2024-05

Engaging with Uncertainty: Three Empirical Studies

Ma, Yan

UNIVERSITY OF CALGARY

Engaging with Uncertainty: Three Empirical Studies

by

Yan Ma

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN MANAGEMENT

CALGARY, ALBERTA

MAY, 2024

Abstract

Engaging with uncertainty is vital in business because it can either generate or destroy wealth. My dissertation, comprising three empirical studies, investigates management decision-making and firm performance under uncertainty. The first study examines how organizational stress represented by resource constraints impacts firm performance. Drawing from the psychology-based Yerkes-Dodson (1908) Law, we propose that, while some amount of stress activated by constraints enhances performance, too much stress hampers performance. Using textual measures to gauge constraints that activate stress at the organizational level, we find an inverted-U relationship between constraints and return on assets. This relationship is more aligned with creativity, reflected by profit margin and innovation activities, than with efficiency in resource usage captured by asset turnover.

My second study analyzes the compensation structure of the top leadership team (TLT), a group of executives responsible for navigating the organization through uncertain times. This study recognizes the importance of both the CEO's unique role and the dynamics among team members through: (1) CEO pay slice, reflecting payment for the CEO's team leadership and management skill, and (2) pay dispersion among the CEO's top team, capturing the weights on team versus individual based payments. We find that TLTs characterized by a large CEO pay slice and low degree of pay dispersion among the CEO's top team outperform others in terms of return on assets. These results highlight complementary relations between CEO team leadership and team-based compensation in compensating TLTs.

My third study analyzes how a strategic focus on balance sheet strength influences investment decisions and performance among Canadian oil and gas firms that navigate through uncertainties. Based on discussions with industry experts, we identify two groups of firms: those

aggressively investing during favorable conditions – “making hay while the sun shines”, and those investing more prudently – “saving for a rainy day”. While investment in downturns declined generally for both types of firms, the decline in investment was significantly less for rainy day companies. These rainy day firms make shrewder acquisitions and achieve greater operational efficiency over time. However, rainy day firms have lower market valuations during upturns compared to making hay firms.

Acknowledgement

Doctoral life has truly been the most memorable phase of my life journey, and the people who supported me during this phase deserve sincere acknowledgement.

First and foremost, I extend my deepest gratitude to Dr. Mark Anderson. He has been more than just my mentor – he is a guiding light, a father figure, and a trusted friend. Beyond academic guidance, Dr. Anderson's optimism, wit, generosity, and inclusiveness have profoundly shaped my perspective. It has been the greatest fortune of my doctoral life to be his student. I will forever cherish the joyful moments with him and his invaluable support. I extend my best wishes to him and his family.

I am indebted to my supervisory committee, Dr. Hussein Warsame and Dr. Peter Sherer, for their guidance, encouragement, and unwavering support throughout numerous milestones. I am also grateful to Dr. Atsuko Tanaka and Dr. Suresh Radhakrishnan for serving as members of my examining committee. I appreciate the valuable time they spent and their insightful and helpful comments.

I express my heartfelt gratitude and remembrance to Dr. Rajiv Banker. His invaluable guidance has profoundly impacted my research and his exceptional talent, profound wisdom, and insightful perspectives have left a lasting impression on me. Dr. Banker’s passing is a significant loss to the management accounting field. His unparalleled contributions and outstanding expertise will be remembered.

My heartfelt thanks go to my coauthors, Dr. Rong Zhao and Dr. Han-up Park. Collaborating with you has been an enriching experience, and I appreciate your valuable guidance, support and contributions.

Appreciations are also extended to Dr. Raj Mashruwala, Dr. Irene Herremans, Dr. Michael Wright, and Lesley Dimarzo for their support and encouragement throughout my doctoral journey. I take pride in my knowledge and experiences I have gained at the Haskayne School of Business and eagerly anticipate the opportunity to contribute to the school in the future.

Special thanks to my colleagues, Dr. Dongning Yu, Dr. Harun Rashid, Dr. Soonchul Hyun, Dr. Joo Hyung Lee, Dr. Rahat Jafri, Dr. Annel Iqbal, and Dr. Ye Wang. Together, we supported and encouraged each other through every stage of our doctoral journey. I will remember those times and I extend my heartfelt wishes for success in all your future endeavors.

To my lifelong love, Fan Xia, your unwavering support, companionship, and understanding have been the greatest blessings in my life. I could not have done this without you by my side! To my daughter, my angel, and my darling, Vivienne Xia, for bringing endless joy to me like sunshine during my toughest times. And to my beloved family – Ping Zhu, Jing Jiang, and Deli Xia– your love, support and understanding have been my most cherished treasures. I wish all of you happiness and health.

Thank you to my previous supervisors, Dr. Yongze Liu and Dr. Xiaohui Qu, for encouraging me in pursing this new journey. Thank you to my dear friends, Zhe Wang and Ruifeng Gao - Your friendship has been a cherished gift that I will forever treasure.

Thank you, once again, to everyone!

Dedication

This thesis is dedicated to my father, Liansheng Ma. Though you are no longer with me, your love and encouragement continue to inspire me every day.

Table of Content

List of Tables

List of Figures

Chapter 1 Introduction

Uncertainty is powerful – it creates and destroys wealth. My interest with this topic evolved after witnessing the economic downturn triggered by the unexpected 2014 oil price collapse, which left Calgary, Canada's most enterprising city, known for its oil and gas industry, grappling with 10 million square feet of vacant downtown office space (Hussain, 2015; Mortlock, 2015; Turander, 2015). I learned that the impact of volatility and uncertainty on companies, their people, their suppliers and their communities is immense - up-cycles lead to development and prosperity but they are mingled with downturns that threaten survival and dampen spirits.

Uncertainty is particularly salient in today's challenging environment, where firms are facing a combination of shocks including supply chain disruptions, increased competition, volatile prices, and constrained resources (Finn et al., 2020; Forster, 2020; Birshan, 2022). Coping with uncertainty while making management decisions represents one of the most challenging tests for management teams. The challenge lies not merely in avoiding risks but in leveraging uncertainty as an opportunity for innovation and strategic advantage (Foster & Kaplan, 2001; Collins & Hansen, 2011; Kaplan & Mikes, 2012; Weidemeyer & Perkin, 2021). My dissertation, comprising three empirical studies, explores management decision-making and firm performance in uncertain environments.

Uncertainty triggers perceptions of risk and negative outcomes, and, inevitably, activates stress (Fletcher et al., 2008; Sonnentag & Frese, 2013). Stress, though individual state in nature, has profound organizational implications – stress may upend employees, upset engagement, dampen creativity, and even threaten company survival. My first study investigates stress activated by constrained conditions and consider how this type of stress influences organizational performance. Inspired by a prominent theory in psychology, the Yerkes-Dodson (1908) Law,

which posits an inverted-U relationship between anxiety and individual performance, we hypothesize that stress activated by constrained circumstances may initially motivate enhanced resource utilization, leading to improved performance. However, beyond a threshold, excessive stress results in disengagement and impaired performance.

Different from previous research which mainly relies on surveys or interviews to measure stress at the individual employee level, we adopt a textual-analysis measure proposed by Bodnaruk et al. (2015) to objectively assess the intensity of constraints as a predictor of stress at the firm level. This methodology measures intensity of constraints based on the percentage of "constraining" words used by managers in annual reports. We document that organizational performance (return on assets or ROA) exhibits an inverted-U relationship with the intensity of constraints at the firm level, which is consistent with my prediction. We also find evidence of an inverted-U shaped relation between performance and intensity of constraints when we use operating profit margin as an alternative profitability measure, or the citations count of a firm's patents as a measure of innovation activity. We don't find the inverted-U relationship for asset turnover as a measure of operating efficiency. These results suggest that the inverted-U relationship has more to do with creativity than putting strain on limited resources. We also find that the shape of the inverted-U relationship steepens or flattens with moderators, including R&D intensity, CAPEX intensity, and managerial ability.

The top leadership team (TLT), the strategic core of an organization, is responsible for setting directions, developing strategies, aligning personnel, and inspiring the entire organization—roles that are critical in today's increasingly uncertain business environment (Kotter, 1990, 2017; Hambrick, 1994; Rosebush, 2012; Whitler & Kersey, 2021). Compensating such a leadership group is challenging as it requires consideration not only of recognizing individual

talents but also of fostering teamwork. My second study recognizes the importance of both the CEO's unique role within the team and the dynamics among other team members. We consider the TLT compensation structure along two dimensions – CEO pay slice and pay dispersion among other members of the TLT under the direction of the CEO (CEO's top team) – and we investigate how the TLT compensation structure is associated with firm performance.

In contrast to the conventional agency approach for examining CEO pay, my second study considers the size of the CEO pay slice (the CEO's share of the total TLT compensation pie) as payment for the CEO's team leadership. Whereas management focuses on planning and control, leadership plays an important role in identifying opportunities, preparing organizations for change, and navigating through uncertain times (Zaleznik, 1981, 2004; Kotter, 1990, 2017). A strong leader seeks to convert constraints into opportunities, guides and inspires the organization through challenges ahead. From a team-based perspective, companies are willing to allocate higher compensation to CEOs relative to the other members of the TLT, presumably to obtain exceptional and rare leadership. We also consider the amount of pay dispersion among the CEO's top team (the remaining part of the pie divided among the CEO's direct reports). Team performance is motivated by rewarding the team as a group whereas individual performance is motivated by rewarding individuals for their individual contributions. Less dispersion, representing a higher amount of team-based relative to individual pay, is desirable in motivating team performance.

Based on analysis of a longitudinal sample, we find a positive association between CEO pay slice and ROA but an insignificant association between pay dispersion among the CEO's top team and ROA. Importantly, on average, the firms characterized by high levels of CEO pay slice and low levels of pay dispersion outperform others. These results suggest that team leader compensation and a team-based pay structure play a complementary role in impacting firm

performance. Leadership operates in a team-based framework, where its value is contingent upon the performance of the cooperation and cohesion among the team members, and the value of the team relies on effective leadership. Additionally, the analysis of DuPont components indicates that these relations are linked more to customer value (profit margin) than operating efficiency (asset turnover).

Nowhere is uncertainty more salient than in the context of cyclical industries. My third study focuses on the oil and gas industry that is heavily impacted by industry economic cycles. These cycles are unpredictable in terms of timing, amplitude, and duration, and thus impose high risk on companies (Zarnowitz, 1985). We examine how a strategic emphasis on balance sheet strength influences investment decisions and performance over time for firms operating in a cyclical environment. Through discussions with oil and gas industry leaders, we identify two groups of companies – one that grows conservatively and invests strategically to build and maintain balance sheet strength over time and one that borrows and invests aggressively during up-cycles. We use the idioms, "saving for a rainy day" and "making hay while the sun shines" to describe these two groups. Rainy day companies use up cycles to build balance sheet strength while making hay companies take advantage of up cycles to grow aggressively. We separate firms into these two groups based on average "cash flows to debt" over time because debt to cash flows is a key measure of balance sheet strength in the oil and gas industry.

We leverage two steep price declines to observe the behavior of firms over industry cycles: one triggered by the widespread 2008 financial crisis and the other by a distinct and prolonged O&G industry downturn in 2014. While investment declined generally in both cases, we find that the decline in investment was significantly less for rainy day companies than making hay firms after the 2014 downturn. We also find that rainy day companies tend to buy carefully and

selectively and may take advantage of decline periods to acquire premium assets from making hay companies, resulting in higher long-term value for their acquisition expenditures and higher operational efficiency over time. Moreover, we document that the capital market rewards making hay companies with higher market valuation and stock returns during upturns, but this advantage diminishes in downturns, suggesting that making hay companies satisfy the market expectation for growth during up cycles but also create opportunities for rainy day firms during down cycles. The findings highlight the use of balance sheet strength not simply as a measure of financial risk, but also as an important marker for articulating investment and operating strategy in cyclical industries.

My dissertation offers insights that may appeal to researchers and practitioners alike. First, aligning with the notion of "uncertainty doesn't have to be paralyzing" (HBR.org, 2022), my research suggests that while uncertainty presents challenges for strategic decision-making, it also brings opportunities for growth and innovation. My first study emphasizes the importance for managers to comprehend how stress impacts performance and to respond adeptly. It suggests that a certain level of stress can serve as a motivator for innovative resource utilization, and it can even convert resource constraints into opportunities. These findings have implications for management accounting tools, highlighting the importance of establishing appropriate targets to effectively motivate and evaluate individuals. A moderate level of tightness in standards can incentivize full participation and involvement, thereby yielding higher returns.

Previous studies on TLT compensation often focus on only one dimension of the compensation structure and present conflicting theories and empirical results regarding how TLT compensation affects firm performance (Bloom, 1999; Bloom & Michel, 2002; Henderson & Fredrickson, 2001; Siegel & Hambrick, 2005; Lee et al., 2008; Kale et al., 2009; Fredrickson et al., 2010, etc.). My second study recognizes both the CEO's unique role and the dynamics among

other team members and highlight the importance of considering different dimensions of the TLT compensation structure (Ridge et al., 2017). Through two perspectives of TLT compensation structure - CEO pay slice and pay dispersion among the CEO's top team – my second study offers evidence that that a higher CEO pay slice represents payment for team leadership that enhances group performance and highlights complementary relations between team leader compensation and team-based compensation.

My research suggests that a firm's ability to weather storms may depend on their management during calmer periods (Kaplan & Mikes, 2012). In my third study, we emphasize how balance sheet strength plays a critical role in managing and responding to economic cycles. By building and maintaining balance sheet strength during "good times", firms can capitalize on downturn periods to invest and make strategic acquisitions when other companies are scaling back investment and divesting assets to survive. My study highlights the significance of balance sheet strength not only as an indicator of financial risk but also as a key factor in formulating investment and operating strategies in cyclical industries.

The remaining chapters of the dissertation are organized as follows. Chapter 2 focuses on stress associated with resource constraints and investigate how this type of stress influences organizational performance (Study 1); Chapter 3 presents information about how the distribution of compensation among TLT influences firm performance (Study 2); Chapter 4 documents how a strategic emphasis on balance sheet strength influences investment decisions and performance over time for firms operating in a cyclical environment (Study 3); Chapter 5 concludes the three studies and discusses implications of studies.

Chapter 2 Constraints, Stress and Organizational Performance

2.1 Abstract

Stress is powerful - it inspires grit and determination but also takes away drive and will. Nowhere is stress more salient than in today's competitive business environment where resource constraints create stress for executives and other employees. Yet not a great deal is known about how this type of stress influences organizational performance. Using a textual approach to measure the intensity of resource constraints as a predictor of stress at the firm level, we investigate how the consequent stress influences organizational performance. We find that firm return on assets exhibits an "inverse-U" shaped relationship with the percentage of constraining words used in annual reports. This indicates that stress predicted by the intensity of constraints initially leads to higher firm performance – the organization earns higher returns with fewer resources – but, beyond a certain degree of constraints, stress leads to disengagement that inhibits firm performance. The inverted-U-shaped relationship is influenced by moderation effects from different levels of R&D intensity, CAPEX intensity, and managerial ability.

2.2 Introduction

Stress impacts all of us, in our personal lives, at work and in business (Aschbacher et al., 2013). Stress is powerful – it is linked to several vital physiological, psychological, and behavioral effects and significantly influences the quality of an individual's daily work and the performance of groups (Schuler, 1980; Sonnentag & Frese, 2013). Stress is particularly salient in today's complex business environment where changes in supply and demand, unrelenting competition, confusing economic indicators, slashed budgets and limited resources are challenges that create tension for organizations and their people (Forbes.com, 2009; HBR.org, 2020 May; Gallup.com,

2022 report). One might observe, “It's the best of times, it's the worst of times” (Dickens, 1859). With constrained circumstances as the norm in the post-COVID era, coping with stress at the organizational level when striving to meet targets and commitments is an increasingly important challenge for executives (Reeves et al., 2020; September; HBR.org, 2020 May; Wright, 2021 September). Yet not much is known about how stress predicted by the intensity of resource constraints affects organizational performance.

