), and will pursue actions that lead to matches with one’s desired, or ideal, end goal (Higgins, Roney, Crowe, & Hymes, 1994; Higgins & Tykocinski, 1992), providing pleasure or satisfaction for the individual. Creativity is enhanced and more alternatives are considered (Crowe & Higgins, 1997; Friedman & Förster, 2001; Liberman, Idson, Camacho, & Higgins, 1999; McMullen & Kier, 2016), so a person with a promotion focus is therefore more alert to opportunities (McMullen & Kier, 2016). Because individuals with a promotion focus are likely to pursue more alternatives rather than let them pass by, they may make more errors of commission (Higgins, 1997) as a result of striving for growth, but perhaps without performing appropriate due diligence in seeking various alternatives.

Associated with value maximization as a result of striving for achievement and growth (Higgins, 1997), a promotion focus has been shown to be positively correlated with both exploration and exploitation (Kammerlander et al., 2015). Seeking both exploration and exploitation highlights the preference for considering multiple alternatives consistent with a promotion focus. Strengths of a promotion focus include proactiveness, alertness to opportunities, strong ideals, cheerfulness, flexibility, creativity, and openness to change (Friedman & Förster, 2001; Higgins, 1997; Liberman et al., 1999; McMullen & Kier, 2016). Potential negative effects of a promotion focus



include a tendency toward escalation of commitment resulting from a lack of due diligence (McMullen & Kier, 2016), and dejection in the face of adversity as failure is felt as particularly poignant by promotion-focused individuals (Higgins, 1997; Idson, Liberman, & Higgins, 2000). The result of these weaknesses is that promotion-focused individuals are likely to make more errors of commission, as they try not to miss recognizing or pursuing potential opportunities (Higgins, 1997).

### *Prevention focus*

A prevention focus stems from a desire to avoid negative outcomes (Higgins, 1998). It is also rooted in an individual's self-guides related to duties, obligations, and responsibilities (Higgins, 1987). Prevention-focused individuals seek to avoid mismatches with desired end goals, and therefore act to avoid potential threats or hazards that could keep them from reaching their goals (Higgins et al., 1994). Driven by duty (Higgins, 1998), prevention-focused individuals exercise due diligence (Liberman et al., 1999) in an effort to minimize situational uncertainty through careful planning (Higgins & Silberman, 1998), and to protect both what may have already been accomplished and to guard against threats of future loss. Less open to change (Liberman et al., 1999), high prevention-focused individuals display a stronger endowment effect than low prevention-focused individuals (Thaler, 1980) and they tend to be more repetitive and seek fewer alternatives when solving problems (Higgins et al., 1994). Therefore a prevention focus is associated with a bias toward the status quo (Chernev, 2004; Jain, Agrawal, & Maheswaran, 2006; Yaniv & Schul, 2000).

Where a promotion focus is beneficial for creating ideas, the caution associated with a prevention focus helps to screen ideas (Liberman et al., 1999), thereby sorting out

recognized opportunities deemed to be of lower potential value. Empirical research has shown a prevention focus to be negatively associated with exploration activities, but to have no effect on exploitation activities (Kammerlander et al., 2015). Benefits of a prevention focus include risk reduction (Pennington & Roese, 2003), careful planning, vigilance (McMullen & Kier, 2016), and perseverance in the face of difficulty (Lam & Chiu, 2002). Potential detriments related to a prevention focus include extreme caution that deters action, a tendency to create undue bureaucracy (Kammerlander et al., 2015), consideration of fewer alternatives when making decisions (Higgins et al., 1994), inflexibility (Lieberman et al., 1999), and agitation-related emotions when intended plans do not go well (Higgins, 1998).

#### *Theoretical background and considerations*

The origin of promotion and prevention behaviors may be rooted in the experiences and development that contribute to an individual's nature, and can provide insight into the potential impacts of each focus. For example, a child who is regularly rewarded for good behavior may learn to pursue those rewards through further positively-viewed behavior. In contrast, a child who expects punishment for bad behavior may be more likely to learn how to avoid bad behavior that results in negative consequences (Higgins, 1998). One set of actions differs substantially from the other, but does not preclude acting in accordance with the other regulatory focus. It is therefore possible for an individual to develop either or both regulatory foci simultaneously. One learns to approach positive outcomes through positive behavior, while the other learns to avoid punishment by shunning negative behavior, and these patterns can continue throughout a person's life. Higgins (1998) points out that an individual may be

socialized with both types of regulatory focus, to simultaneously exhibit both promotion and prevention behaviors. Because regulatory focus is rooted in individual experience, we may similarly assume that the experience of individuals in their careers will impact the regulatory focus and cognitive models used to process imperfect information in those settings (Hannan & Freeman, 1977).

Regulatory focus theory has been explored and applied broadly, such as in parenting styles (Keller, 2008), mood states (Baas, De Dreu, & Nijstad, 2008), creativity (Friedman & Förster, 2001), and teen responses to anti-smoking campaigns (Zhao & Pechmann, 2007). A punitive parenting style, which focuses on correction was associated with children who developed a prevention focus, while a bolstering parenting style, which encouraged goal attainment and pursuing aspirations was associated with children who developed a promotion focus (Keller, 2008). General psychological research, without regard for a specific context, has associated a promotion focus with greater creativity, while a prevention focus was associated with a safer, persevering style of problem solving (Friedman & Förster, 2001). Researchers have interacted regulatory foci with activation of specific mood states (Baas et al., 2008), finding that different moods can affect how regulatory focus is manifested. Activating some moods, such as happiness and joy, can support the creativity associated with a promotion focus, while moods such as sadness can reduce a promotion-focused individual's creativity (Higgins, 2006). This study showed effects related to regulatory focus resulting from both specific cues in a laboratory environment and from individual differences. A study applying regulatory focus to the effectiveness of a marketing campaign found that campaign effectiveness depends on matching the message with the regulatory focus of individual

marketing audience members. A positively-framed anti-smoking message was most effective in persuading promotion-focused teens not to smoke, while a negatively-focused message, emphasizing the dangers of smoking, was most effective at influencing prevention-focused teens (Zhao & Pechmann, 2007). The theory is diverse and robust, providing insight into decision-making processes in many contexts.

Research has discussed and demonstrated the orthogonality of promotion and prevention foci (Higgins et al., 2001; Higgins & Silberman, 1998; Lanaj et al., 2012; Markovits, 2012), and that promotion and prevention are only weakly correlated with one another (Higgins et al., 2001). The orthogonality of promotion and prevention foci is an important aspect of the theory, as actions that seek achievement and advancement may differ from actions that protect against losses or threats, and it is possible for individuals to manifest both tendencies. As an attribute of an individual's personality, regulatory focus has also been shown to be generally stable across time (Higgins et al., 2001; Raffaelli, Crockett, & Shen, 2005), but different individuals can have stronger or weaker levels of either regulatory focus (Higgins, Shah, & Friedman, 1997), and it may vary according to situation (Higgins, 1998).

#### *Application of regulatory focus in organizational leadership contexts*

Regulatory focus is helpful in explaining CEO behavior (Das & Kumar, 2011; Gamache et al., 2015) and the impact of a leader's regulatory focus can be observed through activities carried out by the firm (Brockner & Higgins, 2001; Gamache et al., 2015; Wowak & Hambrick, 2010). The strategies, and activities associated with implementing them reflect the influence of leaders (Hambrick & Mason, 1984).

Therefore, it is important that the values and decision-making style of a firm's leader and the organization be complementary (Brigham, De Castro, & Shepherd, 2007).

A desire to gain market share, consistent with a promotion focus, may not fully equate to the desire to not lose market share, an attitude likely held by managers with a prevention focus, and the corporate-level strategies employed by the firm are likely to reflect those preferences. Beliefs, values, and attitudes differ, and as a result, actions related to desired end states may be expected to differ as well. For example, Simsek et al. (2010) showed that CEO personalities may impact the entrepreneurial orientation of a firm. The regulatory focus of managers can impact the firm through language and symbolic communication (Brockner & Higgins, 2001). The promotion focus of managers may benefit the firm through flexibility (Crowe & Higgins, 1997; Liberman et al., 1999), idea generation (Friedman & Förster, 2001; Liberman et al., 1999), and aspirations (Higgins, 1987), or a prevention focus may be beneficial due to exercised caution (Pennington & Roese, 2003), perseverance (Lam & Chiu, 2002), and careful planning (McMullen & Kier, 2016).

A number of scholars have considered regulatory focus in an entrepreneurial context. Both promotion and prevention foci may be helpful to entrepreneurial initiatives (Brockner et al., 2004). Where a promotion focus helps with creativity and exploring possibilities (Friedman & Förster, 2001), a prevention focus protects resources against loss in the early stages of entrepreneurial activity (Fitzsimmons & Douglas, 2011). Hybrid entrepreneurs (Folta, Delmar, & Wennberg, 2010), who begin an entrepreneurial venture while maintaining an employment position at another organization, devote time to their enterprise according to their regulatory focus (Burmeister-Lamp, Lévesque, &

Schade, 2012). When additional hours worked in the new venture increases risk, those with a promotion focus devoted additional time to the venture, while those with a prevention focus devoted less time. Similarly, prevention-focused entrepreneurs allocated more hours to the new venture when the extra time would decrease risk. Individuals with each focus sought to achieve goals either by pursuing or avoiding risks made salient by their own regulatory focus preferences. Action was pursued in either case of a strong regulatory focus, but the purpose of time devoted to the venture varied depending on how it aligned with that regulatory focus.

Hmieleski and Baron (2008a) connected regulatory focus to creation and discovery-based entrepreneurship (Alvarez & Barney, 2007), two important concepts related to the origin of entrepreneurial opportunity. Because creation-based opportunities are characterized by uncertainty, a promotion focus with its accompanying tendency to seek alternatives is best suited to pursuing creation-based opportunities and in a dynamic environment. In contrast, discovery-based entrepreneurship is more likely to be incremental, efficiency-seeking, and to pursue fewer alternatives, so a prevention focus may be best suited to discovery-focused entrepreneurship, and within a stable environment (Hmieleski & Baron, 2008a; Pennington & Roese, 2003). As noted previously, Kammerlander et al. (2015) found that regulatory focus predicted firm engagement in exploration and exploitation activities of small and medium-sized enterprises. In another study, promotion-focused leaders positively impacted the creativity of employees (Wu, McMullen, Neubert, & Yi, 2008). While these studies primarily focused on new ventures and small businesses, they may be generalizable to the pursuit of innovation in corporate settings.

A literature survey did not observe any studies linking regulatory focus specifically to innovation; nonetheless, the theory offers promise in explaining managerial preferences for risk. We can draw on the regulatory focus research in entrepreneurial domains to build an understanding of how a promotion or prevention focus might affect decisions made by CEOs regarding internal innovation through R&D or external innovation through acquisitions as intended innovation modes. How this decision is impacted by institutional ownership, CEO power, and environmental and organizational factors will further illuminate the impact of CEO regulatory focus on innovation mode decisions.

## CHAPTER III

### THEORETICAL DEVELOPMENT

Both internal and external innovation modes are considered to be risky in the general sense of having outcomes that cannot be known *ex ante* (Hoskisson et al., 2017; Kor, 2006; Miller & Bromiley, 1990), and have also been viewed as potential substitutes or competing strategic alternatives (Hitt et al., 1991; Hitt et al., 1996; Hoskisson et al., 2002; Hull & Covin, 2010). Previous explanations regarding the choice between internal and external innovation have considered governance mechanisms (Hoskisson et al., 2002), strategic and financial controls (Hitt et al., 1996), and firm technology (Hull & Covin, 2010), but no studies considering CEO characteristics, including personality dimensions, have been performed. Additionally, some studies considering innovation modes have focused on innovation outcomes of different modes (Hitt et al., 1991; Hull & Covin, 2010; Prabhu et al., 2005), but most have not looked at the specific choice between internal and external innovation.

Individual characteristics of firm leaders are expected to be reflected in the activities of firms (Hambrick & Mason, 1984). A CEO's characteristics will impact field of vision (Cho & Hambrick, 2006; Ocasio, 1997), how information is filtered and evaluated, and ultimately contribute to the decisions made by firm leaders (Finkelstein et al., 2009). Various personality characteristics have been discussed and shown to be associated with firm engagement in acquisitions and innovation (Chatterjee & Hambrick, 2007; Gamache et al., 2015; Malmendier & Tate, 2008; Miller & Toulouse, 1986; Roll, 1986; Simon & Houghton, 2003; Tang, Li, & Yang, 2015), but without consideration for *how* CEOs pursue innovation, such as whether internal or external innovation would be



preferred as innovation modes. Because of its focus on how individuals perceive and react to opportunities and threats relative to their valued goals and motivations, regulatory focus provides a lens through which to observe risk preferences and motivations of CEOs and leads to a number of hypotheses regarding why CEOs will prefer internal or external innovation modes.

The risk associated with either internal or external innovation may differ as the method of either developing or acquiring innovation is very different. Internal innovation through R&D provides the firm with greater control over the innovative process, testing to be done, and the ability to tailor R&D investment to a specific goal that the firm may be pursuing. For example, a firm may pursue a particular type of medication to solve a specific issue, and has control over that process. However, when such a path is chosen, the firm must accept uncertainty related to the potential payoff related to the expense incurred. Will R&D efforts yield a valuable medication? How long will it take? In contrast, when the firm acquires another firm that has already developed a medication, uncertainty related to the potential effectiveness of the innovation is already known. Whether the product is already on the market, in clinical trials, or simply brings a specific scientific benefit to the firm can already be known. The technological or scientific validity certainty of external innovation provides a distinct alternative to the firm. However, the acquiring firm must accept the acquired technology as it currently stands, without having had the ability to direct the process over time. Uncertainty in acquisitions may relate more to pricing of the transaction and integration of the target firm's technology, assets, and people.

Courses of action carried out by individuals with a promotion focus or a prevention focus will differ according to the values and goals associated with each (Higgins, 1998). A promotion focus leads to action, and seeks to avoid errors of omission (Higgins, 1997), or missing out on potential opportunities. Promotion-centered strategies tend to consider more alternatives and generate creativity (Crowe & Higgins, 1997). A prevention focus leads to greater caution (Kammerlander et al., 2015), and fewer alternatives (Crowe & Higgins, 1997) as it leads to avoidance of mismatches with a desired end state (Higgins et al., 1994; Higgins & Tykocinski, 1992). The caution associated with a prevention focus leads to fewer alternatives being pursued compared to a promotion focus, but may provide some benefits as those alternatives are likely to be better screened (Lieberman et al., 1999) and carry lower risk, resulting in fewer errors of commission (Higgins, 1997). An individual that is high in both promotion and prevention focus is likely to display elements of both regulatory foci, such as considering many alternatives, but exercising due diligence and eliminating those deemed to be of lower value.

Actions related to both promotion and prevention foci may be beneficial to strategy formulation and implementation, with best results when strategies and regulatory focus align (Shah, Higgins, & Friedman, 1998). Interestingly, an individual's regulatory focus profile may be more salient under certain conditions compared to a preference for gain associated with agency theory. Wowak and Hambrick (2010) found that the positive relationship between CEO stock options and risk taking was only salient for individuals with neither a strong promotion nor a strong prevention focus. Financial

incentives appeared to matter less than regulatory focus. When either regulatory focus was strong, the effect related to compensation disappeared.