Stress can be highly debilitating for individuals and taxing on organizations – affecting investment, productivity and innovation (Sonnentag & Frese, 2013; Dai, 2018). But it can also be a positive force - focusing attention, boosting creativity, energizing action, and even flipping a weakness to create an advantage (e.g. Albort-Morant et al., 2020). The question is when and how it does so. In this paper, we focus on stress associated with resource constraints and investigate how this type of stress influences organizational performance.

First, we build a conceptual model to link constraints at the firm level to individual or group behavior and organizational performance (Fletcher et al., 2008; Sonnentag & Frese, 2013). We treat constraints as stressors or activators that evoke stress at the individual and group levels and affect performance at the organizational level (Schuler, 1980; Parasuraman & Alutto, 1984). Constraints limit an organization’s availability or access to required resources, such as human capital, financial capital, materials, and other inputs required to support organizational operations, causing dissonance between what individuals and groups in the organization desire to achieve and the resources available to meet their targets (Acar et al., 2019). This dissonance creates pressure leading to uncertainty about outcomes and activates stress (Schuler, 1980).

Executives, who have more responsibility for resources and outcomes than others in the organization, feel the stress most acutely. In fact, one of the talents of top executives is the ability

to deal with stressful situations (Cooper, 2001; Moran, 2018 December; VitalSmarts.com, 2018; Chamorro-Premuzic, 2020). When operating with limited resources, executives appraise constrained situations based on individual cognitions, and then respond by making decisions and engaging in strategies to cope with tensions (Lazarus & Folkman, 1984; Lazarus, 1991). At the same time, stress at the top management level has a pervasive effect throughout the organization (Friedman & Riggio, 1981; Achor & Gielan, 2015; Kelloway et al., 2017; Nawaz, 2019; Chamorro-Premuzic, 2020; Sanfilippo, 2022). Pressure on managers to meet commitments and deal with constrained circumstances affects engagement between managers and those that report to them. This effect is passed on to employees whose actions are relevant to organizational goals.

Psychological research indicates that both arousal and disengagement associated with stress leads to responses that affect performance (Abramis, 1994; Muse et al., 2013; Sonnentag & Frese, 2013). A prominent theory in psychology (Yerkes & Dodson, 1908) suggests that individuals initially work harder under stress, they become aroused or motivated, but beyond a certain "brain's sweet point", stress eventually limits performance as higher levels of stress translate into discouragement (Anderson, 1976; Westman & Eden, 1996; Goleman, 2006). From the Olympic player who strains his every muscle to the limit, to the researcher who works for a deadline, people sense this inverted-U effect of stress on performance (Selye, 1976). This "Inverted-U Theory" is referred to as the Yerkes-Dodson Law (YDL) when it is applied at the individual level (Corbett, 2015). We investigate how this law applies to stress associated with resource constraints at the organizational level.

We predict that, up to a certain level, constraints activate arousal that is positively channelled to improve productivity and engage in innovation. Arousal motivates managers to use available resources more productively. Managers, for example, focus on engaging in essential

activities and redeploying inputs to obtain additional outputs, thereby leading to higher returns (Copper & Kaplan, 1991). Innovation is an important way for individuals and teams to deal with stress (Pearlin, 1989; Bunce & West, 1996; Albort-Morant et al., 2020). Thus, a certain degree of constraints creates an environment that motivates and challenges managers to use available resources more productively and innovatively, in turn leading to higher returns.

However, high levels of stress associated with constrained circumstances may also lead to disengagement. As constraints become more intense and stress gets more severe, disengagement reduces the firm's ability to exploit promising opportunities, consequently inhibiting performance (Campello et al., 2010; Acar et al., 2019). In summary, stress activated by constrained circumstances may initially lead to higher performance by activating or motivating alternative and higher uses of resources in the conversion process - the organization does more with fewer resources (earns higher returns), but eventually stress leads to discouragement, disengagement and impairment of performance, thereby producing an inverted-U-shaped relationship between the intensity of constraints and returns earned.

Measuring stress is challenging, especially at the group level (Sonnentag & Frese, 2013; Corbett, 2015). Different from previous research which mainly relies on surveys or interviews, we adopt a textual-analysis measure proposed by Bodnaruk et al. (2015) to objectively assess the intensity of constraints as a predictor of stress at the firm level. This methodology measures intensity of constraints based on the percentage of "constraining" words used by managers in annual reports. The use of constraining words in annual reports is relevant because it reflects the managers' sensitivity to constraints in describing the firm's performance. A broad range of constraining keywords used by managers to describe current and subsequent operations appears to be better at capturing qualitative information about constrained situations (Bodnaruk et al., 2015,

p.637). The linguistic approach based on an "automated parsing algorithm" enables us to measure intensity of constraints as a predictor of stress at the organizational level. It mitigates potential errors from subjective measures (Bodnaruk et al., 2015). Additionally, different from surveys or interviews which focus on small samples and rely on responses, this measure of stress is available for any firm that files an annual report with the SEC.

Using a sample of 87,604 firm-year observations over the period from 1993 to 2018, we document that organizational performance (return on assets or ROA) exhibits an "inverted-U" relationship with the intensity of constraints at the firm level. The results are presented graphically in figure 3. This finding is consistent with our prediction that stress associated with constraints initially leads to higher performance - the organization does more with fewer resources (earns higher returns) but eventually the intensity of constraints becomes so high that it leads to disengagement, limiting the ability of the organization to take advantage of opportunities.

In supplemental analyses, we find evidence of an inverted U-shaped relationship between performance measures and intensity of constraints when we use operating profit margin (return on sales) as an alternative profitability measure and the citations count of a firm's patents as a measure of innovation activity. We don't find the inverted-U relationship for asset turnover as a measure of operating efficiency. These results suggest that the inverted-U relationship has more to do with creativity than straining limited resources. We also examine moderation effects for factors that may influence the observed inverted-U relationship (Cohen & Wills, 1985; Schuler, 1980; Sonnentag & Frese, 2013; Aschbacher et al., 2013). We find that the shape of the inverted-U relationship changes (steepens or flattens) with the values of moderators, including R&D intensity, CAPEX intensity, and managerial ability.

The increasingly uncertain business environment has prompted the need for traditional management accounting tools, such as target setting, performance measurement, incentive setting, and budget control, to take a more strategic role in supporting decisions (Bromwich, 1990; Garg et al., 2003; Langfield-Smith, 2008; Sofic, 2009; White, 2009; CIMA, 2015). In management accounting, companies use stretch targets in budgeting and incentive contracts to motivate executives and other employees to do more with less (Atkinson et al., 1997). Our study highlights the importance of setting appropriate targets to effectively motivate and evaluate people. A certain level of tightness in standards can motivate full participation and involvement that leads to higher returns. If standards are set too loose, employees may not be sufficiently aroused to achieve high performance. Very tight standards can create a negative attitude towards control throughout the organization and the unattainable goals may demotivate performance.

"Constraints are inevitable, yes. But rather than accepting them, we can discover and pay attention to them. We can recognize their value." (Huang, 2020 January). In the post-COVID era, leadership in dealing with stress or crisis is an important dimension of managerial ability (Cooper, 2001). Managers need to learn more about how stress affect performance, and then be prepared to act – shape strategies to cope with stress, explore the innovative use of resources, and transform them into returns. High ability managers can convert stress associated with constraints into opportunities and sustain their organizations through the highly uncertain trials ahead.

Section 3 describes the research design and empirical measures. Section 4 details the empirical results, and Section 5 presents the findings of supplemental analyses. The final section discusses conclusions, limitations, and implications for future research.

2.3 Hypothesis Development

Surveys and studies indicate that stress in organizations is reaching an "epidemic proportion" (Schuler, 1980; Fernandez, 2016; Fink, 2016; Dai, 2018; Ganesh et al., 2018). According to a survey of employees across North America, 50 percent reported being affected by organizational change and the pressure impacted productivity of their daily work (ComPsych.com, 2017; Stress.org, 2017). Nor is the situation better for the person at the helm – over half of 839 surveyed U.S. executives (51%) reported experiencing very or extremely high stress, and approximately 80 percent believed that the imbalance in resources and demands was the main driver of their pressure (Ganesh et al., 2018). These numbers will continue or increase with the constrained business environment as the norm in the post-COVID era (HBR.org, 2020; APA.org, 2021; Sanfilippo, 2022).

Decades of research in individual psychology and health science show that stress is related to physiological, psychological, and behavioral conditions that influence individuals' well-being, creativity, productivity, and more (Schuler, 1980; Sonnentag & Frese, 2013; Aschbacher et al., 2013). Nevertheless, limited attention in the management accounting literature has been devoted to the study of stress in organizations. Stress is treated as an individual state, but individuals feel and respond to stress in ways that impact the organization –stress may upend employees, upset engagement, dampen creativity, and even threaten company survival (Schuler, 1980; Fernandez, 2016; Sonnentag & Frese, 2013). Studies even suggest that, with increasing uncertainty in the business environment, stress management should be considered as an important aspect of cooperate governance (Craig, 2018; Gallup.com, 2022). In this paper, we investigate the influence of stress in organizations from a resource-management perspective (Cooper & Kaplan, 1991; 1992).

2.3.1 Situational Stressors, Organizational Constraints, and the Stress Process

Based on theoretical perspectives provided by psychology research (McGrath, 1976; Parasuraman & Alutto, 1984; Schuler, 1980; Edwards, 1992; Fletcher et al., 2008; Sonnentag & Frese, 2013), we develop a conceptual model (illustrated in Figure 1) to describe the relationships between resource constraints, individual or group behavior, and organizational performance. The conceptual model begins with the notion that resource constraints are stressors or activators that create stress at the individual and group levels and affect performance at the organizational level (Schuler, 1980; Parasuraman & Alutto, 1984; Sonnentag & Frese, 2013). Stress in organizations can be caused by various factors, such as workload, job conflicts, downsizing, etc. (Parasuraman & Alutto, 1984; Sonnentag & Frese, 2013). In this paper, we focus on stress activated by resource constraints that affect the organization as a whole. Resource constraints are frictions that limit an organization's availability or access to resources, such as human capital, financial capital, materials, supply chains, and other inputs desired to support organizational operations, development and implementations of strategies, or other desirable ends (Lamont et al., 2001; Acar et al., 2019).

"The mismatched expectation is the enemy of happiness" (Weinberg & Cooper, n.d.). Resource constraints create a dissonance between what individuals and groups in the organization desire to achieve and the resources (labor, capital, or other inputs) available to meet their targets or commitments. This dissonance is perceived to lead to uncertain business outcomes in terms of meeting versus not meeting the targets or commitments and thus activates stress on individuals in the organizations (Schuler, 1980; Parasuraman & Alutto, 1984). Individuals in organizations are where the stress resides, and individuals are also the agents that turn stress into actions. We focus on two groups of individuals whose actions are relevant to organizational goals -the executives/managers and other employees.

When operating with limited resources, the executives and managers – who have the most responsibility for resources and outcomes – sense stress at the organizational level more directly than other employees (Hackman & Wageman, 2004). Research suggests that group members rely heavily on their leaders' decisions, guidance, and directions to overcome uncertain situations (Hackman & Wageman, 2004; Driskell & Salas, 1991; Chamorro-Premuzic, 2020). In fact, executives are expected to have a certain level of competence for coping with stress (Cooper, 2001; Moran, 2018 December; Chamorro-Premuzic, 2020). Executives and managers appraise constrained situations based on their cognitive perceptions to stress. Both arousal and disengagement are associated with stress. Executives may view the condition of constrained circumstances favorably (with optimism) or unfavorably (with discouragement) (Schuler, 1980). How executives appraise and cope with those tensions impacts how stress influences performance (Schuler, 1980; Fletcher et al., 2008). Executives and managers respond by making decisions, engaging in innovations, or implementing strategies, resulting in a wide range of positive or negative organizational outcomes (Fletcher et al., 2008).

At the same time, stress at the top echelon has a widespread effect throughout the organization (Dawson et al., 1972; Behr, 1976; Sheridan & Vredenburgh, 1979). Scientific evidence shows that stress is contagious, "we can pick up negativity, stress, and uncertainty like second-hand smoke" (Achor & Gielan, 2015). How executives appraise and cope with tensions is a key factor in their employees' stress levels – leaders' tones, decisions, and behaviors all matter (Ancona, 2005; Chamorro-Premuzic, 2020). Under constrained circumstances, pressure on managers to meet commitments and deal with uncertainty is likely to profoundly affect engagement between managers and those that report to them. Either arousal or disengagement associated with stress at the top level permeates through other levels of the firm and impacts

employees' quality of work and, inevitably, organizational performance (Hackman & Wageman, 2004; Senge, 1996; Ancona, 2005; Chamorro-Premuzic, 2020).

2.3.2 Stress and Performance: Frustrating Roadblock or Powerful Driving Force

Despite consensus that the effects of stress in organizations are immense, competing thoughts remain on whether the effects motivate good performance or not. The empirical evidence on the relationship between stressors and reactions (mainly by interviews or questionnaires) is both limited and mixed (Sonnentag & Frese, 2013). Some scholars conventionally consider stressors as causers of adverse physiological reactions (depression or sadness), which consume an individual's energy, focus and motivation, and trigger interpersonal conflicts in a group (Kornferry.com, 2018; Pfeffer, 2018). Scholars even comment that "stress brings out people's worst traits." Conversely, some scholars assert that stressors produce challenges to stimulate an individual's creativity and problem-solving capability (e.g., Anderson, 1976; Hatton et al., 1995). Yet others assert that low stress levels look helpful but block an individual's attention and motivations (Arsenault & Dolan, 1983; Hatton et al., 1995; Hockey, 1997; Kahn & Long, 1988).

Some researchers support a theoretical model for a curvilinear relationship between stressors and performance – commonly referred to as the Yerkes-Dodson Law (YDL) that can be traced back to 1908 (Yerkes & Dodson, 1908). It suggests that stressors activate arousal, motivating individuals to perform well, until the degree or intensity of stress reaches a certain point. Beyond that point, stressors become demotivating – an individual may invest more effort and other resources in coping with the stress instead of performing the task (see more in Anderson, 1976; Corbett, 2015). Researchers represent this model graphically as an inverted-U curve (for example, Robbins & Judge, 2011, p. 647). The Yerkes-Dodson Law is now widely cited in psychology texts

and journals when applied at the individual level (Corbett, 2015). We test whether this law applies when the causes and consequences are at the organizational level.

2.3.3 Resource Constraints and Organizational Performance: A Prediction

Based on the conceptual model, we investigate how resource constraints that produce stress at the individual and group levels affect performance at the organizational level. We predict that some degree of resource constraints activates arousal and challenges executives and employees, motivating entrepreneurship in converting limited resources into desired outcomes.

On the one hand, managers and scholars conventionally treat limited resources as a disadvantage (Amabile, 1996; Amabile et al., 2016). The extant research in finance highlights the adverse effects of constraints, examining whether or how the lack of financial resources impacts liquidity management or investment behavior (e.g., Campello et al., 2010; Chen & Wang, 2012). On the other hand, some studies have recognized cognitive and motivational values of constraints, especially on firm creativity (e.g., Acar et al., 2019; An et al., 2018; Ernst et al., 2015; Wu et al., 2017).[1] Based on a review of 145 empirical studies, Acar et al. (2019) found that resource scarcity may encourage bold attempts, forester new exploitation, and simulates bricolage effects, i.e., "making do with what is at hand." These arguments have received considerable attention in the business press. In a recent Harvard Business Review article, Huang (2020 January) points out, "When we notice constraints, but we don't let them define our possibilities, we can actually flip them to create an advantage."

[1] Abundant resources looks helpful, but too many may create complacency or sluggishness, inhibit motivation and exploitation of new directions (Acar et al., 2019 B; Kim et al.,2008; Nohria & Gulati, 1996; Meglino, 1977; Voss et al., 2008).

When they sense the imbalance in resources and demands, executives and managers appraise the constrained circumstances. They may react to some degree of resource constraints as motivating arousals and creative challenges, thus coping with stressors innovatively. While overcoming resource challenges, executives may be able to explore opportunities to access new resources, use available resources in a productive and novel way, and redeploy inputs to obtain additional outputs, thus increasing productivity and returns (Cooper & Kaplan, 1991; 1992; Bunce & West, 1996; Acar et al., 2019; Richardson, 2013; Murray & Johnson, 2021). Their coping strategies provide clarification and guidance to employees. Meanwhile, the arousal perceived by the top level may permeate different levels of the firm and create an atmosphere where employees feel engaged, motivated, and optimistic, despite the face of fear (Chamorro-Premuzic, 2020). This, in turn, allows organizations to earn higher returns.

However, creative challenges may be translated beyond a certain point into interfering effects. A high level of stress from constraints may depress executive and managers' motivation, cause a narrowing ability to use resources innovatively, interfere with conversion processes, and make achieving targets and keeping commitments difficult (Campello et al., 2010; Acar et al., 2019). Coping with a high-stress level may also consume executives' energy and attention in essential organizational activities. Additionally, tight tension from the top level may harm the engagement between managers and those who report to them, which will be passed on throughout the organization. Employees who experience a high level of tension are less committed to the organization, resulting in a relatively lower level of performance. Therefore, stress associated with constraints may initially lead to higher performance by activating or motivating the conversion process – the organization does more with fewer resources (earns higher returns) – but eventually,

the stress may disrupt the conversion process (impair performance), producing an inverted-U-shaped relationship between constraints as predictors of stress and returns.

In summary, our hypothesis represents a merger of the negative (constraints are obstacles) and positive theories (constraints are fuel) by suggesting that constraints produce an inverted U-shaped relationship between stressors and performance (Yerkes & Dodson, 1908). We state our research hypothesis as follows:

> **Hypothesis 1:** The financial performance of the firm exhibits a curvilinear (inverted U-shaped) relationship to the intensity of constraints facing the firm.

2.4 Research Design and Empirical Measures

2.4.1 Sample Selection

Our main sample is based on constraining measures provided by Bodnaruk, Loughran, and McDonald (2015), which includes all 10-K, 10-K405, and 10(-)KSB(40) documents (amended files not included) filed on the Securities and Exchange Commission (SEC)'s website of Electronic Data Gathering Analysis and Retrieval from 1993 to 2018. We exclude utilities and financial services firm-years (Standard Industrial Classification (SIC) codes from 4900 to 4999 and from 6000 to 6999) because special regulations for these industries might affect the measurement of constraints and other financial variables (Bodnaruk, et al., 2015; Law & Mills, 2015). We also require firm-years with non-missing and non-negative assets and sales and firm-years where the total number of words used in annual reports is not less than 2,000 words (Bodnaruk et al., 2015; Law & Mills, 2015). After merging the summary file of constraining words with other required financial data obtained from Compustat, our final sample comprises 87,604 firm-year observations (12,028 U.S. public firms) from 1993 to 2018.

2.4.2 Measuring Stress at the Firm Level

Measuring stress is challenging, especially at the firm level. Previous research that relies on surveys to measure stress is criticized for significant noise in the self-reported stress levels (Corbett, 2015; Sonnentag & Frese, 2013). Also, a self-reported method is not appropriate for measuring stress at the team or group level (Corbett, 2015; Sonnentag & Frese, 2013). Other research uses stressors as predictors of stress, because stressors are objective things that produce stress (Sonnentag & Frese, 2013). We adopt a textual analysis measure proposed by Bodnaruk et al. (2015) to objectively predict stress activated by constraints at the firm level. Their analysis provides a list of 184 words with "constraining" meanings based on the Loughran-McDonald Master Dictionary. They parse all annual reports filed with the SEC using an advanced Linguistic approach to measure the level of constraints based on the frequency of the 184 constraining words. Examples on the list of constraining words are "constrain* (* means its variation)", "depend*", "impose*", "restrict*", "restrain*", "require*", "unavailab*" (see Table 2.2 for the complete list).

Bodnaruk et al. (2015, p 641) conjecture that "the frequency of constraining words that are used by managers to describe current and subsequent operations helps describe a more constrained condition for the firm". Our assumption is that the greater the intensity of resource constraints facing the firm from the manager's perspective, the more constraining words they will use to reflect these conditions. The use of constraining words in annual reports reflects the managers' sensitivity and cognitive perception of an organization's constrained circumstance and is thus relevant in reflecting the stress level activated by the constraints.

Compared to previous work (e.g., Kaplan & Zingales, 1997; Whited & Wu, 2006), Bodnaruk et al. (2015)'s methodology of measuring constraints based on a keyword analysis has the following advantages: (1) Traditional measures are criticized for a high correlation with firm

characteristics by relying on variables such as size, age, and cash flows (Kaplan & Zingales, 1997; Whited & Wu, 2006). Bodnaruk et al. (2015)'s measure, however, focuses on the qualitative words used by managers in annual reports and thus appears to "add information beyond simple accounting variables or ratios" (p. 632). (2) Their measure is constructed based on a long list of 184 constraining keywords covering constraining conditions facing organizations and, therefore, can objectively and more fully capture the degree or intensity of constraints facing the organization. (3) Instead of using manual classification or hand data-collection, this linguistic approach based on an "automated parsing algorithm" can provide a more accurate measure of constraints (Bodnaruk et al., 2015). (4) Different from the methods of survey or interview, which focus on small samples and a single industry, this textual measure can be applied to all companies that file annual reports with the SEC and thus is able to facilitate the use of a large research sample.

2.4.3 Measuring Firm Performance

We use return on assets (ROA) as our metric of firm performance. The ROA metric allows us to focus on firm performance that can be more directly attributed to managerial ability to generate returns on resources employed (Hagel III et al., 2010; Hagel et al., 2013). Scholars and practitioners argue that "ROA may foster a better view of fundamentals of the business, including asset utilization" (Hagel III et al., 2010). The ROA denominator directly measures the assets used to support operating activities and other business actions and thus can be used to assess the company's ability to generate returns on available assets (Hagel III et al., 2010; Hagel et al., 2013), which is the question our research is addressing. ROA is calculated as operating income before depreciation divided by the average total assets based on the most recent two periods.

2.4.4 Regression Specification

We estimate the following equation to test our hypothesis that firm returns exhibit a curvilinear (inverted U-shaped) relationship to the level of constraints facing the firm.

$$Firm\_Performance_{it} = \beta_0 + \beta_1\, Constraints\%_{it} + \beta_2\, Constraints\%_{it}^2 + \beta_3 Control\ Variables_{it} + Fixed\ Effects + e_{it} \quad \text{Equation (1)}$$

Firm Performance is measured as return on assets calculated as operating income before depreciation divided by the average total assets based on the most recent two periods. *Constraints% is* our measure of the intensity of constraints as a predictor of stress and is defined as the percentage of constraining words of the total words parsed from the firm's annual reports for the period of interest. *Constraints%*^{2} is a quadratic term used to capture the curvilinear effects in the regression. We also include the following control variables that may influence company performance and the effect of firm constraints: *Firm size* is measured as the natural logarithm of total assets. Larger firms may hire more effective managers, or larger firms could provide more advantages or resources to the company, facilitating firm performance. *Leverage* is measured as the ratio of long-term debt to total assets. *Firm age* is measured as the natural logarithm of how many years the firm has been listed on Compustat (Demerjian et al., 2012). *R&D Intensity* is measured as the ratio of research and development (R&D) expenditures to sales. *CAPEX Intensity* is measured as the ratio of capital expenditures to sales. Firms that focus more on innovation and investment may realize higher returns on assets.

Following Law and Mills (2013), we add year fixed effects and industry fixed effects (Fama and French (1997) industry classifications) to control for unobservable time and industry characteristics or conditions that may drive both firm constraints and performance. We cluster all standard errors at the industry level (Petersen, 2009) to control for the problem that standard errors

may be correlated within industries, and our results are robust by clustering at both industry and year levels.

2.5 Empirical Results

2.5.1 Descriptive Statistics

In Figure 2.2, we graph how stress predicted by the intensity of resource constraints at the firm level, constructed based on textual analysis, has changed over the years during our sample period of 1993 to 2018. The graph suggests that the constraining words change with the economic conditions imposed on organizational operations. For example, the percentage of constraining words used by managers increased by 0.12% after the terrorist attacks in 2001. In the period following the financial crisis in 2008, the percentage of constraining words further increased. The percentage recently decreased slightly, probably due to the economic recovery around 2017 (World Bank, 2017). This change is consistent with survey studies that indicate that stress level is closed related to economic conditions (Kornferry.com, 2018; Apa.org, 2017; 2021; Sanfilippo, 2022).

Descriptive statistics for the sample are presented in Table 2.3, which shows that the average percentage of constraining words used in annual reports is 0.70%, and its standard deviation equals 0.20%. We assume that a higher percentage of constraining words used by managers in the annual report implies that managers believe the firm is facing more intense constraining conditions (Bodnaruk et al., 2015). Table 2 also reports that, on average, the ROA performance is -0.08 with a median value of 0.09 and standard deviation of 0.62, consistent with previous literature (Bebchuk et al., 2011). Additionally, the mean firm size (the natural logarithm

of total assets) of our sample is 4.95, the mean firm age is 11.82 years, and the average leverage is 20%.

Table 2.4 presents a correlation matrix for our sample. Spearman correlation coefficients indicate that ROA is positively related to the percentage of constraining words used in annual reports ($p<0.001$), while the Pearson correlation indicates that ROA is negatively associated with firm constraints ($P<0.001$). We further explore this relation in the multivariate tests below. Additionally, the low correlation (0.083 & -0.031) is consistent with Bodnaruk et al.'s (2015) argument that there is a very low correlation between constraints measured using textual analysis and constraints measured using financial ratios.

2.5.2 Regression Results

Table 2.5, Panel A presents the results from an OLS regression of firm performance (ROA) on the constraints at the organizational level measured by the percentage of constraining words used in a company's annual report (*Constraints%*), along with control variables. The quadratic term of the percentage of constraining words ($Constraints\%^2$) captures the curvilinear effects. Each model includes year fixed-effects and industry fixed-effects. Panel B in Table 2.5 presents the results for examining the presence of an inverted-U relationship, referred to as "the U-tests" (Lind & Mehlum, 2010). To avoid the influence of outliers, we winsorize all continuous variables at the levels of 1% and 99% in all our analyses. Following Kale et al. (2009), we use heteroscedasticity robust standard errors, and standard errors are clustered at the firm level to control for serial correlation.

We expect that stress activated by constrained circumstances creates an environment that motivates managers to use available resources more productively and innovatively, leading to

higher returns. But high-stress levels associated with more intense constrained circumstances may also lead to disengagement, producing an inverted-U-shaped relationship between constraints and performance. Table 2.5 shows that the estimated coefficient of firm constraints, *Constraints%*, is significantly positive at the 1% level (t-statistic=3.65), and the estimated coefficient of the squared terms, $Constraints\%^2$, is significantly negative at the 5% level (t-statistic=-2.54). This finding is consistent with our prediction that constraints initially motivate higher performance but eventually, constraints become interfering.

Following (Haans et al., 2016; Lind & Mehlum, 2010), we also test for the presence of an inverted-U relationship on specific intervals after the estimation of equation (1). Lind & Mehlum (2010) suggest that we can use equations (2) and (3) to test for the presence of an inverted-U relationship:

$$\text{H0: } \sum \beta_j f_j'(x_l) \leq 0 \; and/or \; \sum \beta_j f_j'(x_h) \geq 0 \text{ versus} \quad (2)$$

$$\text{H1: } \sum \beta_j f_j'(x_l) > 0 \; and/or \; \sum \beta_j f_j'(x_h) < 0 \quad (3)$$

H1 represents the presence of an inverse U-shaped relation in the function, whereas H0 represents the presence of a monotone or U-shaped relation existing in the function (Lind & Mehlum, 2010). We present the results of U-Tests in Table 2.5, Panel B. The results first suggest the slopes are sufficiently steep at both the lower bound (t-statistic=3.793; p-value<0.001) and upper bound (t-statistic=-1.894, p-value<0.05). Panel B also details the overall test of the presence of an inverse U-shaped relationship. The null hypothesis of either a monotone or direct U-shape relationship is rejected at p-value = 0.029, enabling us to accept the alternate hypothesis of an inverse U-shape existing. Thus, the U-test results further support the observed inverted U-shaped relationship.

Our results are illustrated graphically in Figure 2.3. The figure shows us that firm performance (ROA) along the Y axis first increases with the percentage of constraining words along the X axis. When the percentage of words reaches a certain level, we see that the negative effect of constraints comes, demonstrating that the relationship between firm performance and constraining words exhibits an Inverted-U curve.

2.6 Supplemental Analyses

2.6.1 Testing for Other Dimensions of Organizational Performance

In this subsection, we consider other measures of organizational performance, including the operating profit margin as another measure of firm profitability, asset turnover to measure firm's efficiency in turnover assets into sales, and the citation count of a firm's patents to measure a firm's innovation performance. Operating profit margin and asset turnover are two components of ROA in DuPont analysis. Operating profit margin is measured by operating income before depreciation as a fraction of sales, i.e., return on sales. Asset turnover is calculated by dividing total sales by the average of assets over a two-year period. The patent and citation data are obtained from Kogan et al. (2017)'s patent database. Following previous literature, the citation count of a firm's patents is defined as the natural logarithm of one plus a firm's total number of citations received, scaled by the mean citation count of all patents calculated by the same industry and year (Hasan et al., 2020). The measure of patent citations allows us to focus directly on the outputs of a firm's successful innovation activities (Lerner & Seru, 2017).

Table 2.6, Panel A's columns (1) and (2) present the results of regressing *Profit Margin* and *Patent Citations*, respectively, on the percentage of constraining words used in a company's

annual report (*Constraints%)*, along with control variables.[2] The quadratic term of the percentage of constraining words (*Constraints%*^{2}), again, captures the curvilinear effects. Column (1) and (2) show that the estimated coefficients of firm constraints, *Constraints%,* are both significant at the 1% level (t-statistic=3.72 and t-statistic=2.58, respectively) for *Profit Margin* and *Patent Citations*. The estimated coefficients of the squared terms, *Constraints%*^{2}, are both significant e at the 1% level (t-statistic=2.58 and t-statistic=-3.32, respectively), indicating significant curvilinear effects in the regression. These results are consistent with the ROA results presented in Table 2.4 and support inverted U-shaped relationships between profit margin and constraints and between innovation activities and constraints, suggesting that resource constraints initially motivate more productive and creative behavior but eventually constraints become stifling.

Table 2.6, Panel B details the results of U-tests for the regressions in Panel A. The results suggest that the slopes are sufficiently steep at both the lower bound and upper bound for models of *Profit Margin* and *Patent Citations*. The null hypothesis of either a monotone or direct U-shape relationship is rejected at p-value = 0.013 and p-value = 0.006, respectively. The U-test results further support the existence of the observed inverted U-shaped relationship. Results for the models of *Profit Margin* and *Patent Citations* are illustrated graphically in Figure 2.4 and Figure 2.5.

However, when we conduct the analysis by using the asset turnover as performance measure, we don't find the inverted-U relationship for asset turnover. Table 2.7 presents that that the estimated coefficients of firm constraints, *Constraints%* and *Constraints%*^{2}, are both positive but not significant (t-statistic=1.08 and t-statistic=-0.04, respectively). The results of U-tests suggest that the null hypothesis of either a monotone or direct U-shape relationship is not rejected.

[2] We exclude the control variable of R&D intensity in the profit margin model due to high correlation of R&D to sales with profit margin.

Operating profit margin and asset turnover are two components of ROA in DuPont analysis. Profit margin and asset turnover are both important components of ROA, but they offer different insights of operations: Profit margin reflects a firm's effectiveness in converting its sales into income based on products innovation. On the other hand, asset turnover captures a firm's efficiency in leveraging its assets to generate sales revenue. Given that we only observe the inverted-U relationship between profit margin and constraints intensity, and not between asset turnover and constraints intensity, these findings may suggest that the inverted-U relationship has more to do with using resources more effectively than simply using them more efficiently. This is further confirmed by the observed inverted-U relationship between measures involve real innovation activities (patent citations), and constraints intensity. We suggest that the inverted-U relationship has more to do with using resources is more closely linked to innovation or creativity rather than merely straining limited resources.