Individuals with a promotion focus seek growth and accomplishment (Higgins, 1998), and will therefore seek action as a way to achieve those goals, regardless of whether those actions are appropriate to actually meet those goals (Higgins, 1997). Promotion-focused CEOs seeking to advance their organizations will look for opportunities to invest in growth, pursuing many options so as to not let opportunities pass by, even if some of those opportunities turn out to be mistakes. Promotion-focused CEOs may fail to engage in sufficient due diligence (McMullen & Kier, 2016); the opportunity may be considered to be sufficiently attractive so long as there is potential for firm growth. For promotion-focused CEOs, the choice between innovation modes is not likely to matter significantly when considering direct effects. Promotion-focused individuals are open to many alternatives (Crowe & Higgins, 1997), so they will pursue both greater internal and greater external innovation modes in an effort to grow and advance the firm. This may also lead promotion-focused CEOs to pursue a portfolio approach, pursuing investment in both internal and external innovation. Combining external knowledge with internal knowledge has been shown to enhance innovation (Cassiman & Veugelers, 2006), potentially providing benefits to the firm. A promotion focus, which is open to different alternatives (Crowe & Higgins, 1997), may be most likely to pursue both innovation modes, and to do so simultaneously. It may also contribute to greater innovation investment overall. A promotion-focused CEO will view investment in internal innovation as a way to create value for the firm. Likewise, external innovation will be viewed as a different, yet also valuable path to contribute to

firm value. A CEO promotion focus may be expected to be positively associated with both internal and external innovation modes.

*H1a: A higher CEO promotion focus will be positively associated with internal innovation.*

*H1b: A higher CEO promotion focus will be positively associated with external innovation.*

A prevention-focused CEO will consider alternatives more carefully than will a promotion-focused CEO. These individuals seek to avoid negative outcomes (Higgins, 1998); as such, extensive due diligence is exercised (Lieberman et al., 1999). Failure may lead to loss of competitive or reputational standing, so it may seem preferable to a prevention-focused individual to miss or avoid opportunities than to make mistakes pursuing what could be a wrong direction. Prevention-focused individuals also exhibit a preference for the status quo (Chernev, 2004; Jain et al., 2006; Yaniv & Schul, 2000) and are likely to exercise caution that may lead to inaction. Because prevention-focused individuals exercise due diligence, we may expect them to make greater use of financial controls. If the CEO focuses on financial controls, limiting investment in uncertain activities may appear to be a simple way to control costs and avoid potential loss of resources. The caution exercised by prevention-focused individuals leads to opportunity evaluation and elimination of alternatives if the value or risk is not deemed to be acceptable (Lieberman et al., 1999).

Seeking innovation is by nature a risky activity as firms seek new ways of doing things. A CEO prevention-focus has been empirically associated with lower exploration among Swiss firms (Kammerlander et al., 2015), a finding which may be expected to manifest regarding firm innovation modes as well. Kammerlander and colleagues (2015)

also found that because a prevention focus is associated with caution, action may be avoided altogether, leading to missed opportunities. In a generalized context, without consideration of innovation as a purpose for acquisition, Gamache et al. (2015) found that a prevention focus is negatively associated with acquisition activity. Furthermore, focusing too much on analysis may ultimately lead to inaction (McMullen & Kier, 2016). Similarly, when faced with decisions regarding R&D investment, prevention-focused individuals are more likely to err on the side of reduced, potentially inadequate investment, safeguarding resources and ultimately investing less toward innovation.

When CEOs prefer to safeguard resources rather than invest and risk the loss of those resources, investment is likely to be reduced. A prevention focus is associated with caution that may lead to attempts to safeguard rather than invest resources toward innovation. Furthermore, exercising due diligence takes time which may ultimately lead to the loss of opportunities that the firm could have pursued. Inaction may be caused either by taking too much time to make a decision or by not making a decision at all until the opportunity has already passed. Whether options are rejected due to appropriate due diligence, tight financial controls, or because of inaction, a CEO prevention focus will likely lead to less engagement in both internal and external innovation.

*H2a: A higher CEO prevention focus will be negatively associated with internal innovation.*

*H2b: A higher CEO prevention focus will be negatively associated with external innovation.*

Multiple studies have demonstrated the orthogonality of the regulatory foci (Higgins et al., 2001; Higgins & Silberman, 1998; Lanaj et al., 2012; Markovits, 2012); thus, it is possible for a single individual to be high (or low) in both promotion focus and

prevention focus. When a CEO is high in both promotion and prevention foci, we may expect to observe the impact of both foci simultaneously. Because promotion and prevention foci provide situationally specific benefits (Johnson, Smith, Wallace, Hill, & Baron, 2015), the effects of each focus are likely to manifest when both regulatory foci are high.

The promotion focus will lead to consideration of many alternatives (Crowe & Higgins, 1997; Liberman et al., 1999), but the impact of idea screening associated with a prevention focus (Liberman et al., 1999) will lead to lower value or highly risky options being eliminated. While a promotion-focused CEO may consider many potential investment options, consistent with Hypothesis 1, if that same individual also has a strong prevention focus, the likelihood of those alternatives being acted upon may be reduced. For example, a promotion-focused individual may look at many potential acquisitions in the pursuit of external innovation. This larger decision set provides the firm with many options that it could pursue, and likely more than if the CEO had a lower promotion focus and simply had less interest in pursuing new opportunities. Then, the presence of a strong prevention focus in the same individual will motivate the CEO to perform due diligence, to ensure that each option to be pursued is a viable path to achieving organizational objectives. The impact of the CEO's prevention focus helps to avoid some of the errors of commission that are common with a promotion focus. The strength of a high prevention focus may manifest by motivating sufficient due diligence to determine quality of opportunities and eliminate those that may not be as promising. The same effect may happen in pursuing internal innovation. Although multiple paths to achieving innovation through R&D may be attractive to a promotion-focused CEO, extra

care may help to constrict the set of options to a smaller pool of alternatives to be pursued, or to restrict the total pool of resources allocated to internal innovation. Both the benefit of considering many alternatives and the benefit of screening out poor ideas may lead to a balance between seeking many options and eliminating poor options. The promotion focus may initially lead to consideration of more alternatives, but the additional screening and rejection of some of those alternatives associated with a prevention focus will reduce the total amount to be invested in both internal and external innovation. Therefore, a high prevention focus will negatively moderate the positive association between a high promotion focus and both internal and external innovation, reflecting the elimination of screened-out options.

*H3a: A high CEO prevention focus will negatively moderate the relationship between a higher CEO promotion focus and internal innovation.*

*H3b: A high CEO prevention focus will negatively moderate the relationship between a higher CEO promotion focus and external innovation.*

To this point, I have discussed how the impact of both regulatory foci on internal and external innovation should be either positive or negative in total magnitude.

However, a critical question relates to the conditions under which a CEO will prefer to differentiate *between* either internal or external innovation. Although a CEO promotion (prevention) focus may be expected to predict higher (lower) magnitude of both internal and external innovation, those relationships with total magnitude of investment do not demonstrate whether a focus will be placed more on one particular mode over another. Although a promotion or a prevention focus may be associated with the total magnitude

of investment in internal and external innovation modes, deeper analysis is necessary to identify preferences *between* innovation modes.

Because promotion-focused individuals seek to achieve gains, they will look for opportunities most likely to achieve those gains. They also tend to be more comfortable with ambiguity (Liu, 2011) and uncertainty (Hmieleski & Baron, 2008a). Because of this, promotion-focused individuals may be expected to seek opportunities with the greatest potential to create value for the firm, despite potentially longer payoff times or unknown outcomes associated with R&D investments (Hill et al., 1988). Potential gains are salient for promotion-focused individuals as they look forward to positive outcomes with greater anticipation (Hmieleski & Baron, 2008a). Strategic control systems appear to be most compatible with a promotion focus.

In contrast, prevention-focused individuals prefer to exercise due diligence in order to understand potential outcomes of actions taken (Liu, 2011), and a prevention focus has been shown to be associated with lower exploratory behavior (Kammerlander et al., 2015). Less creativity (Crowe & Higgins, 1997; Friedman & Förster, 2001) and a preference for comprehensive due diligence (Lieberman et al., 1999; McMullen & Kier, 2016) may lead prevention-focused individuals to seek quantifiable options that can be thoroughly evaluated in order to facilitate careful planning. This focus appears to be most compatible with an emphasis on financial controls.

How a promotion focus and a prevention focus, together with an expected emphasis on either strategic or financial controls, may be informed by a discussion of the potential innovation opportunities that a firm faces. In some instances it may be preferable for the firm to generate its own opportunities through internal innovation,



while in other instances identification of existing technology may lead to external innovation as the preferred source of innovation opportunity. It is also important to note the potential for simultaneously pursuing both internal and external innovation, which may lead to complementarity and improved performance overall (Cassiman & Veugelers, 2006). This decision has also been shown to be impacted by firm size (Veugelers & Cassiman, 1999), and may be affected by leadership characteristics. Over time a series of individual decisions may display a pattern of preference for one mode over another, whether or not multiple innovation modes comprise the portfolio of total investment.

An important risk related to internal innovation through R&D is the related uncertainty in outcomes. While R&D on average produces benefits to the firm, an analysis of the effect of R&D on firm bond ratings showed that the variance related to R&D had a greater effect on bond valuation than the mean effect of R&D (Shi, 2003). This variance increases uncertainty which makes it more difficult for a corporate entrepreneur to carefully plan and hedge. In entrepreneurial terms, we may view the reduction in bond valuation in terms of uncertainty rather than risk (Alvarez & Barney, 2007; Knight, 1921), as the expected outcome of R&D investment is unknown. In such a context, strategic control systems may be most salient in defining and measuring firm strategy. In contrast, the value of mergers and acquisitions can be more readily quantified and valued. Financial models have long been used to value acquisitions (Buckley, 1975; Franks, Miles, & Bagwell, 1974; Kumar, 2015), and aspects such as the relatedness of technology, which is associated with greater value creation (Singh & Montgomery, 1987), are factors that CEOs can plan for and control in acquisition

evaluation. As discussed in previous work, financial controls appear to be associated with external innovation through acquisitions (Hoskisson et al., 2002).

Hmieleski and Baron (2008a) connected the concepts of uncertainty and risk to regulatory focus. They suggested that prevention-focused entrepreneurs would prefer conditions of risk, while promotion-focused entrepreneurs would prefer conditions of uncertainty. According to Pennington and Roese (2003), prevention-focused individuals would prefer to reduce risk and seek a more incremental discovery approach (Kirzner, 1997). Despite the finding that prevention-focused CEOs engage in less acquisition activity than promotion-focused CEOs (Gamache et al., 2015), when considered as an alternative to R&D, and its related uncertainty, as a mode of producing innovation, acquisitions may be more desirable for prevention-focused CEOs. The result of innovation efforts may already be known, such as the Google acquisition of YouTube, so outcomes of innovation efforts are more certain. In addition, prevention-focused individuals may be more likely to prefer short-term payoffs associated with acquisitions relative to longer-term options with unknown payoff timelines (Khanin & Turel, 2012). The uncertainty associated with internal innovation is likely to be viewed negatively by prevention-focused CEOs, who would prefer to fully analyze and plan for contingencies when making decisions that could result in negative outcomes. Therefore, prevention-focused CEOs are likely to prefer external innovation because its value is more easily quantified and managed.

*H4a: A higher CEO prevention focus will be associated with greater engagement in external innovation relative to internal innovation.*

However, promotion-focused CEOs will look to more uncertain internal innovation through R&D, which may produce greater innovation output than can be

accomplished through acquisitions (Hitt et al., 1991). While an acquisition may provide specific, understood technology, internal innovation may lead to more variance in outcomes. Some efforts will fail, while others may produce significant value to the firm. In contrast to the caution related to a prevention focus, CEOs with a promotion focus may seek the uncertainty associated with internal innovation as a preferable avenue to innovate. They may be more likely to utilize longer-term strategic controls, which have previously been associated with internal innovation (Hitt et al., 1996), rather than financial controls which may be preferable to prevention-focused CEOs. The growth orientation associated with a promotion focus will lead to growth alternatives with less concern for the risk of loss. Internal innovation carries greater uncertainty related to outcomes (Kor, 2006), and it is also more difficult to predict potential payoff times (Lee & O'Neill, 2003).

Promotion-focused CEOs are more likely than prevention-focused CEOs to be comfortable with this uncertainty. Internal innovation is also more associated with firms producing more breakthrough technology (Comanor & Scherer, 1969; Mansfield, 1968; Schmookler, 1966), which would be particularly attractive to promotion-focused CEOs that emphasize growth and achievement. The palatability of uncertainty to a promotion-focused CEO, combined with the potential for long-term gains resulting from breakthrough technology, suggest that internal innovation may be particularly attractive to promotion-focused CEOs. Promotion-focused CEOs will prefer the greater uncertainty and related potential payoff associated with internal innovation.

*H4b: A higher CEO promotion focus will be associated with greater engagement in internal innovation relative to external innovation.*

Beyond consideration of total magnitude of investment in internal and external innovation lies the question of stability of investment in each innovation mode over time. Although a CEO's regulatory focus may suggest a tendency to prefer either internal or external innovation, CEOs may also inherit or otherwise come to oversee innovation modes that are already established in an organization but that may lack compatibility with the CEO's innate preferences. Situational changes may lead to the need to adapt or otherwise change direction, and CEO regulatory focus may impact that adaptation. CEO regulatory focus may affect stability of investment in each innovation mode, although regulatory focus itself is considered to be stable over time (Higgins et al., 2001; Raffaelli et al., 2005). CEOs with different regulatory foci may vary in how they adapt or consider new alternatives. For example, changes in the environment or industry may lead CEOs to lead their firms in new directions regarding innovation mode. Firms may make significant changes in engagement in either internal or external innovation. CEOs with promotion and prevention foci may react differently to environmental and organizational changes that motivate changes in firm innovation investment.

Promotion-focused individuals are open to change and generate more alternatives when faced with decisions (Crowe & Higgins, 1997). Promotion-focused individuals may be expected to demonstrate greater flexibility and to explore new possibilities (Friedman & Förster, 2001) with which the firm has little experience. This greater openness to change may lead firms headed by promotion-focused CEOs to evolve more quickly, and to vary more in how innovation is pursued. These firms may be more likely to increase or decrease investment in internal and external innovation. Additionally,

enhanced creativity associated with a promotion focus (Amabile, Barsade, Mueller, & Staw, 2005; Friedman & Förster, 2001) may allow these CEOs to consider and perceive value in opportunities that are missed by others. This may be why promotion-focused individuals are more alert to new opportunities relative to prevention-focused individuals (McMullen & Kier, 2016). The proactiveness associated with a promotion focus (Fritz & Sonnentag, 2009) further suggests that promotion-focused CEOs would support making changes to established innovation-seeking patterns. The flexibility associated with a promotion focus suggests that changes in innovation mode may be more common for firms led by promotion-focused CEOs. These changes may include either an increase or decrease in investment in each innovation mode, leading to variability in investment in innovation modes beyond the total investment made in each innovation mode.