2.6.2 Testing for Moderation Effects

In this subsection, we examine how moderation variables influence the inverted-U relationship between stress activated by resource constraints and firm performance. We consider how the inverted-U relationship of the percentage of constraining words and return changes for varying values of moderators, including R&D intensity, CAPEX intensity, and managerial ability, by estimating the following equation.

$$Firm\_Performance_{it} = \beta_0 + \beta_1\, Constraints\%_{it} + \beta_2\, Constraints\%_{it}^2 + \beta_3\, \%\, Constraints\%_{it} \times Moderator_{it} + \beta_4\, \%\, Constraints\%_{it}^2 \times Moderator_{it} + \beta_5\, Moderator_{it} + \beta_6 Control\ Vairiables_{it} + Fixed\ Effects + e_{it} \quad \text{Equation (4)}$$

We follow Haans et al. (2016) to test the moderation effects in inverted U-shaped relationships. Haans et al. (2016) suggest that U-shaped or inverted U-shaped relationships can by affected by moderators in two ways: (1) a moderator can shift the shape left- or rightward, which we call "a shift effect"; (2) a moderator can flatten or steepen the curve, which we refer to as "a flatten or a steepen effect". To examine whether there is a shift effect of a moderator, we first focus on testing if $\frac{\beta_1\beta_4-\beta_2\beta_3}{2(\beta_2+\beta_4\times\text{Moderator})^2}$ (Equation (5)) based on coefficients obtained from estimating Equation (4), is significantly different from zero. If the value is significantly different from zero, based on the sign of $\beta_1\beta_4 - \beta_2\beta_3$, we are able to determine the direction of the curve shift: negative for leftward shift and positive for rightward shift. To examine whether there is a flattening or a steepening effect imposed by a moderator, we simply focus on whether the coefficient of β_4 in equation (4) is significant or not. Then, the positive sign of β_4 will indicate a flattening effect of the moderator for an inversed U-shape; while the negative sign will document a steepen effect.

Research suggests that task characteristics may potentially moderate the relationship between stressors and performance (Gardell, 1976, Parasuraman & Alutto, 1984). Thus, we consider firm characteristics reflecting the task characteristics that may moderate the observed inverted U-shaped relationship: R&D intensity and CAPEX intensity. The R&D intensity is measured by the ratio of R&D to sales, indicating a firm's inclination toward researching and developing new projects (Abernethy et al., 2019). The CAPEX intensity is calculated as a ratio of CAPEX to sales, indicating a firm's propensity to make CAPEX investments.

Additionally, we consider individual qualities as moderators of the relationships between stressors and performance (Cooper & Marshall, 1976; Beehr & Newman, 1978). Previous literature suggests that individual abilities and experiences potentially influence how managers perceive the level of stress (as an opportunity or a threat) and how they cope with stress (McGrath,

1976; Schuler, 1980; Fletcher et al., 2008; Sonnentag & Frese, 2013). We use a measure developed by Demerjian et al. (2012), who compute a managerial ability score based on data envelopment analysis (DEA) by first estimating how efficiently TLTs use their firms' resources to generate revenue (relative to firms in the same industry) and then stripping away the influence of firm characteristics that provide advantages not derived from managerial ability. We test whether these firm characteristics and managerial ability moderate the relationship between the level of constraints faced by the firm and the financial performance of the firm.

Moderating Effects of CAPEX intensity

Table 2.8 column (1) presents the results with two interaction terms: the percentage of constraining words used in a company's annual report with CAPEX intensity *(Constraints% × CAPEX Intensity*) and the quadratic term of the percentage of constraining words with CAPEX intensity *(Constraints%^{2} × CAPEX Intensity*). The interaction term of *Constraints% × CAPEX Intensity* is significantly positive (t=4.31, p < 0.001), and the interaction term of *Constraints%^{2} × CAPEX Intensity* is significantly negative (t=-3.74, p < 0.001). According to the calculation of equation (5), the moderator of CAPEX intensity does not significantly shift the effect of the curve. However, the significantly negative sign of β_4, i.e. *Constraints%^{2} × CAPEX Intensity*, supports a moderating role of CAPEX intensity in the second way, the inverted U-shape relationship between firm performance and the level of constraints facing the firm *steepens* as CAPEX intensity increases.

In order to obtain more insights about how CAPEX intensity moderates the relationship between the level of constraints facing by the firm and its performance, we plot the moderating relationships based on three groups of CAPEX intensity: a high-level group (at the 90th percentile

of CAPEX to sales), a middle-level group (at the 50th percentile), and a low-level group (at the 10th percentile). The graph, presented in Figure 2.6, Panel A, demonstrates that high levels of CAPEX intensity steepen or amplify the inverted U-shaped relationship between the level of constraints and firm performance. In other words, the positive effect and the negative effect of constraints on firm performance both are relatively stronger in firms with more capex to sales.

A higher CAPEX to sales ratio typically indicates a high-growth situation. When companies are simultaneously experiencing high growth and facing significant constraints, they may prioritize market development and investment. In such scenarios, every penny must be utilized judiciously, which requires the smarter utilization of resources. Before achieving the extreme point or peak ROA, firms with higher CAPEX intensity have better ability to improve efficiency and utilize the resources, thereby leading to a stronger positive effect. However, after achieving the extreme point, too much capex investment in a high constraining environment may further limit the ability of the organization to take advantage of opportunities and the firm's capacity to exploit promising opportunities, consequently accelerating deterioration and thus demonstrating a stronger negative relationship.

Moderating Effects of R&D intensity

Table 2.8 column (2) presents the results of the moderating effects of R&D intensity. The interaction term of *Constraints%* × *R&D Intensity* is significantly positive (t=2.63, $p < 0.001$), and the interaction term of *Constraints%*^{2} × *R&D Intensity* is significantly negative (t=-1.67, $p < 0.01$). The calculation of equation (5) indicates that the moderator of R&D intensity does not have a statistically significant shift effect on the curve. The significantly negative sign of β_4, i.e. *Constraints*^{2} × *R&D Intensity*, however, indicates that the inverted U-shaped relationship between

firm performance and the level of constraints and firm performance *steepens* as R&D intensity increases.

To visualize how R&D intensity moderates the inverted-U shaped relationship between firm performance and constraints, we plot the moderation effects based on a high-level group of R&D intensity (at the 90th percentile), a middle-level group (approximately at the 60th the percentile), and a low-level group (at the 10th percentile).[3] Figure 2.6, Panel B shows that a higher level of R&D intensity steepens or amplifies the inverted U-shaped relationship, suggesting that the impact of constraints on performance is greater when R&D intensity is higher.

At a level of constraints smaller than the extreme point, firms with innovation intensive environment are able to use available resources in more productive and novel ways when facing challenges from a constraining environment. However, excessive investment in R&D activities may restrict the organization's ability to capitalize on constraints. When confronted with overwhelming commitments, particularly in heavy innovation investment, the downside can be exacerbated. This potentially explains why high levels of R&D intensity may intensify or magnify the inverted U-shaped relationship between the level of constraints and firm performance.

Moderating Effects of Managerial Ability

The moderating effects of managerial ability are presented in Table 2.8, column (3). The interaction term of *Constraints%* × *Managerial Ability* is significantly negative (t=-4.66, p < 0.001). The result of equation (3) is significantly larger than zero (z=3.57, p<0.001). Given that $\beta_1\beta_4 - \beta_2\beta_3$ is negative, managerial ability imposes a significant shift effect on the inverted U shape, and the direction is left-ward. The interaction term of *Constraints%*^{2} × *Managerial Ability*

[3] Since the median R&D to sales ratio is near its lower limit, we opt to utilize the 60% level, approximately 0.05, to show group disparities in the graph.

is significantly positive ($t=2.61$, $p < 0.001$), indicating that as managerial ability increases, the inverted U-shaped relationship between the level of constraints and firm performance *flattens*.

Figure 2.6 Panel C shows that high levels of managerial ability flatten the inverted U-shaped relationship between firm performance and the level of constraints, and that the peak ROA occurs for a lower percentage of constraining words in the high-level managerial ability group than in the low-level group. It is important to note that the measure of managerial ability is not a measure of managers' IQ or native ability. Instead, it is measured based on how efficiently management teams use their firms' resources to generate revenue relative to their peers. Companies led by high-ability management teams demonstrate greater efficiency and productivity in using available resources. In other words, those firms have already operated at high efficiency level, leaving minimal room for further improvement. Therefore, when facing a challenging environment imposed by higher constraints, the positive effects and negative effects firms are both weaker for firms with higher managerial ability.

However, for firms with lower levels of managerial ability, there exists room for improvement, leading to a heightened impact of constraints on performance. This potentially provides the reason for observing a flattening of the inverted U-shaped relationship in the group with high levels of managerial ability. Furthermore, a potential explanation for the significant leftward shift effect on the inverted U-shape could be that the peak performance or extreme point occurs earlier for firms with higher ability top management teams because those firms are able to translate resources into revenue more efficiently.

2.7 Conclusions

Using a sample of 87,604 firm-year observations from 1993 to 2018, we find that organizational performance (return on assets or ROA) exhibits an "inverted-U" relationship with the degree of constraints at the firm level. Organizational performance tends to improve with increasing intensity of constraints up to a certain point, but performance decreases beyond that point. We find consistent results when using operating profit margin as a profitability measure, and the citations count for a firm's patents as measures of productive and innovative activities. We also examine moderation effects influencing the observed inverted-U relationship. We find that high levels of CAPEX intensity and R&D intensity steepen or amplify the inverted U-shaped relationship between firm performance and the level of constraints. However, the inverted U-shaped relationship is flatter for firms with higher levels of managerial ability because those firms already utilize resources more efficiently and productively.

Despite the considerable concerns that the level of stress is related to organizational performance, rare attention has been given by the management accounting literature to addressing this issue. Recognizing the influence of stress from a resource-constraints perspective provides opportunities for empirical management accounting research to examine conditions and mechanisms that affect how stress influence performance at the organizational level. Our study highlights the importance of properly setting targets or incentive to effectively motivate, challenge and evaluate people to create a positive stress environment.

"While a tight labor market has business leaders seeking to improve retention and engagement, they may be overlooking one critical factor: how their managers respond to stress" (Moran, 2018 December). A recent study documents that one third of surveyed managers is not able to manage through the high-stakes situations, which influence their team performance in

different ways (Moran, 2018 December; VitalSmarts.com, 2018). Our findings highlight an important dimension of managerial ability (Demerjian et al., 2012) – managers who can deal with the challenges they face and convert challenges of constraints into opportunities, especially in highly uncertain and competitive environments, are particularly valuable. “We know that leaders at all levels of an organization need vision, strategic focus and a bias toward action. But to shine in today's complex and changing world, leaders also need new insights and skills that up-end conventional thinking about how to increase energy and attentiveness in the face of ever rising pressure” (Cooper, 2001). Managers need to learn more about how constraints and other stressors affect performance and then be prepared to act - explore ways to most effectively use them and transform them into returns. We agree with Acar et al. (2019 November), “Instead of blaming constraints, frame them as creative challenges.”

According to recent surveys, the level of stress imposed on executives and employees increased significantly during the past five years (e.g. Kornferry.com, 2018). During times of high uncertainty, coping with stress at the organizational level is becoming an increasingly important challenge for companies – stress may destroy health, upend employees, upset engagement, and active conflicts. An emphasis on stress management is of immense importance for corporate governance in an increasingly dynamic world (Craig, 2018; Gallup.com, 2022). A responsible company pays attention to sustainability of their people, who bear stress and accept the consequences, and, most importantly, make them feel motivated and optimistic despite fear (HBR.org, 2020). In sustainable environments like this, companies thrive and strive (Clifton, 2022 June).

Some limitations need to be noted. First, our measure of constraints, developed by Bodnaruk et al. (2015), may have some noise. Although they supported the validity of the measure

through several robustness tests, the measurement underlying the textual analysis based on languages that managers use is likely to "capture subtle cues from managers" (Bodnaruk et al., 2015, p.641). Second, previous research suggests that "the inverted-U curve shifts leftward or rightward as the moderators shape whether the constraints are perceived as challenging or controlling" (Acar et al., 2019). At the next stage, we will examine how other moderators, such as CEO power, life-cycle stage, governance, the use of technology, and other factors influence the inverted-U relationship between constraints and ROA. We believe that empirical analysis of how stress affects firm performance opens up many interesting avenues for future research.

Table 2.1 Variable Definitions

Information presented in square brackets represents the item names in Compustat

Variables	Definitions
Constraints%	The percentage of constraining words to the number of total words filed in annual reports (10K) (Bodnaruk et al., 2015). The constraining words is from a list of 184 words with constraining meaning based on the Loughran-McDonald Master Dictionary. The examples on the list of constraining word are "constrain* (* means its variation)", "depend*", "impose*", "restrict*", "restrain*", "require*", "unavailab*", etc. (see Table 2.2 for the whole list)
ROA	Operating income before depreciation [OIBD] divided by the average total assets [AT] based on the most recent two periods
Firm size	Natural logarithm of total assets [AT]
Leverage	The ratio of long-term debt [DLTT] to asset [AT]
Firm age	Natural logarithm of how many years the firm has been listed on the Compustate (Demerjian et al., 2013). We calculate the difference between facial year end date and the date in which the firm was first listed on the CRSP [BEGDAT] and use the difference divided by 365 days.
R&D intensity	Research and development expenditures [XRD] divided by sales [SALE]
CAPEX Intensity	CAPAX expenditure [CAPX] divided by sales [SALE]
Profit Margin	Operating income before depreciation [OIBD] divided by sales [SALE]
Asset Turnover	Total sales [SALE] divided by the average total assets [AT] based on the most recent two periods.
Patent Citations	The citation count of a firm's patents, measured as the natural logarithm of one plus a firm's total number of citations received, and scaled by the average citation count of all patents in the same industry and year
Managerial Ability	Based on managerial ability score developed by Demerjian et al. (2012). First, they estimate firm efficiency based on DEA by estimating how efficient a firm uses resources to generate revenue relative to other firms in the industry. Second, they estimate a model exclude the impact of some firm characteristics from firm's total efficiency and get the residual as managerial ability. We use the decile ranks (by industry and year) for the score.