*H5a: A higher CEO promotion focus will be associated with more variability in firm innovation mode.*

In contrast to promotion-focused individuals, prevention-focused individuals tend to seek fewer alternatives (Crowe & Higgins, 1997) and demonstrate a stronger endowment effect (Lieberman et al., 1999). Prevention-focused individuals show a preference for the status quo (Chernev, 2004; Jain et al., 2006; Yaniv & Schul, 2000), preferring to maintain a stable strategy rather than venture into unknown or unfamiliar alternatives. A prevention-focus also leads to perseverance in difficult situations (Lam & Chiu, 2002) and a lower likelihood of adaptation. Even when situational change may bring new challenges to the firm, prevention-focused CEOs may prefer to hold to a stable strategy rather than evolve with the environment or other competitive pressures. This may be an explanation for why companies such as Kodak fail to change direction, even when they have the demonstrated capability to pursue other alternatives (Harris,

2014). The result of a CEO prevention focus may be entrenchment in an established strategy, and less variability in firm innovation mode. Beyond the total value invested by firms led by prevention-focused CEOs, these firms may also hold investment in both internal and external innovation steady over time rather than make drastic changes.

*H5b: A higher CEO prevention focus will be associated with less variability in firm innovation mode.*

### ***Moderators***

CEO discretion affects the latitude with which a CEO is able to make decisions that will impact decisions carried out by the firm (Finkelstein et al., 2009; Hambrick & Finkelstein, 1987). When a CEO has little discretion, personal preferences will have very little impact, while a CEO with high discretion would be more likely to be able to carry out a preferred course of action. CEO discretion can be constrained by a number of factors. Some factors are organization-specific forces that only affect the focal firm, while others are environmental forces that affect all firms in an industry.

Two firm-specific forces that impact CEO discretion are institutional ownership of the firm's stock and firm performance. CEO discretion is affected in part by the preferences of shareholders. Institutional shareholder that hold sufficient equity in the firm can influence stock price and ultimately have the strength to impact firm decisions (Bushee, 1998; Connelly et al., 2010; Hoskisson et al., 2002). CEOs must consider the preferences of these owners when making decisions. Another force that can impact how a CEO will plan investment in innovation is how the firm has performed. Particularly when performance declines, firms have been known to change investment patterns and take on more risk in an effort to reduce the negative impact of poor performance and

ultimately improve future performance (Chen & Miller, 2007; Cyert & March, 1963; Greve, 2003; Kahneman & Tversky, 1979; Tversky & Kahneman, 1985).

Environmental forces selected are industry munificence and dynamism (Dess & Beard, 1984; Keats & Hitt, 1988). These moderating variables were selected to address external forces that have the potential to affect the relationship between the CEO's preference for gain or caution. Miller and Friesen (1983) and Eisenhardt (1989b) highlighted the importance of planning, and therefore CEO decision making, in uncertain environments. Specifically, when competitors experience the same forces that impact resource availability and uncertainty related to industry sales potential, CEO decisions may be moderated in order to capitalize on opportunities, mitigate risk, and to remain competitive in a changing environment. The impact of each of these moderating variables is discussed.

#### *Institutional Ownership*

Despite the preferences that CEOs may have for particular modes of innovation, various constraints may preclude them from or enable them to pursue a particular innovation mode. While some CEOs have great latitude in pursuing their own strategic agendas, other CEOs may have little discretion and fill a primarily figurehead role (Hambrick & Finkelstein, 1987). A number of factors impact CEO discretion, or the latitude with which the CEO is able to make decisions. One organizational factor that impacts discretion is concentrated ownership. Concentrated owners are able to voice their own preferences, and have stronger relative voting power compared to owners with a smaller percentage of equity. Greater power associated with concentrated ownership

reduces the strategic latitude of CEOs (Hambrick & Finkelstein, 1995; Hoskisson et al., 2002; MacEachern, 1975).

The effect of concentrated ownership on firm actions has been tied to agency theory (Eisenhardt, 1989a; Jensen & Meckling, 1976). CEOs (agents) are hired to represent the wishes of firm shareholders and to manage the firm in accordance with those wishes. Because shareholders generally do not fill managerial roles within the firm (Fama, 1980; Fama & Jensen, 1983b), the risk of managerial opportunism arises (Jensen & Meckling, 1976), and costs surface related to managing that risk (Fama & Jensen, 1983a). One key method of managing the agency relationship is through ownership structure (Dalton, Hitt, Certo, & Dalton, 2007). Specifically, shareholders who own a substantial portion of equity are better able to influence the firm.

One important class of shareholders is institutional shareholders, which often pool many resources together and may represent public or private entities (Bushee, 1998). In contrast with dispersed individual shareholders, institutional shareholders are able to exert a stronger voice in shaping the firm and its strategy. The preferences of institutional owners have been shown to impact the decision between internal and external innovation (Hoskisson et al., 2002), such as those with shorter investment time horizons preferring financial controls and external innovation (Baysinger & Hoskisson, 1990; Hoskisson et al., 2002) and those with longer investment time horizons preferring strategic controls and internal innovation (Hoskisson et al., 2002).

The effect of short-term and long-term institutional ownership has been shown to be associated with the strategic actions of firms according to the time horizon of potential payoffs (Bushee, 1998; Connelly et al., 2010). Connelly et al. (2010) found that



dedicated (long-term) investors preferred strategic actions despite the longer payoff timeline, and transient (short-term) investors preferred actions with a shorter payoff time. Pressure from institutional owners is likely to affect how the preferences of CEOs are implemented in firm innovation mode. When investor preferences are in line with CEO preferences, they may be mutually reinforcing, but when the preferences of the dominant investor coalition contrast with CEO preferences, we may see a weakening of the main effect. Conflict between preferred innovation modes will lead to a negative interaction effect, while agreement between the modes will strengthen the effect.

As discussed previously, promotion-focused CEOs are likely to prefer internal innovation relative to external innovation, while prevention-focused CEOs are likely to prefer external innovation relative to internal innovation. When CEO discretion is impacted by institutional ownership preferences, we may expect that the relationships between CEO regulatory focus and preferred innovation mode are either strengthened or weakened. Dedicated ownership has been shown to be associated with long-term strategic action while transient ownership has been associated with tactical, short-term action (Connelly et al., 2010). Similarly, public pension funds, which generally have a longer-term investment outlook, have been associated with strategic controls and internal innovation while professional investment funds, which prefer shorter-term returns, preferred financial controls and external innovation (Hitt et al., 1996; Hoskisson et al., 2002). The influence of strong institutional ownership may either support or conflict with the preferences of CEOs. Figure 3 illustrates the anticipated agreement or conflict between preferences arising from CEO regulatory focus and institutional ownership.

**Figure 3: The interaction of CEO regulatory focus and institutional ownership**

	Dedicated Institutional Ownership	Transient Institutional Ownership
<i>CEO Promotion Focus</i>	I <i>Internal Internal</i>	II <i>Internal External</i>
<i>CEO Prevention Focus</i>	III <i>External Internal</i>	IV <i>External External</i>

Quadrant I demonstrates a preference for internal innovation associated with a CEO promotion focus that will likely be strengthened by a dedicated institutional ownership preference for internal innovation. As an agent of the shareholders, the CEO may be expected to act in accordance with shareholder preferences. Because both the CEO and institutional investors prefer strategic controls and long-term growth, the long-term preference of dedicated institutional investors will likely strengthen the relationship between CEO promotion focus and internal innovation.

*H6a: Dedicated institutional ownership will strengthen the positive relationship between a higher CEO promotion focus and a preference for internal innovation.*

Quadrant IV illustrates agreement between CEO prevention focus and transient ownership preference for external innovation. Both the CEO and institutional investors prefer shorter-term returns and financial controls. The result is that the influence of transient institutional investors will strengthen the relationship between CEO prevention focus and a preference for external innovation. In this case both the preferences of transient institutional ownership and the prevention regulatory focus of the agent align in preferring external innovation.

*H6b: Transient institutional ownership will strengthen the positive relationship between a higher CEO prevention focus and a preference for external innovation.*

Quadrants II and III show the anticipated conflict between CEO regulatory focus and institutional ownership type. In both instances, the dominant institutional ownership constituency prefers controls and patterns of investment in innovation contrary to those preferred by the CEO. Although the regulatory focus of the CEO may impact innovation mode, the influence of shareholders may also be expected to influence firm innovation mode in accordance with agency theory. Promotion-focused CEOs' preference for internal innovation may conflict with transient owners' preference for external innovation, and prevention-focused CEOs' preference for external innovation may conflict with dedicated owners' preference for internal innovation. The result is that the influence of dedicated (transient) institutional ownership will weaken the relationship between CEO prevention (promotion) focus and external (internal) innovation mode.

*H6c: Dedicated institutional ownership will weaken the positive relationship between a higher CEO prevention focus and a preference for external innovation.*

*H6d: Transient institutional ownership will weaken the positive relationship between a higher CEO promotion focus and a preference for internal innovation.*

### *Firm Performance*

Firm performance may affect the impact of CEO regulatory focus on strategic decisions. According to both the behavioral theory of the firm (Cyert & March, 1963) and prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1975, 1985), firms are more likely to pursue risky actions, including both R&D and acquisitions, when the firm underperforms (Chen, 2008; Chen & Miller, 2007; Greve, 2003; Iyer &

Miller, 2008; Markovitch et al., 2005; Park, 2003; Singh, 1986). According to Kahneman and Tversky (1979), losses weigh heavier on the psyche than gains, so the motivation to curb losses can lead to more risk taking behavior in responses to underperformance.

A promotion focus is associated with escalation of commitment and lack of due diligence (McMullen & Kier, 2016). This tendency, and the poignancy with which promotion-focused individuals feel the emotional effects of loss (Higgins, 1997; Idson et al., 2000) should manifest under conditions of poor firm performance. Prospect theory suggests that losses are felt more strongly than gains (Kahneman & Tversky, 1979). This feeling of loss related to declining firm performance may be enhanced for individuals with a strong promotion focus, who may place an even higher value on gains than those with a lower promotion focus. Under conditions of lower performance, promotion-focused CEOs will resort to achievement-oriented activities in an effort to reverse declining firm performance, increasing investment in both internal and external innovation activities.

*H7a: Firm performance below historical aspirations will strengthen the positive relationship between higher CEO promotion focus and internal innovation.*

*H7b: Firm performance below historical aspirations will strengthen the positive relationship between higher CEO promotion focus and external innovation.*

Prevention-focused individuals tend to exercise caution (Lieberman et al., 1999) and seek to avoid loss (Fitzsimmons & Douglas, 2011; Higgins, 1997). With declining firm performance, prevention-focused CEOs are likely to experience feelings of frustration and agitation, leading to greater efforts to avoid further losses (Higgins,

1997). In an effort to stem further financial losses, they may resort to financial controls, which have been shown to be negatively associated with R&D (Hitt et al., 1996; Hoskisson & Hitt, 1988). The caution associated with a prevention focus should increase the saliency of financial controls.

Declining results may lead to very different responses for prevention-focused CEOs than for promotion-focused CEOs. Because these leaders seek to avoid loss, they will engage in efforts to reduce risk (Pennington & Roese, 2003) in order to slow the decline, including financial rather than strategic control systems. Declining performance may heighten the loss-aversion that generally characterizes prevention-focused individuals. Leaders will seek to reduce spending and shore up their competitive position without pursuing additional risk. Careful planning (McMullen & Kier, 2016) and due diligence (Lieberman et al., 1999) may lead prevention focused CEOs to reduce investment in risky and uncertain innovation-related activities in an effort to curb further losses. Therefore, the negative relationship between a CEO prevention focus and both internal and external innovation will be strengthened when the firm experiences performance declines.

*H8a: Firm performance below historical aspirations will strengthen the negative relationship between higher CEO prevention focus and internal innovation.*

*H8b: Firm performance below historical aspirations will strengthen the negative relationship between higher CEO prevention focus and external innovation.*

#### *Environmental Considerations*

An organization's environment may alter the impacts of CEO regulatory focus. An underlying supposition of the choice that CEOs face between internal and external

innovation is that scarce resources and uncertain outcomes constrain decision making, forcing CEOs to decide between alternatives and pursue what they perceive to be the best alternatives. Environmental factors may contribute to or relieve some of this pressure. For example, a munificent environment is more likely to provide resources and support firm growth (Aldrich, 2008; Castrogiovanni, 1991; Goll & Rasheed, 2005). A firm's environment contributes to the uncertainty and resource availability facing the firm (Dess & Beard, 1984; Keats & Hitt, 1988) that may affect CEOs' decisions. Environmental munificence and dynamism may play an important role in determining firm innovation mode, moderating the effect of CEO regulatory focus.

In a study linking CEO regulatory focus to acquisition activity, Gamache et al. (2015) found that a promotion focus was linked to greater acquisition activity, while a prevention focus was associated with lower acquisition activity. This finding follows the general theory of regulatory focus which has demonstrated that promotion-focused individuals are more likely to pursue action, while prevention-focused individuals prefer caution. However, environmental factors may require firms to act in order to remain competitive. CEOs are forced to act not only in an effort to grow, but also to avoid losing a competitive position that may already have been achieved. Prevention-focused individuals may be forced to make decisions in such an environment that may not be expected otherwise. Nadkarni and Barr (2008) discussed the conflict between an "economic view" wherein environmental factors drive firm strategic action, and a "cognitive view" that relies on the cognitive influence of decision makers. They found that environmental forces do indeed impact cognition and organizational strategic actions.

A major challenge in a dynamic environment is the related volatility (Dess & Beard, 1984; Keats & Hitt, 1988) that contributes to environmental uncertainty. In a dynamic environment characterized by technological advancement and high R&D, firms that fail to innovate are unlikely to survive. CEOs may pursue uncertain internal innovation through the firm's own efforts, or they may prefer external innovation through acquisitions, accessing developed technology and seeking expected results that are more easily quantified. CEOs are likely to understand that some type of innovation action is necessary, and will therefore act to protect their firms' competitive positions and also to grow. In a highly dynamic environment, CEOs may still pursue internal or external innovation, but the environmental contingency may lead to different outcomes than may otherwise be expected.

In a dynamic environment, a CEO must act not only to pursue growth, but also to protect current market share and competitive position within a context of environmental volatility. Because external innovation is more strongly associated with risk than with uncertainty (Hmieleski & Baron, 2008a), it was previously hypothesized that external innovation would be the preferred innovation mode for firms led by prevention-focused CEOs. However, this would conflict with previous research showing that prevention-focused CEOs tend to avoid merger and acquisition behavior (Gamache et al., 2015). Yet when an uncertain environment threatens competitive performance, prevention-focused CEOs will act to protect their competitive position, and are likely to view external innovation as a more acceptable path to gain the technological capabilities necessary to compete. In highly dynamic settings, CEOs with a prevention focus will be more likely to acquire than in less dynamic settings.

*H9: High environmental dynamism will strengthen the relationship between CEO prevention focus and external innovation.*

In a munificent environment (Boyd & Gove, 2006; Dess & Beard, 1984), resources are readily available (Castrogiovanni, 1991; Goll & Rasheed, 2005) and growth is supported (Aldrich, 2008). In such an environment, firms may have many alternatives to consider in seeking growth, and CEOs are likely to have high discretion (Finkelstein et al., 2009; Nielsen & Nielsen, 2013). CEO regulatory focus may manifest differently in a munificent environment due to the available resources and general flexibility within the industry.

In general, CEOs with a promotion focus are expected to prefer internal innovation relative to external innovation, and those with a prevention focus are expected to prefer external innovation relative to internal innovation. However, this choice is primarily necessary because of a scarcity of resources that precludes unlimited investment in both modes. When we consider an environment in which investable resources are more readily available (Castrogiovanni, 1991; Goll & Rasheed, 2005), the need to choose between innovation modes is reduced. Therefore, firms can reasonably pursue more alternatives than they otherwise might be able to do.

Furthermore, because a munificent environment is able to support growth (reducing uncertainty related to future industry growth), investment in longer-term and more uncertain internal innovation is more likely. Strategic controls focusing on long-term opportunities may support a strategy of pursuing internal innovation (Hitt et al., 1996). In contrast, investment in internal innovation may be more difficult under conditions of low munificence because there will be fewer resources, payoff uncertainty is greater, and competition may become more intense. The result is that under low



environmental munificence, firms may look more to external innovation as the preferred method of innovation.

When a promotion-focused CEO, who values growth and achievement, operates under conditions of high environmental munificence, the innate tendency to pursue growth is enhanced. Under these conditions the firm can more readily pursue both internal and external innovation without undue uncertainty. However, because promotion-focused CEOs are expected to generally prefer the greater payoffs related to uncertainty rather than risk (Knight, 1921), they will prefer strategic controls and internal innovation due to its greater potential for large payoffs.

Low environmental munificence will lead to contrasting effects. Because of lower industry growth and resource availability associated with low-munificence environments, firms will face greater constraints, and CEO discretion may be reduced. Due to lower potential growth in the industry, internal innovation may be viewed as a less attractive option, and external innovation may be the preferred innovation mode. When growth is limited and resources are more constrained, firms may also begin to prefer financial controls, which have previously been associated with external innovation rather than with internal innovation (Hitt et al., 1996).

*H10a: High environmental munificence will strengthen the relationship between a CEO promotion focus and a preference for greater internal innovation relative to external innovation.*

Prevention-focused CEOs may prefer external innovation generally due to lower uncertainty and shorter payoff time, but this preference may be less pronounced when the industry is growing and resources are available to invest in innovation. Because of lower environmental uncertainty, prevention-focused CEOs will more readily pursue the

less-certain internal innovation mode both due to available resources in such an environment, reducing the need to choose between competing alternatives, and to avoid losing market share to other growing firms, thereby protecting their own competitive positions. Sustained industry growth and high resource availability reduce uncertainty about future expected returns.

Under conditions of low growth and few resources, prevention-focused CEOs will avoid the greater uncertainty associated with internal innovation to a greater degree. When resources are scarce and the industry is growing slowly, even internal innovation that produces technological progress may be less likely to yield financial rewards. The result is greater uncertainty for internal innovation in conditions of low munificence than in high munificence. Because growth may otherwise be difficult to achieve, and also in an effort to protect market share, when prevention-focused CEOs do seek to invest in innovation under conditions of low munificence, their usual preference for external innovation will be enhanced. Therefore, environmental munificence will moderate the relationship between CEO prevention focus and external innovation relative to internal innovation.

*H10b: Environmental munificence will moderate a CEO prevention focus preference for greater external innovation relative to internal innovation, such that a preference for external innovation relative to internal innovation will be stronger under conditions of low munificence than high munificence.*

## CHAPTER IV

### METHODOLOGY

#### *Sample and sampling issues*

Because of the study's focus on innovation mode, the sample includes high technology companies, which are "firms that emphasize invention and innovation..., deploy a significant percentage of their financial resources to R&D, employ a relatively high percentage of scientists and engineers in their workforce, and compete in worldwide, short-life-cycle product markets" (Milkovich, 1987). Firms in high technology industries must innovate in order to remain competitive, so this provides an appropriate setting in which to observe relevant firm innovation. The need to innovate in these industries will require firms to either invest in R&D or to seek innovation elsewhere. Fast-moving, high-technology industries further present a context in which CEOs have been shown to have higher individual impact on firm direction than in slower-changing industries (Hambrick & Abrahamson, 1995). As a validity check, 10 random acquisitions from the sample were selected to look at press releases or news articles discussing the transaction. Nine of the 10 demonstrated a clear technological purpose for the acquisition, such as Genzyme acquiring the stock of AnorMED Inc to gain access to a late-stage drug candidate (Dealbook, 2006) and Symbol Technologies' acquisition of Matrics Inc to expand capability in data capture (Carlyle Group, 2004). Some were related to existing relationships based on technological development. The clear exception was building to be purchased with the purpose of increasing a company's presence in a research-intensive area (Gilead, 2008).

Previous research in high technology has included industries such as biotechnology, semiconductors, computer software, and electronics (Li et al., 2013). In order to provide variance across industries, this study includes several different industries, including electronic components (SIC 3670s), computer equipment (SIC 3570s), and drugs (2830s). The economic and scientific environments of each of these industries differ across industries (Ang, 2008; Simeth & Cincera, 2015), while firms still rely on technological advancement and innovation for growth and to remain competitive. These industries also vary in cyclicalness. A study of industry cyclicalness observed correlations between industry final demand and GDP to observe industry cyclicalness (Berman & Pfleeger, 1997). Drugs show low historical cyclicalness, and while not particularly high, electronic components and computer equipment appear to be inversely related to one another relative to GDP. In an effort to avoid biases in estimates, small industries (fewer than five firms per 4-digit SIC) have been excluded from the analysis (Chen & Miller, 2007). The final sample includes 159 publicly traded companies within these industries and an average of approximately six firm-year observations per firm with sufficient data for analysis. The total number of firm-year observations in analyses was 955.

#### ***Data sources***

The complexity of this study required a number of data sources to collect all variables. Firm-level variables, including *R&D*, *sales*, *net income*, *cash*, *employees*, and *CAPEX* were collected from COMPUSTAT. CEO demographic and compensation data, including *CEO background*, *salary*, *bonus*, *gender*, *age*, and *functional background* were collected from Execucomp, and *board size* was collected from BoardEx. Acquisition

activity was collected from Thompson ONE, and alliances were collected from the SDC database. Shareholder letters were gathered from Mergent Archives. To measure firms' technology, patent data were collected through the Patent Dataverse at the UC Berkeley Fung Institute. Data for the study begin in 1992, the first year for which Execucomp data are available, through 2009, the last year for which patent data could be deemed reliable, as later years are not included because the patent data end in 2013 and several years were excluded as a buffer due to the time it takes for patent applications to be approved.

### ***Variables***

#### *Dependent variables*

Innovation modes to be analyzed in this study include *internal innovation* measured as R&D intensity and *external innovation* through firm acquisition investment. Previous research has measured R&D intensity as a proxy for *internal innovation* (Greve, 2003; Hitt et al., 1996; Katila, 2002; Katila & Ahuja, 2002; Li et al., 2013) and acquisition activity as a proxy for *external innovation* (Hitt et al., 1996). R&D intensity and acquisition intensity provide explicit measures of intentional investment toward innovation and growth. *Internal innovation* is measured as R&D expenditure divided by total sales, consistent with previous work (Chen & Miller, 2007; Hitt et al., 1996; Hoskisson et al., 2002; Vissa et al., 2010).<sup>2</sup> Although small R&D values are not available in COMPUSTAT, these “unobservable minimal R&D expenses” (Chen & Miller, 2007: 372) are assumed to be negligible. Any missing R&D values will be

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<sup>2</sup> Some portion of R&D expenditure may be invested toward cooperative strategies, but even if cooperative agreements are involved, it seems appropriate to treat total R&D investment as internal innovation due to the strategic nature of R&D investment. Whether invested toward cooperative arrangements or wholly through the firm's own efforts, this still demonstrates engagement in longer-term innovation in contrast with external innovation.

treated as negligible and replaced with zero, in accordance with past studies (Chang & Dasgupta, 2009; Coles et al., 2006; O'Brien, 2003; Uotila, Maula, Keil, & Zahra, 2009).

*External innovation* in this study is measured through acquisitions (Hitt et al., 1996). To create a measure similar to R&D intensity, external innovation is calculated as the total dollar value of an acquiring firm's investment in all acquisitions made in the observation year divided by sales of the acquiring company. By measuring both internal and external innovation relative to sales, the measures will represent a comparable view of financial investment in each innovation mode. However, one concern with this approach is the potential for non-technology acquisitions, such as acquisitions made with the intent of increasing manufacturing capacity or to access a new market, which may partly obscure the measure. This potential difficulty is addressed primarily through research design. The selection of high technology industries increases the likelihood of technologically-focused acquisitions. Even when additional potential benefits of an acquisition exist, a technological component to the acquisition remains likely. Ahuja and Katila (2001) distinguished between acquisitions that have or do not have a technological component. Acquisitions in high technology industries are likely to meet Ahuja and Katila's requirement of a technological component due to the strategic imperative to innovate in these industries. In this way, the context helps control for acquisition type, as acquisitions in a technology field are likely to be largely focused on acquiring and producing technology, products, etc.

#### *Independent variables*

*CEO prevention focus* and *CEO promotion focus* were measured following the process set forth by Gamache et al. (2015). Their study established a rigorously

constructed and well-defended method for analyzing CEO regulatory focus (Steinbach et al., 2016), consistent with established procedures (Duriiau, Reger, & Pfarrer, 2007). Annual CEO letters to shareholders were collected for each firm in the sample and content-analyzed to provide an unobtrusive measure of *CEO promotion focus* and *CEO prevention focus*. Unobtrusiveness is important because individuals are not generally aware of their regulatory focus (Gamache et al., 2015; Uhlmann et al., 2012), even though it may impact their thoughts, actions, and communication (Johnson & Steinman, 2009). Furthermore, the use of shareholder letters provides an avenue through which to observe CEO traits such as integrity (Dikolli, Keusch, Mayew, & Steffen, 2016), charisma (Fanelli, Misangyi, & Tosi, 2009), commitment (McClelland, Liang, & Barker III, 2010), and regulatory focus (Gamache et al., 2015) using readily-available public sources. This process of observing psychological characteristics through shareholder letters allows for observation of individual CEOs, despite the difficulty noted by Hambrick in collecting such data on top executives (Hambrick, 2007).

Shareholder letters provide several benefits for use in analyzing cognitive characteristics. Content analysis has emerged as a powerful tool to address a number of different questions, observing the communication patterns of individuals to deduce specific characteristics (Duriiau et al., 2007). Content analysis of shareholder letters has previously been used to analyze psychological characteristics (Fanelli et al., 2009; Gamache et al., 2015; McClelland et al., 2010) and CEO cognition and attention (Eggers & Kaplan, 2009; Kaplan, 2008; Marcel, Barr, & Duhaime, 2011; Nadkarni & Barr, 2008). Content analysis was performed using the Linguistic Inquiry and Word Count (LIWC) software (Pennebaker, Booth, & Francis, 2007). Analysis of shareholder letters

provides benefits including unobtrusiveness, consistency, and data accessibility not available through other forms of written or spoken communication from CEOs (Eggers & Kaplan, 2009; Gamache et al., 2015).

An individual's regulatory focus is expressed in "words, actions, behaviors, and many other observable artifacts that strongly suggest an underlying regulatory focus." (Johnson et al., 2015: 1521). Johnson and colleagues (2015) noted that CEO communication patterns provide a rich source of data demonstrating an underlying regulatory focus. As examples of regulatory focus being observed through language patterns, regulatory focus was observed in a study of U.S. presidents using rhetoric (Stam, van Knippenberg, Wisse, & Nederveen Pieterse, 2016), and Rhee and Fiss (2014) measured regulatory focus through content analysis of written announcements. Gamache and colleagues (2015) were the first to measure *CEO regulatory focus* through content analysis of shareholder letters. These authors developed a dictionary of words associated with promotion and prevention focus. They began by developing a list of words and word fragments that reflected the motivations of promotion and prevention focus. Next 25 subject matter experts were identified and consulted regarding the validity of these words. These experts were organizational scholars with previous research experience related to regulatory focus. Finally, a group of undergraduate students was recruited to participate in the study. Each provided a writing sample that could be content analyzed using the LIWC software, and then they completed survey-based measures of regulatory focus established in previous studies. The content analysis results from the writing sample were then analyzed through correlation and regression analysis with the survey results to support the validity of the words used in the final dictionary. The frequency of



specified words used in the writing sample determine the regulatory focus measures, which have a minimum of zero if no words from the specific dictionary are used up to 100 if every word in the sample was one of the specified dictionary words. Table 1 shows the LIWC dictionary created by Gamache and colleagues (2015) to measure CEO regulatory focus, which was used for the analysis.

**Table 1. Regulatory Focus Dictionary for LIWC**

<b>Promotion Words</b>	<b>Prevention Words</b>
<i>Accomplish</i>	<i>Accuracy</i>
<i>Achieve</i>	<i>Afraid</i>
<i>Advancement</i>	<i>Careful</i>
<i>Aspiration</i>	<i>Anxious</i>
<i>Aspire</i>	<i>Avoid</i>
<i>Attain</i>	<i>Conservative</i>
<i>Desire</i>	<i>Defend</i>
<i>Earn</i>	<i>Duty</i>
<i>Expand</i>	<i>Escape</i>
<i>Gain</i>	<i>Escaping</i>
<i>Grow</i>	<i>Evade</i>
<i>Hope</i>	<i>Fail</i>
<i>Hoping</i>	<i>Fear</i>
<i>Ideal</i>	<i>Loss</i>
<i>Improve</i>	<i>Obligation</i>
<i>Increase</i>	<i>Ought</i>
<i>Momentum</i>	<i>Pain</i>
<i>Obtain</i>	<i>Prevent</i>
<i>Optimistic</i>	<i>Protect</i>
<i>Progress</i>	<i>Responsible</i>
<i>Promoting</i>	<i>Risk</i>
<i>Promotion</i>	<i>Safety</i>
<i>Speed</i>	<i>Security</i>
<i>Swift</i>	<i>Threat</i>
<i>Toward</i>	<i>Vigilance</i>
<i>Velocity</i>	
<i>Wish</i>	

Alternative tenses of words used also captured  
 Reprinted from *Gamache et al., 2015*

### *Moderator variables*

Institutional ownership (Hypotheses 6a through 6d) includes *transient ownership* and *dedicated ownership* as coded by Bushee (1998). These classifications consider the investment timeline of institutional investors, particularly whether they primarily prefer long-term or short-term returns. The variables are measured as the percentage of each type of institutional ownership as a percentage of total ownership. Institutional owners with less than 1 percent of firm equity were excluded to remove investors with marginal positions. A 1 percent cut-off is consistent with prior research on institutional investors (Connelly et al., 2010; Johnson & Greening, 1999; Tihanyi, Johnson, Hoskisson, & Hitt, 2003).