Table 2.2 List of Constraining Words (Bodnaruk et al., 2019)

ABIDE	DEPENDENCIES	IMPAIRING	NONCANCELLABLE	PROHIBITIVE
ABIDING	DEPENDENT	IMPAIRMENT	OBLIGATE	PROHIBITIVELY
BOUND	DEPENDING	IMPAIRMENTS	OBLIGATED	PROHIBITORY
BOUNDED	DEPENDS	IMPAIRS	OBLIGATES	PROHIBITS
COMMIT	DICTATE	IMPOSE	OBLIGATING	REFRAIN
COMMITMENT	DICTATED	IMPOSED	OBLIGATION	REFRAINING
COMMITMENTS	DICTATES	IMPOSES	OBLIGATIONS	REFRAINS
COMMITS	DICTATING	IMPOSING	OBLIGATORY	REQUIRE
COMMITTED	DIRECTIVE	IMPOSITION	OBLIGE	REQUIRED
COMMITTING	DIRECTIVES	IMPOSITIONS	OBLIGED	REQUIREMENT
COMPEL	EARMARK	INDEBTED	OBLIGES	REQUIREMENTS
COMPELLED	EARMARKED	INHIBIT	PERMISSIBLE	REQUIRES
COMPELLING	EARMARKING	INHIBITED	PERMISSION	REQUIRING
COMPELS	EARMARKS	INHIBITING	PERMISSIONS	RESTRAIN
COMPLY	ENCUMBER	INHIBITS	PERMITTED	RESTRAINED
COMPULSION	ENCUMBERED	INSIST	PERMITTING	RESTRAINING
COMPULSORY	ENCUMBERING	INSISTED	PLEDGE	RESTRAINS
CONFINE	ENCUMBERS	INSISTENCE	PLEDGED	RESTRAINT
CONFINED	ENCUMBRANCE	INSISTING	PLEDGES	RESTRAINTS
CONFINEMENT	ENCUMBRANCES	INSISTS	PLEDGING	RESTRICT
CONFINES	ENTAIL	IRREVOCABLE	PRECLUDE	RESTRICTED
CONFINING	ENTAILED	IRREVOCABLY	PRECLUDED	RESTRICTING
CONSTRAIN	ENTAILING	LIMIT	PRECLUDES	RESTRICTION
CONSTRAINED	ENTAILS	LIMITING	PRECLUDING	RESTRICTIONS
CONSTRAINING	ENTRENCH	LIMITS	PRECONDITION	RESTRICTIVE
CONSTRAINS	ENTRENCHED	MANDATE	PRECONDITIONS	RESTRICTIVELY
CONSTRAINT	ESCROW	MANDATED	PRESET	RESTRICTIVENESS
CONSTRAINTS	ESCROWED	MANDATES	PREVENT	RESTRICTS
COVENANT	ESCROWS	MANDATING	PREVENTED	STIPULATE
COVENANTED	FORBADE	MANDATORY	PREVENTING	STIPULATED
COVENANTING	FORBID	MANDITORILY	PREVENTS	STIPULATES
COVENANTS	FORBIDDEN	NECESSITATE	PROHIBIT	STIPULATING
DEPEND	FORBIDDING	NECESSITATED	PROHIBITED	STIPULATION
DEPENDANCE	FORBIDS	NECESSITATES	PROHIBITING	STIPULATIONS
DEPENDANCES	IMPAIR	NECESSITATING	PROHIBITION	STRICT
DEPENDANT	IMPAIRED	NONCANCELABLE	PROHIBITIONS	STRICTER
UNAVAILABILITY	UNAVAILABLE	STRICTLY	STRICTEST	

Table 2.3 Descriptive Statistics

Variable	N	Mean	Q1	Median	Q3	Std dev
Constraints%	87,604	0.70	0.57	0.69	0.82	0.2
ROA	87,604	-0.08	-0.06	0.09	0.16	0.62
Firm Size	87,604	4.95	3.26	5.00	6.70	2.52
Firm Age	87,604	2.52	1.95	2.48	3.14	0.81
Leverage	87,604	0.20	0.00	0.10	0.31	0.27
R&D Intensity	87,604	0.58	0.00	0.00	0.10	3.03
Capital Expenditure	87,604	0.17	0.01	0.03	0.09	0.59
Profit Margin	87,604	-2.15	-0.07	0.08	0.17	12.22
Patent Citations	21,011	0.03	0.00	0.01	0.02	0.07
Asset Turnover	87,604	1.10	0.49	0.93	1.46	0.89

Table 2.4 Correlation Matrix

	Constraint%	ROA	Firm Age	Leverage	Firm Size	R&D Exp.	Capital Exp.	Profit Margin
Constraint%		0.083	-0.004	0.176	0.278	0.006	0.031	0.028
		0.000	0.248	0.000	0.000	0.098	0.000	0.000
ROA	-0.031		0.170	-0.078	0.454	-0.205	-0.095	0.363
	0.000		0.000	0.000	0.000	0.000	0.000	0.000
Firm Age	-0.007	0.263		0.014	0.329	-0.107	-0.136	0.120
	0.031	0.000		0.000	0.000	0.000	0.000	0.000
Leverage	0.209	0.017	0.100		0.160	-0.034	0.032	0.012
	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Firm Size	0.291	0.411	0.304	0.372		-0.142	-0.058	0.225
	0.000	0.000	0.000	0.000		0.000	0.000	0.000
R&D Intensity	-0.073	-0.241	-0.091	-0.286	-0.183		0.449	-0.756
	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Capital Exp.	0.044	-0.034	-0.095	0.128	0.202	0.073		-0.534
	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Profit Margin	0.081	0.724	0.223	0.253	0.565	-0.307	0.144	
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

P-values are presented below the coefficients.

Table 2.5 Regression Results of ROA on Firm Constraints

Panel A: OLS Regression Results	
Variables	ROA
Constraints%	0.247***
	(3.65)
Constraints%^{2}	-0.0937**
	(-2.54)
Firm Age	0.0290***
	(5.56)
Leverage	-0.274***
	(-14.43)
Firm Size	0.127***
	(39.39)
R&D Intensity	-0.0381***
	(-17.45)
Capital Expenditure	-0.0397***
	(-5.28)
Constant	-0.759***
	(-14.68)
Industry Dummies	Yes
Year Dummies	Yes
Observations	87,604
Number of firms	12,028
R-squared	0.364

Panel B: test of presence of a Inverse U shape:		
	Lower bound	Upper bound
Interval	0.071	2.554
Slope	0.234	-0.231
t-value	3.739	-1.894
P>|t|	0.000	0.029

Overall test of presence of a Inverse U shape:
t-value = 1.89
P>|t| = 0.029

***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 2.6 Regression Results of Profit Margin and Patent Citations on Firm Constraints

Panel A: OLS Regression Results		
Variables	(1) Profit Margin	(2) Patent Citations
Constraints%	3.803***	0.0312***
	(3.72)	(2.58)
Constraints%^{2}	-1.585***	-0.0277***
	(-2.79)	(-3.32)
Firm Age	-0.0876	-0.0004
	(1.07)	(-0.42)
Leverage	-0.573**	-0.00118
	(2.11)	(-0.35)
Firm Size	0.946***	0.005***
	(23.91)	(12.29)
R&D Intensity		-0.0003*
		(-1.75)
Capital Expenditure	-11.21***	0.00211
	(-33.13)	(1.56)
Constant	-5.261***	-0.0007
	(-4.94)	(-0.04)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	87,604	21,011
Number of firms	12,028	3,468
R-squared	0.367	0.229

Panel B: Test of Presence of An Inverse U shape:				
	Profit Margin		Patent Citations	
	Lower bound	Upper bound	Lower bound	Upper bound
Interval	0.071	2.554	0.071	2.554
Slope	3.578	-4.295	0.027	-0.110
t-value	3.796	-2.242	2.495	-3.548
P > | t |	0.000	0.012	0.006	0.000
Overall Test of Presence of An Inverse U Shape:				
t-value =	2.24		2.50	
P> | t | =	0.013		0.006	

***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 2.7 Regression Results of Asset Turnover on Firm Constraints

Panel A: OLS Regression Results	
Variables	Asset Turnover
Constraints%	0.120
	(1.08)
Constraints%^{2}	-0.00268
	(-0.04)
Firm Age	0.0745***
	(7.92)
Leverage	-0.105***
	(-4.24)
Firm Size	-0.0682***
	(-19.13)
R&D Intensity	-0.0268***
	(-18.50)
Capital Expenditure	-0.237***
	(-30.25)
Constant	1.109***
	(6.72)
Industry Fixed Effects	Yes
Year Fixed Effects	Yes
Observations	87,604
Number of firms	12,028
R-squared	0.257
Panel B: Test of Presence of An Inverse U shape:	
Inverse U shape rejected; Monotone or U shape	

***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 2.8 Moderation Effects on the Relationship between Firm Constraints and ROA

	(1) ROA	(2) ROA	(3) ROA
Constraints%	0.141**	0.170***	0.741***
	(2.09)	(2.6)	(7.48)
Constraints%^{2}	-0.0405	-0.0609*	-0.272***
	(-1.10)	(-1.72)	(-5.02)
Firm Age	0.0295***	0.0296***	0.0163***
	(5.66)	(5.69)	(3.63)
Leverage	-0.274***	-0.270***	-0.210***
	(-14.42)	(-14.28)	(-11.20)
Firm Size	0.127***	0.126***	0.105***
	(39.32)	(39.36)	(35.58)
R&D Intensity	-0.0383***	-0.123***	-0.0740***
	(-17.57)	(-4.82)	(-14.06)
Capital Expenditure	-0.356***	-0.0393***	-0.0194***
	(-5.21)	(-5.32)	(-3.46)
Constraints% × Capital Expenditure	0.730***		
	(4.31)		
Constraints%^{2} × Capital Expenditure	-0.377***		
	(-3.74)		
Constraints% × R&D Intensity		0.169***	
		(2.63)	
Constraints%^{2} × R&D Intensity		-0.0670*	
		(-1.67)	
Constraints% × MA rank			-0.738***
			(-4.66)
Constraints%2 × MA rank			0.238***
			(2.61)
MA rank			0.632***
			(9.34)
Constant	-0.708***	-0.726***	-0.974***
	(-13.70)	(-14.38)	(-17.09)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	87,604	87,604	80,471
R-squared	0.362	0.364	0.321

***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Figure 2.1 A Conceptual Framework of the Effects of Stress in Organizations

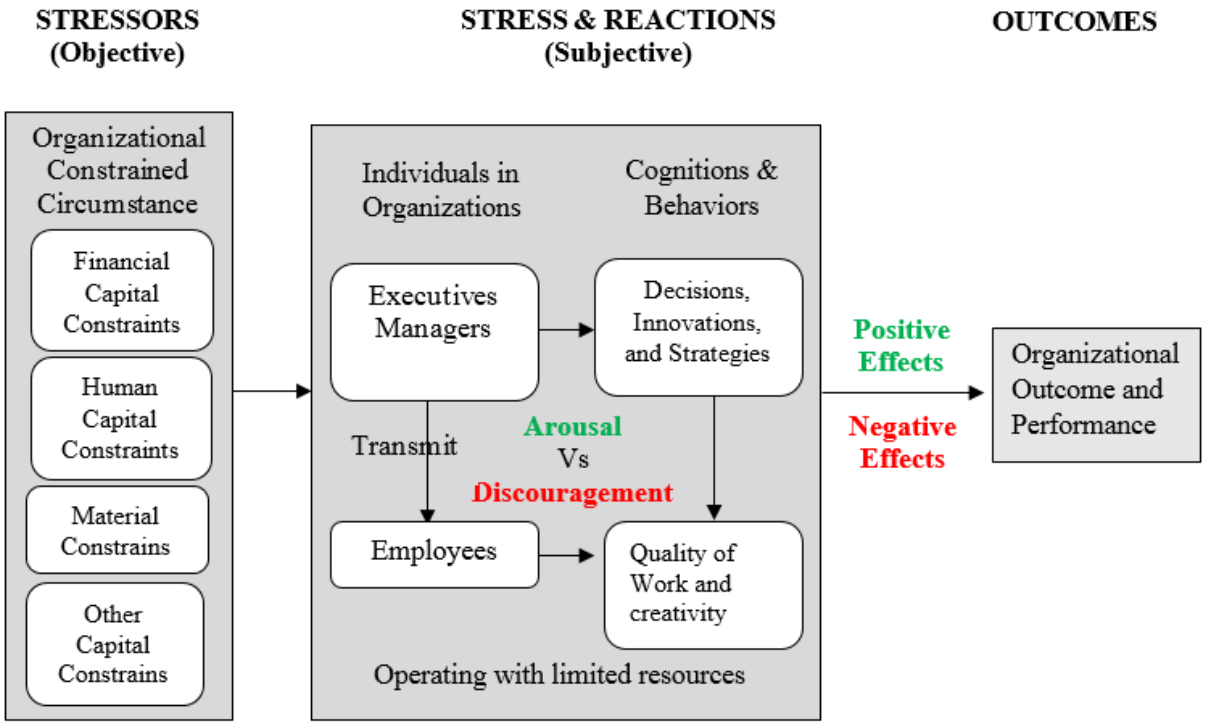


Figure 2.2 The Change of Average Percentage of Constraining Words over the Sample Period

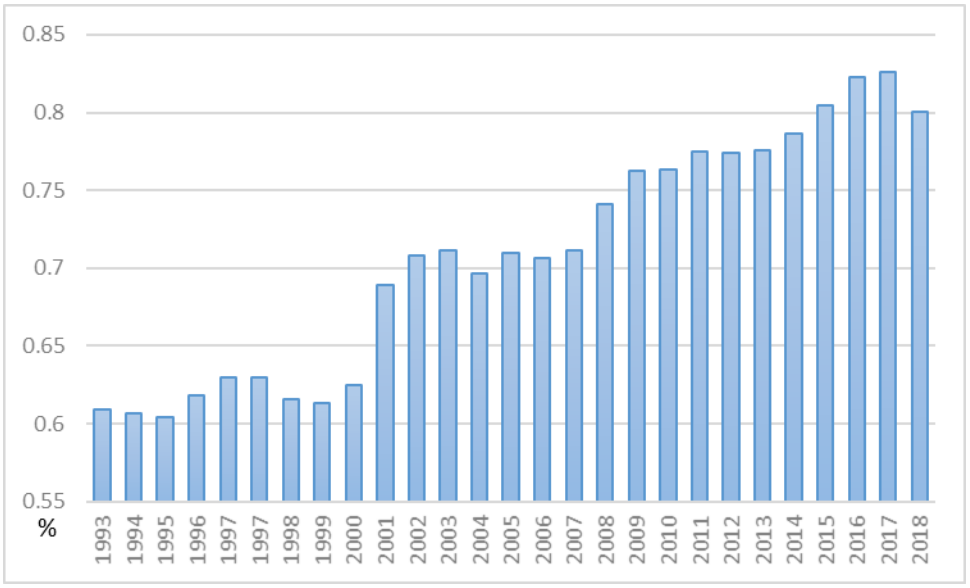


Figure 2.3 Results Demonstrated by an Inverse U-Shaped Relation between ROA and Constraining Words Percentage

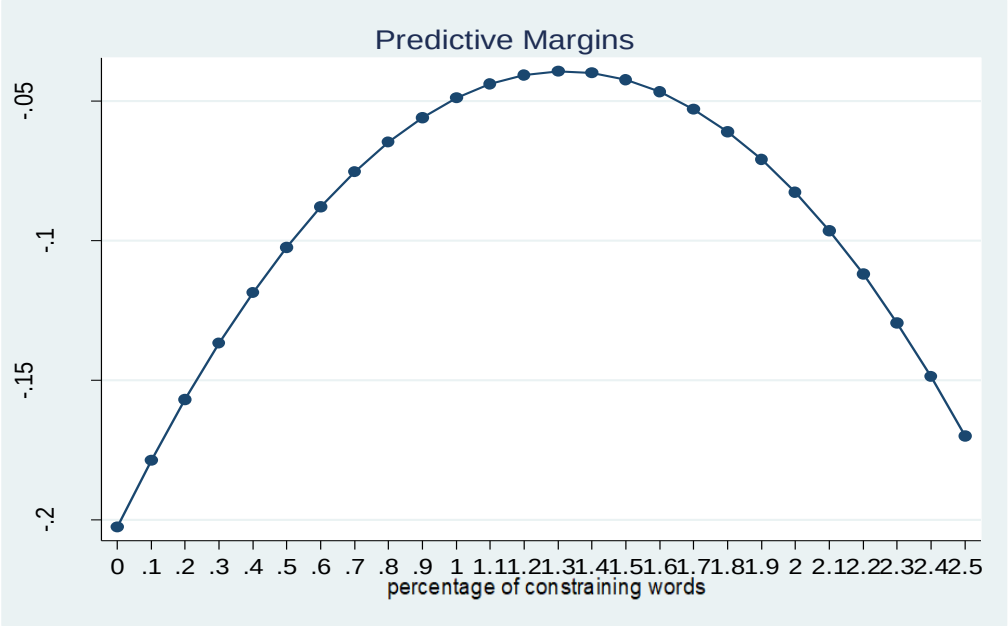


Figure 2.4 Results Demonstrated By an Inverse U-Shaped Relation between Profit Margin and Constraining Words Percentage