*Firm performance relative to aspirations* (Hypotheses 7a through 8b) has been measured in different ways, depending on the type of aspiration level measured. Return on assets (ROA) and return on equity (ROE) have been used as measures of performance, but ROA is a better measure for management research due to cross-organizational differences in relative equity levels (Greve, 2003). For this study, performance was measured as ROA, calculated as net income divided by total assets. Aspirations constitute the second part of the measure of *firm performance relative to aspirations*, and have also been measured in different ways for various studies. The effect of social aspirations differs from that of historical aspirations (Kim et al., 2015). Because of this study's focus on how CEOs react to a firm's performance changes over time, the appropriate measure is historical aspirations. Cyert and March (1963) considered aspirations to be an accumulation of the firm's own past performance, but how firms weigh and consider past performance is difficult to measure (Baum, Rowley,

Shipilov, & Chuang, 2005; Chen & Miller, 2007; Miller & Chen, 2004). This study follows Chen and Miller (2007), measuring firm aspiration as performance in the previous year. For analysis, *ROA change* represents the difference between a firm's performance in the current year relative to performance in the previous year.

Environmental variables that may impact CEO influence on firm action include *environmental dynamism* and *environmental munificence* (Finkelstein et al., 2009; Hambrick & Mason, 1984). *Environmental dynamism* (Hypothesis 9) considers volatility or instability of the industry (Aldrich, 1979; Dess & Beard, 1984; Keats & Hitt, 1988). *Environmental munificence* (Hypotheses 10a through 10b) is a measure of industry capacity for growth (Aldrich, 1979; Keats & Hitt, 1988). Both measures were derived from aggregated industry sales over the previous five years, log transformed and then regressed over the five-year time period. *Environmental dynamism* was drawn from the exponentiated standard errors of the regression slope. *Environmental munificence* was derived from the exponentiated slope of the regression equation. Measurement of these variables follows the method described by Krause, Withers, and Semadeni (2016). The use of a five-year window has been shown to be substantively similar to either a three or seven-year window (e.g. Boyd & Gove, 2006).

#### *Control variables*

A number of other variables that may contribute to CEO discretion were also controlled for. First, a number of studies have investigated the impact of CEO compensation and ownership on engagement in R&D and acquisitions (Boyd, 1995; Devers et al., 2008; Faleye, Hoitash, & Hoitash, 2011; Lim & McCann, 2013a; Sanders & Hambrick, 2007). Aspects of a CEO's compensation structure and personal wealth

have been shown to impact CEO behavior in many studies. Therefore, *CEO salary*, *bonus*, and *stock ownership* are included as control variables. In addition, demographic variables may also influence decisions made (Barker & Mueller, 2002; Kimberly & Evanisko, 1981; Wu et al., 2005), so the analysis controls for CEO *age*, *gender*, and *tenure*. CEO functional background, specifically whether or not the CEO has a technical background, has been shown to influence firm R&D intensity (Daellenbach, McCarthy, & Schoenecker, 1999), is also controlled for by coding whether the individual has a *business* or *research*-focused background. A business- or research-focus is measured by coding CEO's educational background. A business-focus includes anything related to management, marketing, accounting, finance, and law, while a research-focus includes basic sciences, medical degrees, and engineering, which are likely to influence how the CEO perceives either the management or scientific concerns of the business.

CEO power impacts CEO discretion and has been measured through CEO duality, which considers chief executives who also serve as board chair (Ellstrand, Tihanyi, & Johnson, 2002; Finkelstein & D'aveni, 1994; Finkelstein et al., 2009). *Chair* is coded as 1 when the CEO also serves as board chair, and 0 when another individual serves as board chair. Firm size also impacts CEO discretion and is measured as total assets, which has also been considered as a proxy measure of firm inertia in previous work (Hannan & Freeman, 1984; Keats & Hitt, 1988). To address this concern and to control for potential human capital, the log of the firm's employees is used. *Board size* is also included as a control variable as the number of directors on the board may affect the CEO's individual discretion, and is measured as the count of a firm's directors. Also, because slack resources, including cash, may affect investment in innovation (Nohria &

Gulati, 1996; O'Brien, 2003), *cash* is operationalized as the sum of both cash and cash equivalents.

Although this study focuses on the choice between internal and external innovation modes through R&D and acquisition investment, other avenues for pursuing innovation exist, including hiring talented innovators and allying with other firms and organizations. Hiring new talent may provide benefits to the firm, which may leverage the expertise of new hires (Singh & Agrawal, 2011). This path to innovation is at least generally addressed through the dependent variable *internal innovation*, as the cost of new hires will be captured through R&D expenditures. Even if the firm seeks to hire in order to improve its innovative capability, future innovation must still come through the firm's own investment of resources and time, and will therefore be captured as part of *internal innovation*. Alliances with other firms provide another mode through which firms may pursue innovation (Rothaermel & Boeker, 2008). As discussed previously, alliances may include sharing risk (Ohmae, 1989), contributing complementary assets and technology (Arora & Gambardella, 1990; Hitt et al., 2000; Kaul, 2013; Kogut, 1991; Rothaermel, 2001), and positive externalities related to external environment (Park et al., 2002). A portion of the investment through cooperative strategies will also be captured through reported R&D investment, but that does not capture all cooperative considerations. To address this concern, the number of *alliances* is included as a control variable.

Technological complementarity of firms may also contribute to firms' likelihood of pursuing external innovation (Cassiman & Veugelers, 2006; Hull & Covin, 2010). Firms that are either too similar or too different in technological capability may not be

attractive acquisition targets. To control for this, *technological distance* will be controlled for by industry using the patent classes in which firms have demonstrated capabilities. *Technological distance* is calculated as the Euclidean distance of a firm's patents relative to its aggregated industry center. Using patent data to control for technological parity will provide a stronger empirical measure than the survey measure used by Hull and Covin (2010). Because it is not possible to identify and measure the technological parity of all potential target firms, this study generally follows Cassiman and Veugelers (2006), who measured parity as a measure of how the firm relates to its industry. The more a firm differs from the technological center of its industry, the higher the *technological distance* measure will be.

## *Analysis*

Hypotheses are tested using a linear dynamic panel-data structure. This approach is appropriate for this study due to the observation of multiple firms over multiple years, and the potential for variation resulting from CEO changes, environmental pressure, firm performance, and other influences. Because the data cover multiple firms across multiple years, this data structure allows consideration of both interfirm and intrafirm variation. Two important challenges with the data structure are the potential for heteroscedasticity and autocorrelation (Lim, 2015). Firm-level outcomes, such as innovation mode, can become routinized, following similar patterns from year to year (Chen & Miller, 2007) and creating the potential for bias.

The Arellano-Bond dynamic panel estimator (Arellano & Bond, 1991) provides a possible method of analysis due to its ability to control for both this autocorrelation and firm-level effects that may bias results, and because it can control for heteroscedasticity (Lim & McCann, 2013b) due to the weighting of generalized method of moments (GMM) estimators (Lim & McCann, 2013a). This approach would follow other studies that have considered similar data structures and research questions (Lim, 2015; Lim & McCann, 2013a, b; Vissa et al., 2010). In addition, the Arellano-Bond model addresses concerns regarding endogeneity as a lag of the dependent variable is used as an instrumental control variable, and as a fixed-effects model, it addresses potential firm-level omitted variable concerns (Lim, 2015).

However, despite its potential to address the needs of this study, the Arellano-Bond model provides little flexibility regarding the use of the lagged dependent variable as an instrument. Particularity for *internal innovation*, the lagged variable is too similar to

the dependent variable on a year-to-year basis, causing the instrument to be overidentified with the DV. To address this issue, a linear dynamic panel-data estimation model (xtdpd in Stata) was implemented, which is derived from the Arrelano Bond estimator but provides flexibility regarding the lag structure of the instrumented variable, creating a lagged difference to be used as an estimator (Arellano & Bover, 1995; Blundell & Bond, 1998). The depth of the lag was adjusted for the models, generally 2-3 years behind the dependent variable, in order to address this concern. In addition, the xtdpd model includes a bias-corrected robust estimator for two-step VCEs derived by Windmeijer (2005). To address the potential concern of autocorrelation, the Arellano-Bond test of autocorrelation was performed using the estat abond command in Stata. Because decisions related to firm innovation mode may take time to be implemented, all independent and control variables are lagged one year. To address heteroskedasticity, robust standard errors are used.



## CHAPTER V

### RESULTS

The final sample includes a panel of 159 individual firms, averaging 6.01 panel years per firm in the final analyses, but ranging from 1 to 15 years. The total number of firm-year observations was 955. These firms represent 17 unique industries as determined by 4-digit SIC code. For a firm to be included in the final analysis required multiple years of data availability in order to satisfy the lag structure of the models. Table 2 shows descriptive statistics for firms and CEOs included in the final sample. Due to skewness in firm size, cash, capex, and employees, these measures were logged to correct for non-normality. CEOs in the final sample averaged 54.9 years old (range 35 to 93), 4.7 years in their current position (range 0 to 58), and 99% were male. 55% percent also served as board chair, 45% had a business-focused background, and 42% had a research-focused background. Firms averaged 8,227 employees with a range of 6 to 122,200, and boards ranged from 1 to 31 individuals, with a mean of 7.85 individuals. Dedicated institutional ownership averaged 7.3% with a range of 0 to 54.2%, and transient institutional ownership averaged 10.7% with a range of 0 to 63.9%.

**TABLE 2. Descriptive Statistics**

	Mean	Standard Deviation	Min	Max
Internal (log)	0.24	0.44	0.00	4.46
External (log)	0.08	0.26	0.00	2.49
Promotion	1.87	0.73	0.00	6.38
Prevention	0.21	0.23	0.00	2.06
Narcissim	0.23	0.32	0.00	3.64
Employees (log)	0.54	1.86	-5.12	4.81
ROA change (1 year)	0.00	0.21	-1.56	4.73
Cash (log)	5.01	1.91	-3.69	10.46
Alliances	0.87	2.85	0.00	37.00
Capex (log)	3.15	2.18	-5.52	8.90
Salary (\$000s)	604.15	328.50	0.00	2,270.50
Bonus (\$000s)	445.65	773.29	0.00	14,276.00
CEO Ownership %	2.70	8.10	0.00	69.88
Dedicated Ownership	0.073	0.088	0.000	0.542
Transient Ownership	0.107	0.103	0.000	0.639
Environmental dynamism	1.02	0.02	1.00	1.24
Environmental munificence	1.11	0.10	0.62	1.65
Board chair	0.55	0.50	0.00	1.00
Technological distance	629.67	671.07	0.00	2,355.50
Board size	7.85	3.48	1.00	31.00
Gender (male = 1)	0.99	0.10	0.00	1.00
Business focus	0.45	0.50	0.00	1.00
Research focus	0.42	0.49	0.00	1.00
Tenure (years)	4.68	6.19	0.00	57.00
Age	54.92	8.21	35.00	93.00

Table 3 provides correlations for variables included in the analysis. A review of the correlation matrix shows a negative and significant relationship between promotion and prevention focus (corr = -0.1828). Although regulatory foci are considered to be orthogonal variables in general, in this sample the correlation appears to be meaningful. The correlations between promotion focus and both internal innovation (corr = -0.2202) and external innovation (corr = -0.0509) are both negative and statistically significant, which runs contrary to past findings and the theory of this study. The correlation between prevention focus and internal innovation (corr = 0.1165) is positive and significant, also contrary to expectations. The correlation between prevention focus and external innovation (corr = 0.0129) is not statistically significant. These correlations raise questions related to the hypothesized relationships in this study. VIFs were calculated to address the potential for multicollinearity, checking for potential bias in models predicting both internal and external innovation. With internal innovation as a dependent variable, the mean VIF was 1.75, with the highest at 6.08. For the model predicting external innovation the mean VIF was 1.80 with the highest at 6.22. Based on these calculations multicollinearity was determined to not be a concern.

**TABLE 3. Correlations**

	Internal (log) <sup>1</sup>	External (log) <sup>1</sup>	Promotion	Prevention	Narcissim
External (log) <sup>1</sup>	0.0657 **				
Promotion	-0.2202 ***	-0.0509 *			
Prevention	0.1165 ***	0.0147	-0.1828 ***		
Narcissim	0.0009	-0.051 *	-0.0123	-0.0078	
Employees (log)	-0.3902 ***	0.0129	0.0274	-0.0555 *	-0.0483
ROA change (1 year)	-0.0547 *	-0.031	0.0386	-0.0351	-0.0121
Cash (log)	-0.0216	0.1017 ***	-0.1587 ***	0.0184	-0.0394
Alliances	-0.0593 **	0.1177 ***	-0.0805 **	-0.0306	-0.0689 **
Capex (log)	-0.3039 ***	0.0476 *	-0.0033	-0.0721 **	-0.0592 *
Salary (\$000s)	-0.0811 ***	0.0091	-0.1015 ***	0.1392 ***	-0.0478
Bonus (\$000s)	-0.0849 ***	0.0094	-0.0726 *	-0.0058	-0.0533
CEO Ownership %	-0.0524 *	-0.051 *	0.0327	0.0959 **	0.1369 ***
Dedicated Ownership	0.0232	0.0488 *	-0.0624 *	-0.0812 **	-0.0397
Transient Ownership	0.0968 ***	0.0485 *	-0.0195	-0.0426	0.0385
Environmental dynamism	-0.119 ***	-0.02	0.0274	-0.0604 *	-0.0616 *
Environmental munificence	-0.0218	0.0135	-0.0235	-0.1399 ***	0.0335
Board chair	-0.1167 ***	0.0798 ***	0.0138	0.0004	0.0389
Technological distance	-0.0677 **	0.0066	0.0691 *	-0.1744 ***	-0.06 *
Board size	-0.0205	0.0968 ***	-0.0468	0.1009 ***	-0.0324
Gender	-0.0032	-0.0425	-0.0626 *	-0.0054	-0.0172
Business focus	-0.1162 ***	-0.008	0.0152	0.0193	-0.003
Research focus	0.1394 ***	-0.0062	-0.0311	-0.0635 *	0.0388
Tenure	-0.0779 ***	-0.0257	-0.0759 **	0.0973 ***	0.0401
Age	-0.1347 ***	-0.0872 ***	-0.0461	0.1065 ***	0.0421