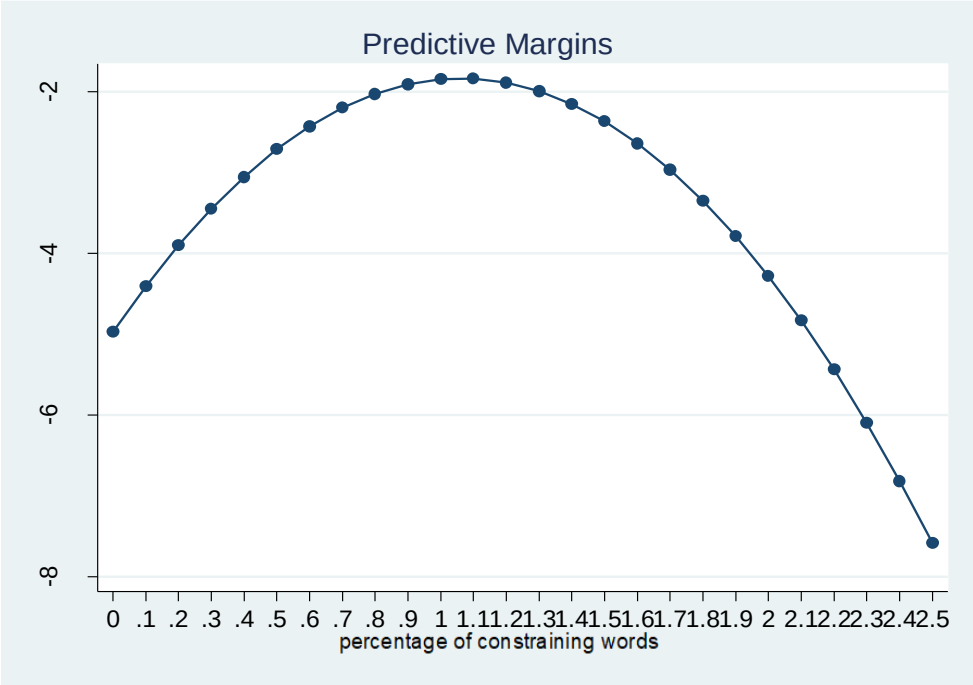


Figure 2.5 Results Demonstrated by an Inverse U-Shaped Relation between Patent Citations and Constraining Words Percentage

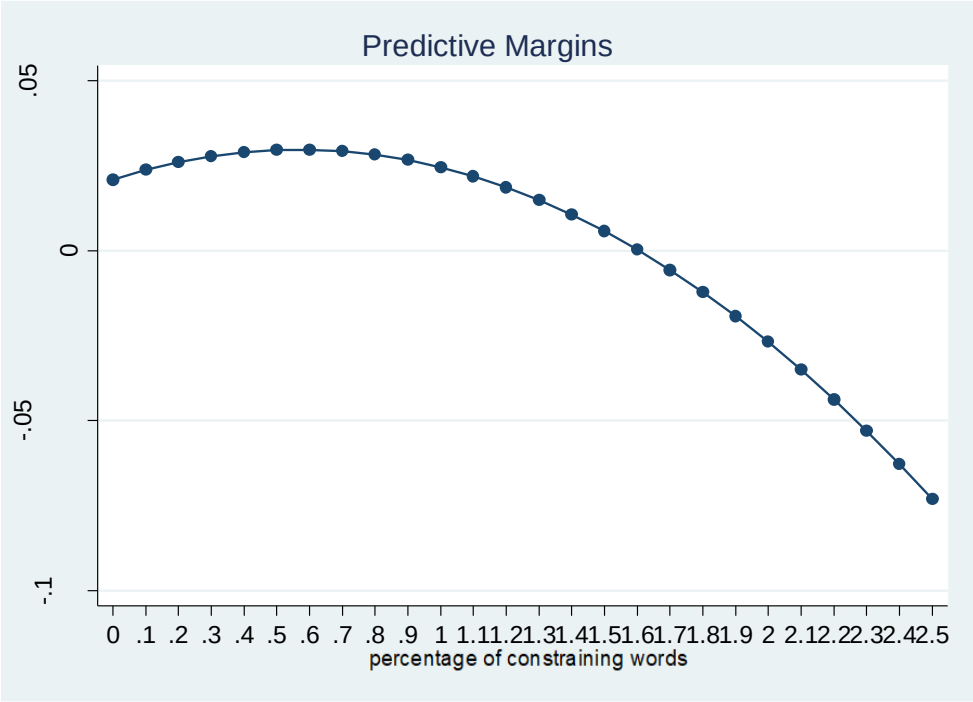
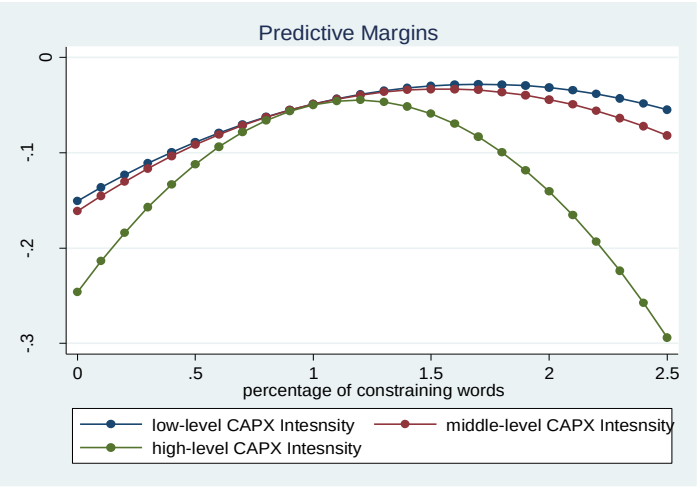
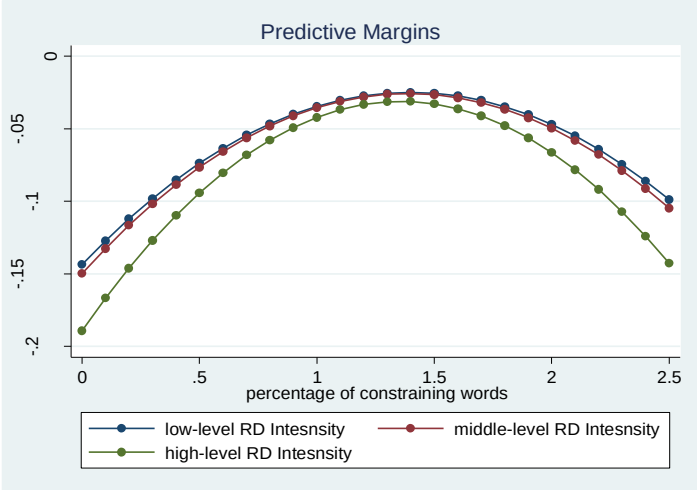


Figure 2.6 Moderation effects on an Inverse U-Shaped Relation between ROA and Constraining Words Percentage

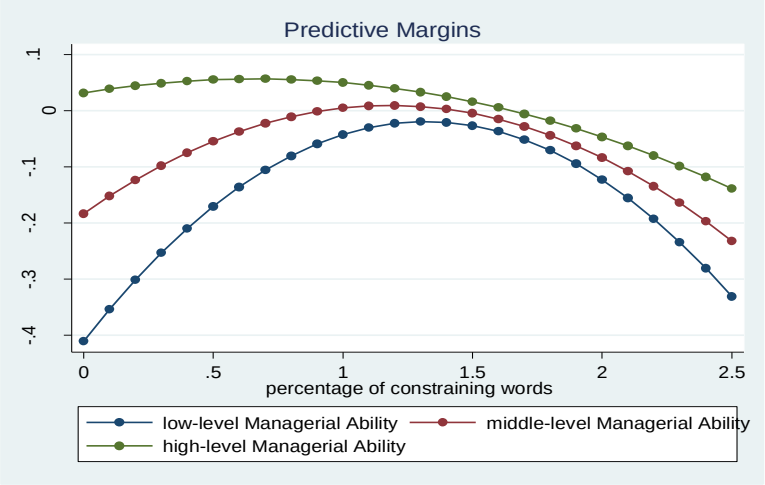
Panel A: Moderators- CAPEX Intensity



Panel B: Moderators – R&D Intensity



Panel C: Moderators – Managerial Ability Score Rank



Chapter 3 Rewarding a Leadership Team:

Insights from CEO Pay Slice and Pay Dispersion Among the CEO's Top Team

3.1 Abstract

Rewarding a top leadership team (TLT), comprised of diverse individuals working collaboratively to direct the organization, represents an important and challenging problem. In this study, we recognize the importance of the CEO's unique role within the team and the dynamics among other team members. Specifically, we analyze TLT compensation along two dimensions: (1) the size of the CEO pay slice, reflecting payment for the CEO's team leadership and management skill, and (2) the degree of pay dispersion among the CEO's senior team, capturing the extent to which payment is based on team versus individual effort. We explore how these factors collectively influence firm performance. Our findings, based on analysis of a longitudinal sample, show that, on average, TLTs characterized by a large CEO pay slice and low degree of pay dispersion among the CEO's top team outperform others in terms of return on assets. Our analysis of DuPont components indicates that these relations are linked more to customer value (profit margin) than operating efficiency (asset turnover). Overall, our results highlight the complementary relations between CEO team leadership and team-based compensation in rewarding TLTs.

3.2 Introduction

The top leadership team (TLT) comprised of C-level executives such as Chief Executive Officer (CEOs), Chief Financial Officers (CFOs), Chief Operating Officers (COOs), Chief Information Officers (CIOs), and Chief Technology Officers (CTOs), serves as the strategic core

of an organization. This leadership team is responsible for setting directions, developing strategies, aligning personnel, and inspiring the entire organization—roles that are critical in today's increasingly competitive and uncertain business environment (Kotter, 1990, 2017; Hambrick, 1994; Rosebush, 2012; Whitler & Kersey, 2021). The TLT is more than just a group of the company's senior-most executives; it is a collective of leaders, each contributing diverse expertise, yet working collaboratively to direct the entire organization (Whitler & Kersey, 2021). Rewarding such a leadership team is challenging as it requires consideration not only of recognizing individual talents but also of fostering teamwork. In this study, we consider how the compensation structure of the top leadership team is associated with firm performance.

Existing studies provide competing theories and conflicting empirical evidence on how distribution of TLT compensation affects firm performance. Many of these studies treat the CEO and other team members as equally participating members and overlook the distinctive role and responsibilities of the CEO within the team (e.g. Bloom & Michel, 2002; Lee et al., 2008). Studies that focus on the disproportionately high compensation of the CEO might fail to account for the intricate interplay among other team members (e.g. Bebchuk et al., 2011; Bugeja et al., 2017). In this study, we recognize the importance of both the CEO's unique role within the team and the dynamics among other executive members (Ridge et al., 2017). We delineate the TLT compensation structure along two dimensions - the CEO pay slice and the pay dispersion among the remaining TLT members - and explore how these factors collectively influence firm performance.

We treat the CEO as the leader of the TLT and the remaining TLT members (CEO's top team) as peers who act under the direction of the CEO. The first dimension of TLT compensation structure is CEO pay slice, measured as the fraction of total TLT compensation that goes to the

CEO (Bebchuk et al., 2011). Literature based on CEO power suggests that a large CEO pay slice reflects the outsized influence of a CEO who has the power to extract excess compensation, potentially impairing company performance (Bebchuck et al., 2011; Li et al. 2016; Ntim et al. 2019; Sheikh 2019; Shahab et al. 2020). Conversely, other literature suggests that CEO pay slice reflects efficient contracting, dynamic bargaining or a tournament that improve firm performance (Lee et al., 2008; Kale et al., 2009; Connelly et al., 2014; Ridge et al., 2017).

Another possibility is that a large CEO pay slice reflects compensation for the CEO's exceptional leadership of the TLT and organization. In contrast to management that focuses on planning and control, leadership plays a pivotal role in identifying opportunities, preparing organizations for change, and navigating through uncertain times (Zaleznik, 1981, 2004; Kotter, 1990, 2017). These leadership qualities demand a distinct blend of skills, traits, and attributes that go beyond managerial competence (Zaleznik, 1981, 2004). CEOs work with their team to envision the future, craft strategies, and develop innovative approaches. A strong leader seeks to convert constraints into opportunities, guide and inspire the organization through challenges ahead (Zaleznik, 1981, 2004; Kotter, 1990, 2017). Not every leader possesses robust leadership skills; indeed, there are "CEOs who simply do not lead" (Farkas & Wetlaufer, 1996; Rosebush, 2012). From a team-based perspective, allocating a higher portion of the total TLT compensation to the CEO suggests recognition of the CEO's ability to make the whole team better, presumably by providing exceptional and rare team leadership. Thus, from a leadership perspective, we expect a positive relation between CEO slice and firm performance.

The second dimension is the pay dispersion among the CEO's leadership team, reflecting a deliberate allocation of the remaining portion of TLT compensation among non-CEO executives. We argue that this allocation depends on the weighting of team-based versus individual-based

compensation (Lazear, 2018). Team-based pay is shared by the team members whereas individual-based pay is not. Pay dispersion increases when compensation is tied to subunit performance or a tournament-style incentive system aimed at enhancing firm performance through individual contributions (Hambrick, 1995; Ridge et al. 2017). However, such emphasis on individual contributions, along with feelings of inequity or injustice triggered by disparities, can weaken behavior integration within the team (Hambrick, 1994, 1995; Siegel & Hambrick, 2005; Fredrickson et al., 2010; Li et al., 2020). Therefore, less dispersion representing a higher amount of team-based relative to individual pay is desirable in motivating team performance.

We investigate the combined effects of CEO pay slice and pay dispersion among CEO's leadership team on firm performance. Leadership operates within a team framework, where its value is contingent upon cooperation and cohesion among the team members (Li et al., 2020). Similarly, the value of the team relies on effective leadership (Aiken & Keller, 2007; Ling et al., 2008). Therefore, team leadership and team cohesion are complementary. A cohesive top team, fostered by effective coordination, mutual interaction, and a foundation of trust, is better equipped or committed to understand and execute the CEO's perspectives and guidance (Hambrick, 1994; Li et al., 2020). Therefore, we expect that a low (high) degree of pay dispersion among the CEO's top team and a high level of CEO pay slice to be directly (inversely) complementary with regard to firm performance.

Using executive compensation data including 24,647 firm-year observations spanning thirty years from 1993 to 2022, we group firm-years based on the CEO pay slice each year. We document that, on average, a high CEO slice is positively associated with performance measured by return on assets (ROA). However, we do not observe a significant association between pay dispersion among the CEO's top team and ROA. Importantly, we find that the interaction effect

between a high level of CEO pay slice and a high degree of pay dispersion among the CEO's top team is negatively associated with ROA, indicating that a high level of CEO pay slice and a high degree of pay dispersion among CEO's top team are inversely complementary. Through comparisons of coefficients, we find that firms characterized by high levels of CEO pay slice and low levels of pay dispersion (team-based pay) outperform others. These results suggest that team leader compensation and a team-based pay structure play a complementary role in impacting firm performance.

In supplementary analysis, we examine the DuPont components of ROA: profit margin and asset turnover. This allowed us to gain insights into the implications of TLT compensation structure on different aspects of firm performance. First, we find that the positive association between ROA and CEO pay slice is due to profit margin, not asset turnover. Next, we find that there is a negative interaction between a high level of CEO pay slice and a high degree of pay dispersion among the CEO's top team on profit margin, consistent with our findings for ROA. In other words, the positive effect of CEO slice on profit margin is diminished when there is high pay dispersion among the top team. We also find that pay dispersion is negatively associated with asset turnover and we do not find a significant interaction effect. These results suggest that the observed relations between CEO pay slice and dispersion of pay across the CEO's team are more about creating customer value, through product innovation and differentiation, than generating higher revenue through efficient use of assets.

A top leadership team is more than just a group of senior executives - "it's a microcosm for the entire organization" (Whitler & Kersey, 2021). Compensating such a talented team presents an interesting and important question, impacting not only how the team works together but also how the company as a whole operates (Whitler & Kersey, 2021). Compared with individual executive

compensation, TLT compensation has received less attention (Porter, 2007; Finkelstein et al., 2009; Frydman & Saks, 2010; Eavis, 2014; Balsam et al., 2011). Our research contributes by examining the implications of TLT pay distribution from two angles and providing evidence on how these dimensions combine to influence firm performance. We recognize both the CEO's unique role and the dynamics among other team members and highlight the importance of considering different dimensions of the TLT compensation structure (Ridge et al., 2017).

Discussions on high CEO pay have drawn widespread attention (The New York Times.com, 2018; Eavis, 2019; Saporit, 2019). Many commented that during the pandemic CEO pay remained notably high while boards claimed that they aim to acknowledge executives' efforts in navigating through difficult times (Eavis, 2019; Saporit, 2019). While our paper does not intend to contribute to this debate, we offer evidence that that a higher CEO pay slice represents payment for team leadership that enhances group performance, and our results highlight complementary relations between team leader compensation and team-based compensation.