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

<sup>1</sup> Variable lagged one year

**TABLE 3, CONTINUED**

	Employees (log)	ROA change (1 year)	Cash (log)	Alliances	Capex (log)
External (log) <sup>1</sup>					
Promotion					
Prevention					
Narcissim					
Employees (log)					
ROA change (1 year)	-0.0228				
Cash (log)	0.8591 ***	0.0011			
Alliances	0.3638 ***	-0.0114	0.311 ***		
Capex (log)	0.8977 ***	-0.0398	0.7044 ***	0.3713 ***	
Salary (\$000s)	0.7345 ***	0.0124	0.595 ***	0.1466 ***	0.5918 ***
Bonus (\$000s)	0.4076 ***	0.09 ***	0.3674 ***	0.2299 ***	0.3909 ***
CEO Ownership %	-0.2192 ***	-0.0098	-0.2182 ***	-0.0819 ***	-0.1358 ***
Dedicated Ownership	-0.0093	-0.0021	-0.0071	0.0326	0.0502 *
Transient Ownership	-0.1893 ***	0.0061	-0.0967 ***	-0.158 ***	-0.2117 ***
Environmental dynamism	0.0388	0.0104	0.0474 *	-0.0427 *	0.0387
Environmental munificence	-0.0645 **	-0.0675 **	-0.0817 ***	0.0961 ***	0.0365
Board chair	0.1487 ***	-0.0093	0.0439 *	0.0093	0.1768 ***
Technological distance	0.0242	-0.0261	0.1118 ***	-0.0013	0.031
Board size	0.6415 ***	-0.0057	0.5701 ***	0.3048 ***	0.5313 ***
Gender	0	-0.0042	0.0246	0.0204	0.0483 *
Business focus	0.0718 ***	0.0034	0.0001	0.0183	0.0262
Research focus	-0.2184 ***	0.0054	-0.1434 ***	-0.079 ***	-0.215 ***
Tenure	0.0468 *	-0.0185	-0.0003	0.0214	0.0455 *
Age	0.05 *	-0.0052	-0.0452	0.0053	0.0456

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

<sup>1</sup> Variable lagged one year

**TABLE 3, CONTINUED**

	Salary (\$000s)	Bonus (\$000s)	CEO Ownership %	Dedicated Ownership	Transient Ownership
External (log) <sup>1</sup>					
Promotion					
Prevention					
Narcissim					
Employees (log)					
ROA change (1 year)					
Cash (log)					
Alliances					
Capex (log)					
Salary (\$000s)					
Bonus (\$000s)	0.3411 ***				
CEO Ownership %	-0.2265 ***	-0.1215 ***			
Dedicated Ownership	-0.1021 ***	0.0877 ***	-0.1096 ***		
Transient Ownership	-0.2817 ***	-0.1637 ***	-0.02	0.0698 ***	
Environmental dynamism	-0.1598 ***	-0.043	0.0338	-0.0355	0.0397
Environmental munificence	-0.1372 ***	-0.0518 *	-0.0062	0.178 ***	0.075 ***
Board chair	0.2275 ***	0.1604 ***	0.1921 ***	0.0805 ***	-0.0456 *
Technological distance	-0.1796 ***	0.036	-0.0798 **	0.0079	0.0811 ***
Board size	0.5451 ***	0.2334 ***	-0.1896 ***	-0.1592 ***	-0.164 ***
Gender	-0.0178	0.0298	0.0288	0.0056	-0.0708 **
Business focus	0.0956 ***	0.0285	-0.142 ***	0.0093	0.0111
Research focus	-0.1819 ***	-0.0462	0.101 ***	-0.0064	0.0672 **
Tenure	0.0868 ***	0.0874 ***	0.2111 ***	0.0279	-0.0703 ***
Age	0.1457 ***	0.1024 ***	0.1705 ***	-0.0529 *	-0.1154 ***

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

<sup>1</sup> Variable lagged one year

**TABLE 3, CONTINUED**

	Environmental dynamism	Environmental munificence	Board chair	Technological distance	Board size
External (log) <sup>1</sup>					
Promotion					
Prevention					
Narcissim					
Employees (log)					
ROA change (1 year)					
Cash (log)					
Alliances					
Capex (log)					
Salary (\$000s)					
Bonus (\$000s)					
CEO Ownership %					
Dedicated Ownership					
Transient Ownership					
Environmental dynamism					
Environmental munificence	-0.0821 ***				
Board chair	-0.0333	-0.0106			
Technological distance	0.1408 ***	0.1043 ***	-0.0547 *		
Board size	-0.0055	-0.1334 ***	0.0146	-0.1128 ***	
Gender	0.0566 *	0.0429	0.0753 **	0.0145	-0.0112
Business focus	0.0146	-0.005	-0.0769 ***	-0.0798 ***	0.0891 ***
Research focus	-0.0591 **	0.0002	-0.0664 **	0.033	-0.1275 ***
Tenure	-0.0249	0.0042	0.1531 ***	0.0132	-0.1229 ***
Age	-0.0093	-0.0775 **	0.181 ***	-0.1125 ***	-0.0126

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

<sup>1</sup> Variable lagged one year

**TABLE 3, CONTINUED**

	Gender	Business focus	Research focus	Tenure
External (log) <sup>1</sup>				
Promotion				
Prevention				
Narcissim				
Employees (log)				
ROA change (1 year)				
Cash (log)				
Alliances				
Capex (log)				
Salary (\$000s)				
Bonus (\$000s)				
CEO Ownership %				
Dedicated Ownership				
Transient Ownership				
Environmental dynamism				
Environmental munificence				
Board chair				
Technological distance				
Board size				
Gender				
Business focus	-0.0257			
Research focus	-0.0511 *	-0.1224 ***		
Tenure	0.0447	-0.0876 ***	0.0081	
Age	-0.0205	0.0136	0.0933 ***	0.3374 ***

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05



Table 4 presents Models 1 and 2 showing results of the base models with control variables as baseline analyses. Model 1 uses the log of internal innovation as the dependent variable and Model 2 uses the log of external innovation as the dependent variable. Table 5 presents statistical tests for Hypotheses 1 and 2 in Models 3 and 4, with internal innovation and external innovation respectively as dependent variables. These models incorporate CEO promotion focus and prevention focus. The coefficient for promotion focus predicting internal innovation is negative and not significant ( $\beta = -.088$ ,  $p > .1$ ), failing to support Hypothesis 1a, but the coefficient for promotion focus predicting external innovation is significant and positive ( $\beta = .135$ ,  $p < .05$ ), providing support for Hypothesis H1b. The coefficient for prevention focus predicting internal innovation is positive and not significant ( $\beta = .092$ ,  $p > .1$ ), and the coefficient for prevention focus predicting external innovation is negative and not significant ( $\beta = -.102$ ,  $p > .1$ ). Neither Hypothesis 2a nor 2b is supported. Table 6 presents the test for Hypotheses 3a and 3b, predicting a negative interaction between prevention focus and promotion focus in predicting both internal and external innovation. The coefficient for the interaction of promotion and prevention predicting internal innovation is negative and not significant ( $\beta = -.028$ ,  $p > .1$ ) and the coefficient of the interaction variable predicting external innovation is positive and not significant ( $\beta = .013$ ,  $p > .1$ ). Hypotheses 3a and 3b are not supported.

Hypotheses 4a and 4b consider a preference for one innovation mode over the other. Because of concerns related to ratios in testing preferences (Certo, Busenbark, LePine, & Kalm, Forthcoming), these hypotheses are tested by predicting on innovation mode while controlling for the other. Table 7 shows Models 7 and 8 considering each of

these hypotheses. The coefficient for CEO prevention focus predicting external innovation while controlling for internal innovation is negative and not significant ( $\beta = -.128, p > .1$ ), and the coefficient for promotion focus predicting internal innovation while controlling for external innovation is also negative but not significant ( $\beta = .089, p > .1$ ), failing to support Hypotheses 4a and 4b. Surprisingly, as shown in Model 8, there is a positive and significant ( $\beta = .123, p < .05$ ) relationship between CEO promotion focus and external innovation when controlling for internal innovation. Contrary to Hypothesis 4a, promotion-focused CEOs may actually prefer external innovation rather than internal innovation.

Table 8 presents Models 9 and 10, providing statistical tests for Hypotheses 5a and 5b. In order to test variability in innovation mode, the dependent variable in these models is derived from the standard deviation of internal and external innovation undertaken by firms within a CEO's tenure. The coefficient for promotion focus predicting variability in internal innovation is positive and significant ( $\beta = 1.678, p < .05$ ), and the coefficient for promotion focus predicting variability in external innovation is also positive but not significant ( $\beta = .896, p > .1$ ). This provides partial support for Hypothesis H5a. The coefficient for prevention focus predicting variability in internal innovation is negative and significant ( $\beta = -3.379, p < .05$ ), and the coefficient for prevention focus predicting variability in external innovation is also negative but not significant ( $\beta = -.394, p > .1$ ). This provides partial support for Hypothesis H5b.

Hypotheses 6a through 6d are tested in Models 11 to 15 as shown in Table 9. These hypotheses consider the interaction between CEO regulatory focus and institutional ownership type. The coefficient for the interaction between promotion focus

and dedicated institutional ownership predicting external rather than internal innovation is positive and not significant ( $\beta = .553, p > .1$ ), failing to support Hypothesis 6a. The coefficient for the interaction between prevention focus and transient institutional ownership predicting internal rather than external innovation is positive and not significant ( $\beta = 1.523, p > .1$ ), failing to support Hypothesis 6b. The coefficient for the interaction between prevention focus and dedicated institutional ownership predicting external rather than internal innovation is negative and weakly significant ( $\beta = -3.053, p < .1$ ). Although this might have supported Hypothesis 6c, without a significant relationship between prevention focus and external innovation, it is difficult to interpret as a meaningful finding or merely a statistical artifact. Finally, the coefficient for the interaction between promotion focus and transient institutional ownership predicting internal rather than external innovation is negative and not significant ( $\beta = -.683, p > .1$ ), failing to support Hypothesis 6d.

Hypotheses 7a through 8b are tested in Models 15 through 18 in Table 10. These hypotheses consider how firm performance relative to historical aspirations may impact the relationship between CEO regulatory focus and innovation mode. The coefficient for the interaction of ROA change and promotion focus predicting internal innovation ( $\beta = .067, p > .1$ ) and external innovation ( $\beta = .214, p > .1$ ) are positive but not significant, providing no support for Hypotheses 7a and 7b. The coefficient for the interaction between ROA change and prevention focus predicting internal innovation ( $\beta = -.409, p > .1$ ) is negative and not significant, and positive and not significant in predicting external innovation ( $\beta = .049, p > .1$ ). Hypotheses 8a and 8b are not supported.

Table 11 shows tests for Hypotheses 9, 10a, and 10b. Hypothesis 9, considering the impact of environmental dynamism on the relationship between prevention focus and external innovation is shown in Model 19. The coefficient for this interaction is positive and not significant ( $\beta = 7.747, p > .1$ ). Hypothesis 9 is not supported. Hypotheses 10a and 10b consider how environmental munificence might impact the relationship between regulatory focus and innovation mode. Model 20 shows the interaction between CEO promotion focus and environment munificence predicting internal innovation. The coefficient for this interaction is negative and not significant ( $\beta = -.232, p > .1$ ). Model 21 shows the interaction between CEO prevention focus and environmental munificence predicting external innovation. The coefficient for this interaction is negative and not significant ( $\beta = 2.494, p > .1$ ). Hypotheses 10a and 10b are not supported.

**TABLE 4. Results**

	<b>Model 1</b>		<b>Model 2</b>	
	dv=Internal		dv=External	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal (log) <sup>1</sup>	0.008	0.128		
External (log) <sup>1</sup>			-0.488	0.098 ***
Narcissim	0.056	0.220	0.175	0.263
Employees (log)	-0.090	0.121	-0.271	0.192
ROA change (1 year)	-0.137	0.140	-0.085	0.141
Cash (log)	0.066	0.049	0.334	0.157 *
Alliances	-0.016	0.016	-0.012	0.021
Capex (log)	-0.042	0.053	-0.147	0.098
Salary (\$000s)	0.000	0.000	0.000	0.000
Bonus (\$000s)	0.000	0.000	0.000	0.000 **
CEO Ownership %	0.013	0.021	0.079	0.067
Dedicated Ownership	-0.111	0.327	-0.183	0.628
Transient Ownership	0.528	0.403	-0.898	0.792
Environmental dynamism	-0.856	2.095	-4.276	3.541
Environmental munificence	-0.823	0.711	0.056	0.984
Board chair	-0.307	0.124 *	-0.016	0.129
Technological distance	0.000	0.000	0.000	0.000
Board size	-0.026	0.018	-0.033	0.040
Gender	0.651	2.607	1.381	1.725
Business focus	0.133	0.129	0.026	0.198
Research focus	0.145	0.100	0.161	0.270
Tenure	0.037	0.017 *	-0.004	0.020
Age	-0.001	0.012	-0.014	0.018
Constant	1.420	3.482	3.038	3.968
	<i>n</i>	955	955	
	<i>groups</i>	159	159	
	<i>Wald Chi<sup>2</sup></i>	68.3	***	112.1

\*\*\* p&lt;0.001

\*\* p&lt;0.01

\* p&lt;0.05

† p&lt;0.1

<sup>1</sup> Variable lagged one year

**TABLE 5. Results**

	<b>Model 3</b>		<b>Model 4</b>	
	dv=Internal		dv=External	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal (log) <sup>1</sup>	0.007	0.123		
External (log) <sup>1</sup>			-0.304	0.064 ***
Promotion	-0.088	0.056	0.135	0.060 *
Prevention	0.092	0.138	-0.102	0.146
Narcissim	0.050	0.215	0.369	0.254
Employees (log)	-0.117	0.117	-0.262	0.163
ROA change (1 year)	-0.119	0.127	-0.010	0.106
Cash (log)	0.056	0.048	0.191	0.097 *
Alliances	-0.027	0.018	0.002	0.022
Capex (log)	-0.047	0.055	0.077	0.092
Salary (\$000s)	0.000	0.000	0.000	0.000
Bonus (\$000s)	0.000	0.000	0.000	0.000
CEO Ownership %	0.014	0.020	0.033	0.040
Dedicated Ownership	-0.170	0.337	-0.389	0.501
Transient Ownership	0.614	0.428	-0.138	0.538
Environmental dynamism	-1.235	1.991	-1.915	3.903
Environmental munificence	-1.068	0.785	0.347	0.854
Board chair	-0.338	0.140 *	0.083	0.129
Technological distance	0.000	0.000	0.000	0.000
Board size	-0.028	0.018	0.026	0.031
Gender	0.003	2.537	0.394	0.608
Business focus	0.130	0.128	0.156	0.108
Research focus	0.134	0.101	0.046	0.161
Tenure	0.033	0.015 *	-0.024	0.017
Age	0.000	0.011	0.010	0.018
Constant	2.879	3.321	-0.702	4.989
	<i>n</i>	955	955	
	<i>groups</i>	159	159	
	<i>Wald Chi<sup>2</sup></i>	48.3	**	175.6

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

**TABLE 6. Results**

	<b>Model 5</b>		<b>Model 6</b>	
	dv=Internal		dv=External	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal (log) <sup>1</sup>	0.006	0.122		
External (log) <sup>1</sup>			-0.305	0.065 ***
Promotion	-0.081	0.055	0.131	0.077 †
Prevention	0.139	0.276	-0.124	0.288
Promotion*Prevention	-0.028	0.129	0.013	0.179
Narcissim	0.046	0.214	0.370	0.253
Employees (log)	-0.114	0.120	-0.260	0.163
ROA change (1 year)	-0.119	0.127	-0.011	0.104
Cash (log)	0.057	0.049	0.191	0.097 *
Alliances	-0.027	0.019	0.002	0.022
Capex (log)	-0.048	0.056	0.077	0.092
Salary (\$000s)	0.000	0.000	0.000	0.000
Bonus (\$000s)	0.000	0.000	0.000	0.000
CEO Ownership %	0.014	0.020	0.033	0.040
Dedicated Ownership	-0.167	0.338	-0.390	0.506
Transient Ownership	0.606	0.415	-0.139	0.537
Environmental dynamism	-1.186	2.040	-1.916	3.915
Environmental munificence	-1.051	0.775	0.344	0.864
Board chair	-0.338	0.140 *	0.083	0.127
Technological distance	0.000	0.000	0.000	0.000
Board size	-0.028	0.017	0.026	0.032
Gender	-0.034	2.563	0.395	0.608
Business focus	0.126	0.121	0.156	0.108
Research focus	0.128	0.106	0.050	0.169
Tenure	0.033	0.015 *	-0.024	0.017
Age	0.000	0.011	0.010	0.018
Constant	2.842	3.292	-0.695	5.018
	<i>n</i>	955		955
	<i>groups</i>	159		159
	<i>Wald Chi<sup>2</sup></i>	53.6	***	178.4

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

**TABLE 7. Results**

	Model 7		Model 8	
	dv=Internal		dv=External	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal (log) <sup>1</sup>	0.006	0.123	-0.344	0.228
External (log) <sup>1</sup>	0.014	0.116	-0.304	0.072 ***
Promotion	-0.089	0.060	0.123	0.062 *
Prevention	0.093	0.140	-0.128	0.155
Narcissim	0.053	0.225	0.327	0.244
Employees (log)	-0.123	0.132	-0.275	0.166 †
ROA change (1 year)	-0.119	0.127	-0.144	0.146
Cash (log)	0.055	0.048	0.191	0.095 *
Alliances	-0.029	0.028	0.005	0.021
Capex (log)	-0.047	0.055	0.092	0.095
Salary (\$000s)	0.000	0.001	0.000	0.000
Bonus (\$000s)	0.000	0.000	0.000	0.000
CEO Ownership %	0.014	0.019	0.042	0.047
Dedicated Ownership	-0.180	0.358	-0.333	0.502
Transient Ownership	0.618	0.440	-0.180	0.540
Environmental dynamism	-1.222	1.955	-1.920	3.883
Environmental munificence	-1.070	0.794	0.123	0.834
Board chair	-0.342	0.149 *	0.108	0.132
Technological distance	0.000	0.000	0.000	0.000
Board size	-0.028	0.017	0.030	0.031
Gender	-0.075	2.746	0.487	0.617
Business focus	0.128	0.123	0.119	0.119
Research focus	0.144	0.144	0.067	0.158
Tenure	0.033	0.016 *	-0.021	0.017
Age	0.000	0.011	0.001	0.020
Constant	2.926	3.511	-0.025	4.922
	<i>n</i>	955	955	
	<i>groups</i>	159	159	
	<i>Wald Chi<sup>2</sup></i>	47.4	**	211.0

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year



**TABLE 8. Results**

	<b>Model 9</b>		<b>Model 10</b>	
	dv=Internal Variability		dv=External Variability	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal Variability	-0.573	0.069 ***		
External Variability			-0.837	0.272 **
Promotion	1.678	0.857 *	0.896	0.618
Prevention	-3.379	1.413 *	0.394	0.572
Narcissim	-1.667	1.799	-1.246	1.005
Employees (log)	1.789	2.477	-0.774	1.412
ROA change (1 year)	-5.869	3.279 †	1.300	1.036
Cash (log)	0.185	0.947	0.532	0.538
Alliances	0.110	0.100	0.057	0.075
Capex (log)	-1.390	0.910	-0.749	0.613
Salary (\$000s)	0.000	0.003	0.000	0.001
Bonus (\$000s)	0.000	0.000	0.000	0.000
CEO Ownership %	0.028	0.363	0.034	0.128
Dedicated Ownership	6.854	7.017	-4.539	2.552 †
Transient Ownership	0.377	5.778	-3.285	3.029
Environmental dynamism	-10.659	28.150	23.191	28.411
Environmental munificence	-8.649	9.677	7.633	6.642
Board chair	-0.550	1.340	0.121	0.501
Technological distance	-0.001	0.002	0.001	0.001
Board size	0.560	0.415	0.048	0.136
Gender	-3.752	20.408	4.037	9.568
Business focus	3.624	2.226	0.972	1.006
Research focus	-3.139	2.367	0.196	0.760
Tenure	-0.079	0.104	-0.136	0.126
Age	-0.038	0.117	0.023	0.049
Constant	22.071	32.183	-38.748	44.401
	<i>n</i>	915	955	
	<i>groups</i>	152	159	
	<i>Wald Chi<sup>2</sup></i>	409.0	***	311.3

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

**TABLE 9. Results**

	Model 11		Model 12		Model 13		Model 14		
	dv=External		dv=Internal		dv=External		dv=Internal		
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	
Internal (log) <sup>1</sup>	-0.302	0.226	0.000	0.129	-0.337	0.195 †	0.005	0.117	
External (log) <sup>1</sup>	-0.291	0.069 ***	0.007	0.112	-0.465	0.116 ***	0.024	0.117	
Promotion	0.086	0.067	-0.095	0.062	0.074	0.075	-0.022	0.062	
Prevention	-0.120	0.157	-0.055	0.117	0.142	0.152	0.098	0.140	
Dedicated Ownership	-1.311	1.225	-0.188	0.341	0.629	0.871	-0.105	0.397	
Transient Ownership	-0.149	0.543	0.161	0.382	-1.185	0.746	1.816	1.058 †	
Promotion*Dedicated	0.553	0.585							
Prevention*Dedicated					-3.053	1.774 †			
Promotion*Transient							-0.683	0.464	
Prevention*Transient			1.523	1.154					
Narcissim	0.333	0.244	0.063	0.222	0.095	0.260	0.070	0.223	
Employees (log)	-0.310	0.156 *	-0.134	0.133	-0.390	0.219 †	-0.144	0.128	
ROA change (1 year)	-0.132	0.150	-0.123	0.130	-0.191	0.178	-0.128	0.127	
Cash (log)	0.191	0.094 *	0.053	0.048	0.275	0.151 †	0.052	0.050	
Alliances	0.007	0.022	-0.031	0.028	-0.022	0.021	-0.033	0.029	
Capex (log)	0.100	0.091	-0.054	0.054	-0.080	0.095	-0.049	0.056	
Salary (\$000s)	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	
Bonus (\$000s)	0.000	0.000	0.000	0.000	0.000	0.000 **	0.000	0.000	
CEO Ownership %	0.037	0.045	0.013	0.019	0.075	0.069	0.016	0.019	
Environmental dynamism	-1.806	3.940	-0.622	1.883	-5.015	4.323	-0.773	2.121	
Environmental munificence	0.108	0.811	-0.853	0.747	-0.328	1.039	-1.117	0.812	
Board chair	0.101	0.133	-0.340	0.149 *	0.070	0.135	-0.369	0.151 *	
Technological distance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Board size	0.031	0.032	-0.029	0.017 †	-0.010	0.044	-0.024	0.017	
Gender	0.389	0.612	-0.574	2.856	1.117	1.632	0.122	2.865	
Business focus	0.138	0.120	0.100	0.120	0.080	0.168	0.133	0.125	
Research focus	0.059	0.154	0.148	0.142	0.110	0.230	0.159	0.142	
Tenure	-0.020	0.017	0.032	0.016 *	-0.006	0.025	0.036	0.016 *	
Age	0.002	0.020	0.002	0.011	-0.026	0.028	0.001	0.011	
Constant	-0.038	4.947	2.579	3.414	5.078	4.813	2.118	3.772	
	<i>n</i>	955		955		955		955	
	<i>groups</i>	159		159		159		159	
	<i>Wald Chi<sup>2</sup></i>	216.5	***	56.4	***	191.2	***	56.2	***

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

**TABLE 10. Results**

	<b>Model 15</b>		<b>Model 16</b>		<b>Model 17</b>		<b>Model 18</b>	
	dv=Internal		dv=External		dv=Internal		dv=External	
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>
Internal (log) <sup>1</sup>	0.002	0.129	-0.353	0.223	0.016	0.120	-0.344	0.228
External (log) <sup>1</sup>	0.015	0.117	-0.307	0.074 ***	0.014	0.114	-0.304	0.073 ***
Promotion	-0.095	0.067	0.127	0.062 *	-0.091	0.060	0.123	0.063 *
Prevention	0.094	0.142	-0.145	0.175	0.093	0.139	-0.128	0.155
Dedicated Ownership	-0.189	0.354	-0.355	0.503	-0.218	0.365	-0.334	0.499
Transient Ownership	0.626	0.445	-0.125	0.559	0.676	0.449	-0.185	0.566
ROA change (1 year)	-0.226	0.335	-0.522	0.455	0.007	0.213	-0.155	0.184
Promotion*ROA Change	0.067	0.154	0.214	0.231				
Prevention*ROA Change					-0.409	0.549	0.049	0.647
Narcissim	0.046	0.216	0.340	0.247	0.057	0.223	0.327	0.244
Employees (log)	-0.128	0.131	-0.282	0.170 †	-0.117	0.133	-0.274	0.171
Cash (log)	0.052	0.050	0.189	0.095 *	0.052	0.047	0.190	0.095 *
Alliances	-0.030	0.029	0.007	0.022	-0.027	0.028	0.005	0.021
Capex (log)	-0.047	0.055	0.084	0.096	-0.048	0.056	0.092	0.095
Salary (\$000s)	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Bonus (\$000s)	0.000	0.000	0.000	0.000 †	0.000	0.000	0.000	0.000
CEO Ownership %	0.014	0.019	0.044	0.049	0.014	0.020	0.041	0.047
Environmental dynamism	-1.207	1.972	-1.848	3.857	-1.402	1.946	-1.912	3.922
Environmental munificence	-1.069	0.794	0.103	0.838	-1.128	0.799	0.128	0.845
Board chair	-0.349	0.155 *	0.110	0.135	-0.339	0.145 *	0.109	0.132
Technological distance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Board size	-0.027	0.017	0.034	0.032	-0.029	0.017	0.031	0.032
Gender	-0.057	2.764	0.661	0.689	-0.170	2.679	0.495	0.627
Business focus	0.131	0.123	0.112	0.121	0.127	0.123	0.120	0.120
Research focus	0.147	0.148	0.072	0.159	0.146	0.144	0.070	0.176
Tenure	0.034	0.016 *	-0.021	0.017	0.032	0.015 *	-0.021	0.017
Age	0.000	0.011	0.001	0.020	0.000	0.011	0.001	0.021
Constant	2.915	3.540	-0.251	4.843	3.307	3.373	-0.040	4.981
<i>n</i>	955		955		955		955	
<i>groups</i>	159		159		159		159	
<i>Wald Chi<sup>2</sup></i>	50.0	**	213.0	***	54.5	***	216.4	***

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

**TABLE 11. Results**

	<b>Model 19</b>		<b>Model 20</b>		<b>Model 21</b>		
	dv=External		dv=Internal		dv=External		
	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	<i>Coef.</i>	<i>St. Err.</i>	
External (log) <sup>1</sup>	-0.307	0.063 ***	0.016	0.119	Coef.	Std.	
Promotion	0.127	0.063 *	0.166	0.741	0.130	0.063 *	
Prevention	-7.995	11.336	0.093	0.140	2.612	2.891	
Dedicated Ownership	-0.443	0.513	-0.181	0.358	-0.277	0.543	
Transient Ownership	-0.087	0.515	0.620	0.441	-0.147	0.539	
ROA change (1 year)	-0.017	0.108	-0.120	0.129	-0.160	0.152	
Prevention*Dynamism	7.747	11.105					
Promotion*Munificence			-0.232	0.698			
Prevention*Munificence					-2.494	2.709	
Narcissim	0.383	0.253	0.059	0.230	0.369	0.245	
Employees (log)	-0.229	0.180	-0.123	0.133	-0.244	0.161	
Cash (log)	0.199	0.096 *	0.056	0.048	0.193	0.095 *	
Alliances	0.001	0.023	-0.029	0.029	0.005	0.020	
Capex (log)	0.073	0.093	-0.046	0.054	0.094	0.096	
Salary (\$000s)	0.000	0.000	0.000	0.001	0.000	0.000	
Bonus (\$000s)	0.000	0.000	0.000	0.000	0.000	0.000	
CEO Ownership %	0.032	0.041	0.014	0.020	0.039	0.047	
Environmental dynamism	-3.430	3.920	-1.268	1.933	-1.265	3.924	
Environmental munificence	0.271	0.889	-0.684	1.288	0.641	0.929	
Board chair	0.093	0.132	-0.344	0.150 *	0.111	0.134	
Technological distance	0.000	0.000	0.000	0.000	0.000	0.000	
Board size	0.025	0.032	-0.029	0.017 †	0.031	0.032	
Gender	0.482	0.649	0.012	2.744	0.486	0.634	
Business focus	0.134	0.116	0.131	0.125	0.146	0.129	
Research focus	0.060	0.166	0.158	0.155	0.057	0.158	
Tenure	-0.023	0.017	0.034	0.016 *	-0.025	0.017	
Age	0.009	0.019	0.001	0.011	0.001	0.020	
Constant	0.863	5.152	2.450	3.785	-1.364	5.080	
	<i>n</i>	955		955		955	
	<i>groups</i>	159		159		159	
	<i>Wald Chi<sup>2</sup></i>	167.2	***	189.1	***	209.1	***

\*\*\* p<0.001

\*\* p<0.01

\* p<0.05

† p<0.1

<sup>1</sup> Variable lagged one year

### *Robustness tests*

A number of tests were performed to ensure robustness of analyses. Although the primary analyses considered ROA change over one year, additional tests were performed using a three-year ROA change to explore whether a longer lag would impact results, and also various lags of cash with no meaningful change in results. The instrument structure was also varied to allow deeper lags in the instruments. Although significance of results does vary with the lag structure, the general patterns for significant results hold over multiple years. Changing the lag structures also does not appear to affect statistical results in a meaningful way for non-significant relationships. Additional models without robust standard errors are also tested, again with similar results.

Because acquisitions can be measured by counting the number of acquisitions rather than calculating their value, I also tested the relationship between CEO regulatory focus and external innovation using the count of acquisitions. Both the Poisson and negative binomial models were tested, with each supporting the hypothesized relationship between promotion focus and external innovation. In addition, the interaction of regulatory foci was tested in these models. These tests showed the interaction between promotion and prevention focus to have significant and positive relationship with acquisition activity, opposite the hypothesized relationship in Hypothesis 3a. It appears that there is more to be learned about the relationship between regulatory foci and acquisition activity.

To further explore the impact of a firm performing below aspirations, additional tests were performed considering how firms performed relative to peer groups (Vissa et al., 2010), an alternate measure of firm aspirations. Average industry performance was

calculated to consider firms most similar to each individual firm, and then a measure of the difference between the ROA of each firm relative to the ROA of its industry was calculated. Hypotheses 7a through 8b were retested using this alternate measure, also resulting in no significant relationships and failing to support the hypotheses. Additionally, tests were performed with a simpler variable coding whether firm ROA above or below historical performance, but this did not yield significant results.