Section 2 follows by discussing prior related literature and by developing the hypotheses. Section 3 describes the research design and empirical measures. Section 4 details the empirical results, and Section 5 presents the findings of robustness tests. The final section discusses conclusions, limitations, and future research.

3.3. Theory and Hypotheses

3.3.1 Compensation of the Top Leadership Team

Previous studies on TLT compensation often focus on only one dimension of the compensation structure and present conflicting theories and empirical results regarding how TLT compensation affects firm performance (Bloom, 1999; Bloom & Michel, 2002; Henderson &

Fredrickson, 2001; Siegel & Hambrick, 2005; Lee et al., 2008; Kale et al., 2009; Fredrickson et al., 2010, etc.). From a leadership perspective, we view the CEO, who exerts significant influence over group dynamics, as the team leader and remaining TLT members as peers or teammates (Fredrickson et al., 2010). We recognize the importance of both the CEO's unique role within the team and the dynamics among other executive members and we delineate the TLT pay distribution along two dimensions: the size of the CEO pay slice and the degree of pay dispersion among the CEO's top team. To use an analogy, if the compensation of the TLT is considered a pie, the first dimension of the compensation distribution is how big of a slice goes to the leader of the TLT, i.e., the CEO, and the second dimension is how evenly the remaining part of the pie is divided among the CEO's direct reports. We explore the implications of these two dimensions for firm performance.

3.3.2. CEO Pay Slice

Research based on agency theory suggests that a substantial CEO pay slice may reflect the CEO's power in pursuing significant compensation not linked to value creation, signaling weak corporate governance and detrimentally impacting company performance (see Brahma & Economou (2023)'s literature review). For instance, Bebchuk et al. (2011) discovered that firms characterized by higher CEO pay slices, reflective of weaker corporate governance, tend to exhibit lower Tobin's Q and make inferior acquisition decisions. Chen et al. (2013) also document that CEO pay slice increase the company's cost of equity, again consistent with a larger CEO pay slice being indicative of higher CEO power.

Conversely, some literature posits that CEO pay slice reflects efficient contracting, dynamic bargaining, or a tournament prize (Lee et al., 2008; Kale et al., 2009; Ridge et al., 2017).

For instance, Bugeja et al. (2017) argue that CEO pay slice indicates a rational allocation of decision authority between the CEO and other executives, and they find that there is no significant relationship between CEO pay slice and subsequent firm performance. Furthermore, certain studies consider CEO pay slice as a tournament prize, where the CEO's substantial compensation incentivizes individual executives in the CEO's top team, who are vying for promotion to the CEO position, to exert greater efforts, thereby positively influencing firm performance (e.g., Lee et al., 2008; Kale et al., 2009).

We acknowledge the validity of these theories and suggest it would be reasonable to consider a larger CEO pay slice as compensation for the CEO's exceptional talent and valuable leadership skills provided to the TLT and company. Both management and leadership are essential, with Kotter (1990, 2017) distinguishing between them: Management focuses on stability, whereas leadership is about coping with change. Managements appropriates value through planning, budgeting, organizing, staffing, and controlling processes, while leadership creates value by developing a vision and strategies, aligning people, and inspiring the entire organization (Zaleznik 1981, 2004; Kotter, 1990, 2017; Rosebush, 2012).

Though management and leadership are both important to a company's survival and success, leadership skill can be a scarcer resource (Zaleznik 1981, 2004; Kotter 1990, 2017). Distinctive leaders craft strategies, guide in new directions, inspire people, and foster a shared vision to take on challenges ahead (Zaleznik 1981, 2004; Kotter 1990, 2017).[4] A strong leader seeks to convert resource constraints into opportunities and guide the organization through uncertainties (Aiken & Keller, 2007). Research on teams has highlighted the significant impact of

[4] Farkas and Wetlaufer (1996) clarify that "A leadership approach is a coherent, explicit style of management, not a reflection of personal style." Kotter (1990) emphasized that leadership "has nothing to do with having 'charisma' or other exotic personality traits." Similarly, Farkas and Wetlaufer (1996) state that leadership is not defined as an outgrowth of a strong and charismatic personality.

leaders, or "stars," on team effectiveness outcomes (Humphrey & Aime, 2014; Liu, 2014; Li et al., 2015). Similarly, CEOs with exceptional leadership abilities lead strategic thinking, identify and pursue new opportunities, and leverage industry knowledge, thus making distinctive contributions to their TLTs and companies.

Castanias and Helfat (1991, 2001) propose a managerial rents theory, suggesting that the skills and abilities of the managers are internal firm resources that enable the creation of rents. A CEO's unique talent or leadership ability represents a distinctive blend of skills, traits, and attributes that extend beyond mere managerial competence and represent a rarer internal resource within companies (Zaleznik, 1981, 2004; Rosebush, 2012). Such resources (exceptional leadership skills) help a firm gain a competitive edge and generate greater returns. Therefore, companies tend to allocate a larger share of TLT compensation to the CEO to capitalize on these benefits, with other TLT members also benefiting.[5] As such, we expect that a high CEO slice, reflecting the CEO's unique abilities and contributions to the team, correlates positively with firm performance.

Hypothesis 1: The CEO pay slice is positively related to a company's profitability.

3.3.3 Pay Dispersion Among CEO's Top Team

Pay dispersion among CEO's top team represents a mix of team-based pay and individual pay (Lazear, 1989). Radian Group Inc., for example, indicates that their compensation program must be "equitable to reflect an executive's responsibilities and contributions to value creation and to ensure teamwork and coordination across the organization" (2016, p.55). Team-based pay is shared by the team members whereas individual pay is not. Less dispersion represents a higher amount of team-based relative to individual pay.

[5] A talented NFL quarterback gets a large slice of the pie because the quarterback impacts the performance of other players.

On one hand, the CEO's top team comprises individual executives leading their respective responsibility centers. Pay dispersion within this team reflects differences in managerial talent or performance linked to subunit performance (Carpenter & Sanders, 2002). When the hierarchy of pay within the CEO's top team aligns with the individual executives' responsibilities and contributions to value creation, each executive is incentivized to apply their talents (Main et al., 1993; Eriksson, 1999; Conyon et al., 2001). Furthermore, because compensation within the top leadership team is transparent, pay dispersion could also foster a managerial tournament environment, wherein team members compete for higher compensation relative to their peers for positions as the CEO's heir apparent (Eriksson, 1999; Lee et al., 2008; Kale et al., 2009; Ridge et al., 2017).[6]

On the other hand, literature argues that high pay dispersion can foster individualistic behaviors that undermine a team's "behavioral integration" (Hambrick, 1994).[7] Under an individual-based payment system, top executives may prioritize personal rewards and recognition over team responsibilities (Hambrick, 1995; Carpenter & Sanders, 2002).[8] "When everyone starts pulling in their own direction, collaboration and coordination suffer", as noted by Hambrick (1995). Moreover, from a social-psychology perspective (Pfeffer & Langton, 1993; Siegel & Hambrick, 2005; Yanadori & Cui, 2013), executives below the CEO typically feel that achievements, power, and status are important and often compare their pay with peers (Frank, 1985; Fredrickson et al.,

[6] Tournament theory (Lazear & Rosen, 1981) considers the hierarchy of rewards as a "managerial contest". Analogous to the Olympic Games, the managerial tournament rewards only the winner who performs well relative to other competitors in the hierarchy (Conyon et al., 2001). The competitor – or agent – needs to perform at an exceptionally high level to be on the podium and achieve a medal. The high rewards in the managerial tournament provide strong economic incentives to managers. In order to achieve the promotion and earn the rewards, managers will expend greater effort.

[7] Hambrick (1994) defines behavioral integration as "the degree to which the group engages in mutual and collective interaction" (p.188). It has three key elements: "(1) quantity and quality of information exchange, (2) collaborative behavior, and (3) joint decision making" (p.188).

[8] Carpenter and Sanders (2002) highlight agency theory's emphasis on cooperation between managers and shareholders, rather than among the managers themselves.

2010). Large pay dispersion may trigger strong feelings of inequity within the team, and such feelings may undermine executives' motivations to cooperate, and "in extreme cases may engage in outright sabotage of others' activities" (Lee et al., 2008, p.319), which, in turn, leads to a low firm performance (Wade & O'Reilly, 2006; Lee et al., 2008; Fredrickson et al., 2010; Ridge et al. 2017).[9] Therefore, when companies pursue effective team performance, a shared or team-based compensation structure, with lower pay dispersion, is desirable.

To summarize, pay dispersion among the CEO's top team reflects the extent to which payment is based on team versus individual effort. Team performance is motivated by rewarding the team as a group whereas individual performance is motivated by rewarding individuals for their separate contributions. The former leads to more uniformity in pay across the team whereas the latter leads to more dispersion in pay across the team. Pay dispersion among the CEO's top team would have a positive effect on firm performance when individual performance at each top position is desired. High pay dispersion could impair firm performance it lowers behavioral integration among the TLT if team performance is desired. Therefore, we state our second hypothesis as a two-sided hypothesis.

> **Hypothesis 2:** The pay dispersion among CEO's top team is positively (negatively) related to a company's profitability.

[9] Fredrickson et al. (2010) find that greater pay dispersion has a negative effect on ROA. More recent work by Yanadori and Cui (2013) argues that large pay dispersion, which increases competitive tension, leads to employees not willing to share knowledge with others, undermines the firm's intellectual development. Using an annual compensation survey data for U.S. high-technology firms (during the period of 1997 to 2002), they find that pay dispersion within the R&D group is negatively associated with firm innovation.

3.3.4 Complementary Effects

The literature emphasizes the importance of understanding the dynamic interplay between dimensions of TLT compensation. For instance, Carpenter and Sanders (2002) demonstrate how the alignment between the compensation of the CEO's "inner circle" and the CEO pay impacts firm performance. Additionally, Ling et al. (2008) emphasized the importance of "CEO-TLT interface" in promoting corporate entrepreneurship. More recently, Ridge et al. (2017) focus on the four non-CEO executives in the CEO's top team and illustrate the simultaneous effects of the team's multiple pay comparisons on its turnover. Given that CEO pay slice and pay dispersion among the top team are both important and distinct aspects of the TLT compensation structure, it is important to investigate their dual effects on firm performance.

In the previous section, we argued that CEO pay slice may reflect the CEO's ability to identify opportunities and prepare organizations for change. However, the effectiveness of these endeavors relies heavily on mutual and collective team interaction. Li et al. (2020) suggest that coordination among team members significantly influences how effectively a central star's ideas are integrated into teamwork. A CEO's top team characterized by high behavior integration exhibits extensive and quality information exchange, collaborative behavior, joint execution, and shared accountability among various functional departments (Hambrick, 1994, 1995).[10] In such teams, members trust each other and collaborate to solve problems and resolve disagreements, which enables the team to grasp and implement the leader's perspectives and guidance effectively and ensure alignment among different subunits throughout the organization (Hambrick, 1994, 1995; Whitler & Kersey, 2021).[11]

[10] Li et al. (2020): "Coordination allows information, knowledge, resources, and ideas to smoothly flow within the team. In turn, the team as a whole becomes more responsive, integrated, adaptive, and innovative."
[11] Based on interviews with senior executives, Whitler and Kersey (2021) indicates that the top leadership team "is collaborative, aligned, and accountable to shared goals. Collaborative in their approach to identifying and solving

At the same time, effective team performance relies on the team leader's success in extracting greater joint performance from the team (Aiken & Keller, 2007; Ling et al., 2008). A leader establishes a clear purpose and direction for the team, guides it in identifying and pursuing new opportunities, and provides supports when challenges arise (Jackson, 1992; Hambrick, 1995; Farkas & Wetlaufer, 1996; Hambrick, 1997; Ling et al., 2008; Finkelstein et al., 2009). A TLT team leader also aligns all responsibility centers in a common direction and fosters their commitment to shared goals by shaping characteristics of the TLT (Hambrick, 1995; Farkas & Wetlaufer, 1996; Ling et al., 2008).

Leadership is inherently team-based. The value of the CEO's leadership is contingent upon the effectiveness of CEO's top team, while the value of the team relies on effective leadership. Therefore, we argue that team leadership and team performance complement each other. Specifically, we contend that a high degree of behavior integration within the CEO's top team (reflected as low pay dispersion among CEO's top team) is important for organizations characterized by strong team leadership (indicated by a high CEO pay slice).

It follows that a high level of CEO pay slice and a high degree of pay dispersion among the CEO's top team would be inversely complementary. The positive impacts of CEO pay slice may be undermined if members of the CEO's top team prioritize their own interests. Members of such a team may exhibit fragmented behavior, withholding information or ideas, and working in isolation rather than collaboratively - Unresolved disagreements and conflicts can further erode trust and cohesion within the team (Siegel & Hambrick, 2005; Wade & O'Reilly, 2006; Lee et al., 2008; Fredrickson et al., 2010; Li et al. 2020). As Fredrickson et al. (2010, p.1038) note "it is hard

problems together – leveraging the best insights from every member. Aligned in their shared commitment to walking out of the room having disagreements resolved and being unified and on the same page to the rest of the organization. And accountable to each other to do their part to achieve shared goals – placing the team above individual recognition and rewards."

to imagine that a firm could function well if this elite group lacks cohesion, has members whose actions undermine others, and who do not cooperate". Hambrick (1994) observes that without behavioral integration, individual team members are less likely to engage in the necessary internal exchange and collaboration to bring innovative ideas to fruition. Consequently, despite distinctive leadership's potential positive influence on firm performance, high pay dispersion among CEO's top team may undermine its effectiveness in implementing the CEO's vision and guidance, negatively impacting performance.

By comparison, when the CEO lacks distinctiveness in terms of talent, skills, or leadership—reflected in a lower CEO compensation slice—firms are more likely to rely on a competent team to complement the CEO. For instance, firms may utilize other senior executives like the COO, CFO, or CTO to develop ideas, explore alternative perspectives, and generate value (Caglar et al., 2012; Ernst & Young, 2010; Davies, 2017). In these scenarios, forming a competitive team with high pay dispersion among the CEO's top team may provide more benefits to the TLT and the company.

In summary, we expect a high level of CEO pay slice and a high degree of pay dispersion among CEO's top team to be inversely complementary and make an empirical prediction that the interaction effects of these two factors would be negative. Therefore, we hypothesize the following:

> **Hypothesis 3:** The interaction effect between a high level of CEO pay slice and a high degree of pay dispersion among the CEO's top team is negatively associated with firm performance.

3.3 Research Method

3.3.1 Sample and Database

Our sample is comprised of 24,647 firm-year observations (2,664 U.S. public firms) over the period from 1994 to 2022. All the financial information is obtained from COMPUSTAT and the compensation data is from EXCUCOMP. We delete firm-years for utilities and financial industries because special regulations for these industries could influence compensation measurement (Lee et al., 2008) or firm performance (Demerjian et al., 2013).[12] We retain observations for firm-years with non-missing and non-negative assets, sales, and compensation information. We also exclude observations without sufficient data to construct all variables.

3.3.2 Measuring TLT Compensation Structure

We define the TLT as the top five executives included in the proxy disclosures and require firm-years to have at least five executives listed in ExcuComp (e.g., Aggrawal & Samwick, 2003; Bertrand & Schoar, 2003; Lee et al., 2008; Bebchuk et al., 2011). According to the SEC (Securities and Exchange Commission), public companies are required to disclose compensation information for the CEO and four other highly compensated executives in the proxy statements.[13] Following Bebchuk et al. (2011), if the firm discloses compensation for four or fewer executives compensation (including the CEO), we delete those firm-years (8.5% of our total sample) to make the pay dispersion comparable across the sample. Also, if the firm reports compensation for six or more executives (about 37% of total sample), we keep the top five highest paid executives (Bebchuk et al., 2011).

[12] We use the Fama-French 48-industry definition in our paper. We exclude the firm-years in "utilities", "banking", "insurance", "real estate", and "trading" industries, according to the Fama-French 48-industry definition.
[13] This policy changed to disclosing the compensation of CEO, CFO, and other three executives with highest pay after 2006.