Post estimation tests were performed on all models to address potential concerns related to autocorrelation. Autocorrelation may create concerns as the instrumented dependent variable can be too similar to the dependent variable. Using the Arellano-Bond test for zero autocorrelation and first-differenced errors, I found that some, but not all models have first-order autocorrelation, but for all models I am unable to reject the null hypothesis of no autocorrelation for second-order autocorrelation. Because we would expect that CEOs will have similar regulatory focus over time, the first-order autocorrelation is not considered to be a problem. Second-order autocorrelation could be a potential concern for these analyses, but through the lag structure created by the linear dynamic panel-data estimation, instruments have been adjusted to eliminate this concern.

## CHAPTER VI

### DISCUSSION AND CONCLUSION

The purpose this study was to explore the impact of CEO regulatory focus on firm innovation mode. Options exist regarding how firms pursue growth and enhanced profitability, and those options may carry different types and levels of risk.

Understanding these relationships may provide insight both into how different CEOs perceive strategic options and their associated risk, and also which options may be viewed as more risky than others. Internal innovation through R&D provides the firm with control over the innovation process from start to finish and may allow the firm to build on previously established competences, while external innovation through acquisitions can provide rapid growth opportunities and provide the firm with ready-made solutions. However, while the acquiring firm does have control over the acquisitions that it chooses to make, there may still be a greater level of uncertainty related to how that technology was developed and how the technology and new competences will be integrated into the firm. Both R&D and acquisition activity have been used as proxy measures of for risk-taking behavior (Bromiley, Rau, & Zhang, 2017; Hoskisson et al., 2017), but some recent research has questioned the value of R&D as a measure of firm risk (Bromiley et al., 2017). Because regulatory focus considers how individuals seek to achieve goals, whether through striving for success or by avoiding pitfalls, this study provides an opportunity to observe differences in how CEOs with different psychological characteristics may approach these innovation modes.

The study presented a number of hypotheses suggesting that firms led by promotion-focused CEOs would be more likely to engage in innovation-focused

investment, both internally and externally, that firms led by prevention-focused CEOs would be more likely to engage in less investment in each innovation mode, and also how decisions between innovation modes might be made. In addition, the variability of firm investment in innovation modes was considered, as well as the potential impact of a number of organizational and environmental moderators that had the potential to impact the expression of CEO regulatory focus and how that might impact firm innovation mode. Ultimately most hypothesized relationships were not supported, but a few statistically-significant relationships do provide insight into how CEOs approach investment in different innovation modes. None of the moderated relationships were sufficiently supported to be able to draw meaningful conclusions, or had no statistical significance whatsoever.

Although most hypothesized relationships were not supported, there are still a number of things to be learned from this study. Despite many non-significant findings, we can see that the way promotion and prevention foci predict investment in innovation mode does differ by both regulatory focus and innovation mode. While CEO prevention focus does not appear to demonstrate a preference for one innovation mode over the other, CEO promotion focus does appear to show a positive and significant relationship with external innovation but not with internal innovation. We can also see a difference in stability of investment in internal innovation, as promotion focus was positively associated with variation in internal innovation, while prevention focus was negatively associated with variation in internal innovation. Finally, the study also provides theoretical consistency with previous studies. The relationship between regulatory focus



and innovation modes does appear to differ. It is valuable to find that while most hypothesized relationships were not supported, a meaningful distinction was observed.

Finding of this study may also provide insight into the debate of how much CEOs really matter (Collingwood, 2009; Finkelstein et al., 2009; Fitza, 2014; Quigley & Graffin, 2016), as we observe meaningful differences in firm direction to be associated with psychological characteristics of CEOs. Despite studies discussing how much individual CEOs may matter through a variance decomposition method (Fitza, 2014), observation of differences between individual CEOs influencing the innovation investment of firms provides evidence of the importance of CEOs in firm-level decision making. The more we learn about how CEOs make decisions, the more we may learn about how firms are likely to perform in the future and perhaps lead into better matching of CEOs' characteristics and abilities with the needs of firms.

Several important theoretical contributions arise from this study. First, we learn something of how CEO regulatory focus affects firm innovation mode. Statistical results did not support most hypotheses, but statistical analysis appears to show that promotion-focused CEOs prefer the shorter-term option of external innovation opposite of the hypothesized relationship, while prevention-focused CEOs do not show a significant preference. It appears that there is a difference in how regulatory focus and firm innovation mode. Further research could provide greater clarity into the relationship between CEO regulatory focus and firm innovation mode (or other strategic options available to the firm), perhaps by expanding the research context or including cooperative innovation as an additional alternative.

We also see a pattern emerge regarding the stability of investment in internal innovation. Firms with CEOs that have a strong prevention focus tend to hold internal innovation steadier over time than do other CEOs, and firms led by promotion-focused CEOs tend to vary investment in internal innovation. Were it possible to select CEOs based on regulatory focus, it would appear that promotion-focused CEOs would be a good fit for firms that would benefit from a change in innovation strategy, while prevention-focused CEOs would be better suited to firms that would most benefit from a steady innovation strategy.

Another interesting theoretical contribution of this study concerns the potential riskiness of investment in R&D. Many studies have considered R&D as a firm risk factor (Hoskisson et al., 2017), but the way that CEO regulatory focus impacts R&D and acquisitions in this study appears to be different. Although promotion-focused CEOs show a tendency to invest more in acquisitions, consistent with previous research (Gamache et al., 2015), no such relationship appears related to R&D. Furthermore, CEO prevention focus was negatively associated variability in R&D spending, while CEO promotion focus was positively associated with variability in R&D spending. Beyond direct investment, it appears that promotion-focused CEOs, who would be expected to avoid risk that could lead to negative outcomes (Higgins, 1998), prefer to hold to an established course of consistent investment in internal innovation through R&D, while promotion-focused CEOs are more willing to vary investment in internal innovation. This is consistent with previous research discussing that CEOs tend to be less open to change in general (Lieberman et al., 1999) and show a preference for the status quo (Chernev, 2004; Jain et al., 2006; Yaniv & Schul, 2000). Further questioning the validity

of R&D as a factor of firm risk taking, Bromiley et al. (2017) ask whether R&D is truly a meaningful proxy for firm risk taking. They investigated the relationship between R&D and firm risk, generally with non-significant findings. The lack of a finding between either promotion focus or prevention focus and R&D intensity may support this study. R&D itself may not be a good measure of firm risk taking, although the positive relationship between promotion focus and variation in R&D, combined with the negative relationship between prevention focus and variation in R&D may suggest that changing a firm's innovation strategy is a more meaningful measure of risk, while simply engaging in R&D is not. Ultimately, we can see what may be a more cautious approach related to internal innovation taken by prevention-focused CEOs who simply stay the course and do not make changes, and a riskier strategy taken by promotion-focused CEOs, which tend to vary investment in R&D to a greater degree.

One important statistical finding of this study, that also reinforces theory, relates to the positive relationship between CEO promotion focus and acquisition activity. This relationship remains positive and significant whether measuring external innovation as either the value or count of acquisitions. This is valuable as a replication of the Gamache et al. study (2015), and shows that this relationship holds in a specific high-technology industry context rather than a general context without consideration for industry. However, it is interesting that a negative relationship between prevention focus and acquisition activity is not present. It may be that in an innovation-centric context, acquisitions may remain a viable option for obtaining technology, which firms may need in order to protect a technological or market position. In this way, firms in a fast-cycle market may engage in acquisition activity not only to grow, but also to fend off potential

threats, posing external innovation as a viable strategy for prevention-focused CEOs. This strategic option may not provide the same benefit in a slower-cycle market, which may be the reason that a negative relationship was found in the previous study as acquisitions may pose a greater level of risk-taking in slow-cycle markets than in fast-cycle market.

Finally, the study provides theoretical insight into the strategic entrepreneurship model put forth by Ireland et al. (2003). A key part of that model is the relationship between managing resources strategically and applying creativity and developing innovation. Promotion-focused CEOs appear to prefer investing resources in acquisitions as a mode to obtain or develop innovation. Prevention-focused CEOs remain consistent with a stable strategy of investment in R&D, and appear willing to invest in acquisitions as well, as no negative relationship between CEO prevention focus and acquisition behavior was found. The positive relationship between CEO prevention focus and variability in R&D, contrasted with the negative relationship between CEO promotion focus and variability in R&D further shows how CEO regulatory focus can affect the innovation pursued by the firm. By showing how regulatory focus impacts these relationship, we can learn better how decisions are made regarding the use of firm resources in the pursuit of innovation. As CEOs lead their firms in pursuing innovation, their own biases and preferences become relevant influences on firm innovation investment.

With one possible exception, all hypothesized moderations resulted in non-significant findings. The one possible exception is a negative relationship between the interaction of prevention focus and dedicated institutional ownership and a preference

for external innovation. Based on other findings and non-findings, it is difficult to argue that this relationship is the result of the theoretical reasoning suggested previously, which is that a preference for internal innovation would be preferred by dedicated investors, thereby weakening a positive (and statistically unobserved) relationship between prevention focus and external innovation. The statistical result observed may be the result of something else entirely. It would not be surprising to see a negative relationship between dedicated institutional ownership and external innovation, as that would agree with previous studies (Bushee, 1998; Connelly et al., 2010), showing a relationship between dedicated institutional ownership and a long-term strategy, but that relationship does not appear in any other model. The observed relationship between CEO promotion focus and external ownership also may leave the possibility that prevention-focused CEOs do not necessarily pursue external innovation. It is possible that the combination of CEO prevention focus and dedicated institutional ownership does lead to less external innovation, but a single relationship with weak significance does not provide sufficient statistical support to make a meaningful interpretation.

Other hypothesized interactions consider institutional ownership, firm performance, environmental dynamism, and environmental munificence. With the previously discussed possible exception, none of these results shows a significant relationship. While somewhat surprising to find no significance in any of these interactions, it is possible that individual regulatory focus is sufficiently salient that other factors do not affect CEOs' decisions. This possibility was established by Wowak and Hambrick (2010), who showed no significant relationship between CEO stock options and risk-taking behavior for individuals with either a promotion focus or a high

prevention focus, although CEOs with moderate regulatory foci did respond to increased stock options with greater engagement in risk-taking behavior. It is possible that a strong regulatory focus has a sufficiently strong affect that other moderators have little impact when it is considered. Further research could explore this possibility for new moderators and in different contexts.

This study leads to a number of potential future studies. Despite the non-findings within this study, questions related to the relationship between CEO regulatory focus and firm innovation remain. For example, while this study does not find a significant difference in the investment that firms made toward R&D, there was a difference in how steady that relationship held. A significant and positive relationship was found between CEO promotion focus and variability in internal innovation investment, and a significant and negative relationship was found between CEO prevention focus and in internal innovation investment. Promotion-focused CEOs appear to be more willing to change course than prevention-focused CEOs. It may be possible that firms with a prevention-focused CEO are able to benefit from a steady and predictable investment in R&D. However, this same predictability may actually become a detriment to the firm, as variation in R&D investment related to a CEO promotion focus may have the potential to spur greater creativity. The result may be observable differences in innovation outcomes, such as the number of patents, impact of patents, or complexity of patents. Further studies could consider the impact of CEO regulatory focus on firm innovation outcomes rather than on firm innovation mode.

There may also be other observable differences related to firms' acquisition activity. While a positive relationship has been demonstrated between CEO promotion

focus and acquisition activity both in this and previous studies, it is possible that the terms of those acquisitions may meaningfully differ. Individuals with a promotion focus are more likely to make errors of commission relative to prevention-focused individuals (Higgins, 1997), and to demonstrate a lack of due diligence (Lieberman et al., 1999; McMullen & Kier, 2016). This could potentially result in higher acquisition premiums paid by promotion-focused CEOs. In contrast, prevention-focused CEOs would be expected to exercise extensive due diligence (Lieberman et al., 1999), so while they appear to be willing to engage in some acquisition activity, they may be more careful than their promotion-focused counterparts, leading to lower acquisition premiums paid. We may see that despite the lack of a relationship between CEO prevention focus and acquisition activity, these prevention-focused CEOs may do a better job of analyzing and vetting potential deals, leading to better outcomes as the result of better due diligence.

Other potential studies arising from this project could relate to additional psychological characteristics of CEOs that have the potential to impact firm innovation mode and outcomes. Through content analysis, CEO narcissism, temporal focus, positive affect, and other characteristics may be measured. Each of these has the potential to explain firm strategies related to innovation mode and also to innovative output. Another area to which this and other studies can contribute value is related to the concept of CEO discretion. With activist investors, technological advancement, a rapidly changing global business environment, and other factors, previous research on discretion may have become outdated. Both the level of discretion enjoyed by CEOs and their impacts appear to merit further research.

### *Limitations and future research*

This study has a number of important limitations to consider. Because the research context was constricted to three main industries in order to focus on innovation, the results may not be generalizable. Further research could consider similar questions in a broader context. While innovation in the current context may take place through a process of R&D that is focused on generating valuable patents, innovation in other contexts could take many different forms. As a result, the findings of this study could be very different from what would be found in other contexts.

Another limitation of this study that could be remedied through future research is the exclusion of cooperative strategies as a potential innovation mode. This study considers how CEO regulatory focus relates to potential uncertainty associated with internal and external innovation. However, cooperative relationships such as research agreements and joint ventures could be viewed very differently. These relationships may contribute to uncertainty related to a partner's actions, or serve as a method of managing uncertainty by sharing risk among multiple organizations.

Using content analysis of shareholder letters as a method of measuring CEO regulatory focus does raise some concern related to who writes the letter and whether it truly reflects the psychology of the CEO. While not a perfect method, shareholder letters have been used to measure CEO regulatory focus (Gamache et al., 2015), CEO charismatic visions (Fanelli et al., 2009), and CEO commitment to the status quo (McClelland et al., 2010). Whether someone other than the CEO helped write the letter may also present some room for concern. However, the CEO signs the letter and so confirms that the letter is a reflection of his or her intended communication. Although



concerns may arise, this can be viewed as a conservative test if findings are still apparent despite the potential for confounding influences. The findings of multiple studies indicate the validity of this method.

### ***Conclusion***

The goal of this study was to address how CEO regulatory focus impacts firm innovation mode. Understanding how psychological characteristics impact decision making provides a valuable insight into organizational leadership, informs upper echelons theory, and in an innovative context has the potential to illuminate how CEOs choose particular innovation modes in which to invest firm resources. Regulatory focus theory, which considers an achievement and growth-oriented promotion focus, and a cautious, threat-avoiding prevention focus, can inform strategic decision making beyond what other psychological characteristics can do. Many studies have considered how regulatory focus impacts various firm-level activities, and this study explores potential relationships between regulatory focus and firm investment in internal innovation through R&D and external innovation through acquisition activity. Results of the study indicate that firms led by promotion-focused CEOs may invest more in external innovation, without a significant relationship with internal innovation, and provide no evidence of a relationship between prevention focus and internal innovation. Additionally, the study hypothesized and supported that prevention-focused CEOs are likely to hold a more stable innovation strategy, while promotion-focused CEOs are more likely to vary innovation investment. Going forward, I hope to see additional research into both regulatory focus of CEOs and other high-level organizational leaders,

and also greater attention paid to the modes through which firm leaders pursue innovation.

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