We require all firms in our sample to have only one CEO in the firm's TLT. We exclude firms-years where we cannot identify the CEO, firm-years with multiple CEOs and firm-years where the CEO is not in the top five highest paid executives. We also address CEO turnover concerns by stipulating that the same CEO must have served the firm in both the prior and current fiscal years, ensuring no CEO transitions occurred during the fiscal period. [14] In our final dataset, each firm's TLT consists of one CEO as the top leader and four other executives as members of the CEO's top team. Regarding composition, approximately 83% of firm-year observations have a CFO, or equivalent finance position (such as senior vice president of finance, or treasurer) in their TLTs. The other highly frequent positions in the TLT are chief operating officer (COO) and chief marketing officer (CMO) (or vice president of marketing).[15]

We estimate *CEO pay slice* (denoted by *"CPS"*) using the ratio of the CEO's compensation divided by the total compensation (ExecuComp item "TDC1") of all five executives (including CEO) within the TLT (Bebchuk et al., 2011). Following previous literature (Siegel & Hambrick, 2005; Wade & O'Reilly, 2006; Lee et al., 2008; Fredrickson et al., 2010; Ridge et al., 2017), we measure *Pay dispersion among the CEO's top team* (denoted by *"Dispersion4"*) as the coefficient of variation of total compensation for the TLT members other than the CEO. The coefficient of variation is defined as the ratio of the standard deviation of executives' compensation to the mean of total compensation for the TLT members other than the CEO (e.g., Siegel & Hambrick, 2005; Harrison & Klein, 2007; Lee et al., 2008; Fredrickson et al., 2010). Please refer to Table 3.1 for variable definitions.

[14] We identify the CEO turnover year based on the information provided by the "BECAMECEO" item and the "LEFTOFC" item in ExecuComp. We delete observations when the CEO took on or left the position during the fiscal year (at t and t-1).

[15] We use "TITLEANN" information in the ExcuComp to identify the executive position. For example, for CMO, we search for "chief marketing officer", "vice present of marketing/sales", etc. Due to the fact that there are too many variations in the names of executive positions in "TITLEANN" information, the classification of the executive positions may contain errors, and we view this position analysis as purely exploratory.

3.3.3 Regression Specification

We estimate the following equation to test our hypotheses:

$$Firm\ Performance_{it} = \beta_0 + \beta_1\, High\_CPS_{\ it-1} + \beta_2\, High\_Dispersion4_{it-1} + \beta_3\, High\_CPS_{it-1} \times High\_Dispersion4_{\ it-1} + \beta_9 Control\ Variables_{it-1} + Fixed\ effects + e_{it}$$

We use *return on assets or ROA* to measure firm performance. The *ROA* metric allows us to focus on firm performance that can be directly attributed to a leadership team's effectiveness in generating returns on resources employed (Hagel III et al., 2010; Hagel et al., 2013). *ROA* is measured by operating income divided by the average total assets based on the most recent two periods.

High_CPS and *High_Dispersion4* as are categorical indictors of TLT compensation based on previously defined measurements. We classify firm-years that are above the 50th percentile as *High_CPS* (categorical indicator=1) and other firms as *Low_CPS (*categorical indicator=0). We classify firms that are above the median as *High_Dispersion4* (categorical indicator=1) and below median as *Low_Dispersion4* (categorical indicator=0).

We contend that these dimensions of TLT compensation reflect both the composition of the TLT and the distribution of pay among its members. Consequently, these categorical indicators of TLT compensation structure serve as proxies for various types of TLT dynamics. For instance, a TLT characterized by *High_CPS* and *High_Dispersion4* may imply a CEO with strong leadership skills and a CEO's top team emphasizing individual executive performance. Or this lack of congruence may indicate a CEO with high power and a team that relies on individual performance instead of team performance. Conversely, a TLT with *High_CPS* and

Low_Dispersion4 might suggest a strong leader prioritizing collaboration among team members. Moreover, categorizing these variables can simplify the interpretation of interaction effects.

We also include the following control variables that may influence a firm's performance: *Firm size* is measured as the natural logarithm of total assets. Larger firms may hire more effective managers, or larger firms could provide more advantages or resources to the TLT. *Leverage* is measured as the long-term debt divided by total assets (Bebchuk et al., 2011, etc.). High leverage may constrain management performance. *Firm age* is measured as the natural logarithm of years the firm has been listed on CRSP (Bebchuk et al., 2011). More mature firms may have competitive advantages in their industries. We also include *R&D/Sales* and *Capital Expenditure (CAPEX)/Sales* as variables which affect firm performance.

We include CEO characteristics. The *CEO outsider* is an indicator variable that takes 1 if the CEO has worked for the company less than one year before serving as CEO (Bebchuk et al., 2011). On the one hand, outsider CEOs may bring previous experience, broader perspectives, and unique skills that enhance competitive effectiveness. On the other hand, compared to CEOs promoted from within the firm, an outsider CEO may not be familiar with the firm and TLT, leading to decreased team collaboration and TLT competitive effectiveness. *CEO duality* takes 1 if the CEO is the chairman of the board. It measures how strongly the CEO influences the firm (Adams et al., 2005, Bebchuk et al., 2011). A powerful CEO may influence the TLT's decision making and its performance.

Following Bebchuk et al. (2011), we use one-year lagged independent variables, including one-year lagged *CPS* and *Dispersion4*, to mitigate the endogeneity problem. To avoid the influence of outliers, all continuous variables are winsorized at the levels of 1% and 99% in all of our analyses. We include both year fixed-effects and industry fixed effects in the model to mitigate the

potential bias and confounding effects that could arise from time trends and industry-specific characteristics. The standard errors are clustered at the firm level to control for cross-sectional correlation (Peterson, 2009).

3.4 Empirical Results

3.4.1 Descriptive Statistics

Table 3.2 Panel A reports the descriptive analysis results for main variables in our tests. The mean *CPS* is 0.39 (standard deviation of 0.11), consistent with previous studies such as Bebchuk et al. (2011) and Chen et al. (2013). This indicates that, on average, 39% of the total TLT compensation goes to the leader of the TLT over our sample period. The mean (median) *Dispersion 4* is 0.33 (0.28), with standard deviation of 0.22. This suggests that, on average, the coefficient of variation of total pay among CEO's top team is 0.34. The average *ROA* is 14.01% and its standard deviation equals 10.05%. Additionally, only 15 percent of sample observations have a CEO from outside of the firm, and 53 percent of firm-years have the CEO serving as the chairman of the board.

In Table 3.2 Panel B, we present the descriptive analysis for subgroups categorized by high versus low levels of TLT compensation variables. The *High_CPS* group allocates an average of 47.3% of its total TLT compensation to the top leader, whereas the *Low_CPS* group allocates an average of 30.8%. On average, the *High_CPS* group exhibits lower *Dispersion4* compared to the *Low_CPS* group. Additionally, the *High CPS* group tends to be larger, more leveraged, and more mature, with higher investments in R&D. The mean *ROA* for the *High_CPS* group is significantly higher ($p<0.05$) than that for the *Low_CPS* group.

The *High_Dispersion4* group has an average pay dispersion of 0.49, whereas the *Low_Dispersion4* group has an average dispersion of 0.16. The *High_Dispersion4* group, on average, allocates 2.3% more of TLT compensation to the CEO than the *Low_Dispersion4* group. Furthermore, the *High Dispersion4* group exhibits characteristics such as larger firm size, higher leverage, younger age, and higher allocation towards capital expenditures. However, there is no significant difference in ROA between the high and low *Dispersion4* groups.

Table 3.3 presents a correlation matrix for our sample. Pearson correlation coefficients are presented below the diagonal and Spearman correlation coefficients are reported above the diagonal. The Spearman and Pearson correlation coefficients indicate that *ROA* is positively related to *CPS* ($p<0.01$), but do not indicate a significant association between *Dispersion4* and *ROA*.

Table 3.4 presents a descriptive analysis of the mean *ROA* across four categories of TLT compensation structure. We classify companies into four groups based on their 50th percentile values: the *High_CPS/High_Dispersion4* group, the *High_CPS/Low_Dispersion4* group, the *Low_CPS/High_Dispersion4* group, and the *Low_CPS/Low_Dispersion4* group. From this univariate analysis, we observe that the *High_CPS/Low_Dispersion4* group exhibits the highest average *ROA*, followed by the *High_CPS/High_Dispersion4* group, while the *Low_CPS/Low_Dispersion4* group has the lowest *ROA*. However, the difference in *ROA* between the *High_CPS/Low_Dispersion4* and *High_CPS/High_Dispersion4* groups does not reach a conventional significance level. We further explore the relationship between TLT compensation structure and firm performance by conducting a multivariate analysis.

3.4.2 Regression Results

Table 3.5, Column (1) reports the results from an OLS regression of a firm's *ROA* on lagged TLT compensation variables along with control variables. To test Hypothesis 1, we examine whether firms with a high level of *CPS* perform differently from other firms in terms of profitability. Results in Column (1) document that the estimated coefficient of the *High_CPS* indicator is significantly positive at the 1% level (coefficient = 0.847, t-value = 4.41). This indicates that, on average, firms characterized by a high level of *CPS* exhibit higher profitability compared to firms with a low level of *CPS* over our sample period. This result is consistent with our Hypothesis 1.

Table 3.5, Column (1) also reports results of the association between *Dispersion4* and *ROA*. We observe that the estimated coefficient of *Dipsersion4* is negative but not significant (coefficient = -0.109, t-value = -0.63), indicating that pay dispersion by itself does not significantly influence *ROA*. We argue that pay dispersion among the CEO's top team reflects the extent to which payment is based on team versus individual effort. A possible explanation for the insignificant result could be that some firms prioritize motivating individual performance, while others emphasize team performance. On average, these preferences might even out, resulting in no observable difference in the overall effect.

In Hypothesis 3, we expect that the interaction effect between a high level of CEO pay slice and a high degree of pay dispersion among the CEO's top team is negatively associated with firm performance. In Table 3.5, Column (2), we introduce the interaction terms between *CPS* and *Dispersion4* (*CPS* Dispersion4*). We see a significantly positive association between the High CPS indicator and ROA (coefficient = 1.166, t-value = 4.52) and a significantly negative association between the interaction term and ROA (coefficient = -0.626, t-value = -2.01). These

results indicate that the benefits obtained from high CEO pay slice are reduced when there is a high level of pay dispersion among the four other executives. In other words, a high degree of pay dispersion among CEO's top team is inversely complementary to a high CEO pay slice. Despite the potential positive impact of distinctive CEO leadership on firm performance observed, high pay dispersion among the CEO's top team may undermine effectiveness in executing the CEO's vision and guidance, thereby negatively affecting profitability.

The results of the regression analysis are illustrated in Figure 3.1, with predicted values derived from marginal effects. The *High_CPS* group demonstrates better performance compared to *Low_CPS* group in terms of ROA. Additionally, the figure demonstrates a stronger positive relationship between *High_CPS* and *ROA* when *Dispersion4* is low. And this positive relationship is weaker when we have *High_CPS* and *High_Dispersion4*, aligning with our finding that lower *Dispersion4* complements the positive relationship between CEO pay slice and ROA. Furthermore, we observe that the highest performing group is *High_CPS/Low_Dispersion4*, followed by *High_CPS/High_Dispersion4*, with *Low_CPS/Low_Dispersion4* displaying the lowest performance. One potential explanation could be that when the CEO lacks distinctiveness in terms of talent, skills, or leadership, reflected in a lower CPS, firms may need to rely more on other talents or use more tournament-based incentives within the CEO's top team.

3.4.3 Additional Analysis

In this section, we investigate the association of TLT compensation and different dimensions of firm performance - ROA's constituent components of profit margin and asset turnover. According to the DuPont framework:

ROA (Operating Income/Average of Total Assets) = Profit Margin (Operating Income Income/Sales) x Asset Turnover (Sales/ Average of Total Assets).

Academic literature and textbooks suggest that the relationship of asset turnover and profit margin to ROA has important implications for management practices, performance measurement, and evaluation (Chang et al., 2014; Anderson et al., 2022). The profit margin reflects a company's ability to convert its sales into income, often achieved through pricing premiums based on product differentiation or innovation. On the other hand, asset turnover captures a firm's efficiency in leveraging its assets to generate sales revenue, and often provides insight into managerial ability in asset management.

Table 3.6, Columns (1) and (2) present the findings from separate OLS estimations for profit margin and asset turnover, respectively. We find that the *High_CPS* indicator has a significantly positive association with profit margin (coefficient = 1.049, t-value = 2.59). However, the interaction term of *High_CPS* × *High_Dispersion4* exhibits a significantly negative association with profit margin (coefficient = -1.168, t-value = -2.53). This indicates that a high level of CEO pay slice and a high (or low) degree of pay dispersion among the CEO's top team are inversely complementary (or complementary). This finding aligns with the results observed in the analysis of *ROA*.

In contrast to the findings for profit margin, the results for asset turnover do not indicate a significant relation between asset turnover and the *High_CPS* indicator. Similarly, the interaction term of *High_CPS* × *High_Dispersion4* is not significant. The only significant relationship observed in this analysis is the negative association between the *High_Dispersion4* indicator and asset turnover. Overall, these results suggest that a high level of pay dispersion among the CEO's

top team negatively moderates the relationship between CPS and profit margin and is negatively associated with asset turnover.

A possible explanation is that companies tend to rely more on the CEO's leadership in fostering product innovation than operational efficiency. Exceptional CEOs may lead their teams in shaping ideas and differentiating the brand and products, enabling premium pricing and higher profit margins (Ling et al., 2008; Keller & Meaney, 2017). For example, Jan Carlzon, the CEO of Scandinavian Airlines System, articulated a vision focusing on frequent business travelers, which led to high margins and significant growth (Kotter, 1990, 2017). Similarly, Lou Gerstner's leadership at American Express defied industry norms by crafting a dynamic enterprise vision in the face of increased competition (Davis & Dickson, 2014). Relying on a star CEO to drive product innovation and market success may require a higher degree of behavioral integration among team members to ensure that ideas are comprehended and executed effectively (Hambrick, 1994; Hambrick, 1995; Siegel & Hambrick, 1996).

Asset turnover, on the other hand, may rely more on management tasks like pre-planning, controlling, budgeting, and standardization. While both profit margin and asset turnover require team corporation and coordination, firms may rely less on CEO’s exceptional talent and leadership skills in driving asset management, and thus impose lower needs of team’s integration in implementing the CEO's ideas (Hambrick, 1995; Siegel & Hambrick, 1996).

3.5 Conclusions

While individual executive compensation design has been an important issue in the business arena for decades (Jensen & Murphy 1990; Murphy, 1999; Core et al., 1999; Frydman & Saks, 2010; Murphy & Zabojnik, 2004; Bebchuk & Grinstein, 2005), the compensation structure

for the top leadership team as a whole has received increasing attention from the media and theorists in recent years (Porter, 2007; Finkelstein et al., 2009; Eavis, 2014; Zhang, 2019). The compensation structure of the TLT affects executives' individual efforts and coordination among the team members, both of which impact organizational performance (Main et al., 1993; Bloom, 1999; Bloom & Michel, 2002; Siegel & Hambrick, 2005; Wade & O'Reilly, 2006; Lee et al. 2008; Kale et al., 2009).

In this study, we delineate the TLT compensation structure along two dimensions: the size of the CEO's pay slice and the degree of pay dispersion among the CEO's top team, highlighting the importance of both the CEO's unique role within the team and the dynamics among other members. We focus on investigating the interactive effects of these two dimensions of TLT compensation structure on different aspects of firm performance. We analyze CEOs' compensation relative to TLT from the perspective of their unique contribution through exceptional talent and leadership skills. Drawing upon longitudinal compensation data, we find that, on average, a high CEO pay slice is positively correlated with ROA. Additionally, because leadership makes the team better and the team makes the leader better, we observe that higher team payment (lower dispersion) complements and amplifies the positive relationship between CEO pay slice and ROA.

In contrast to the conventional agency approach for examining CEO pay, my second study considers higher CEO pay slice (the CEO's share of the compensation pie) as payment for transformative leadership over and above effective management. While companies recognize the critical importance of attracting and retaining leaders with exceptional talent or rare leadership skills (Aguinis & O'Boyle, 2014; Li et al., 2020), the literature presents conflicting results on their performance (Pfeffer, 2001; Khurana, 2002). Our study highlights the importance of congruence

between team leadership (the CEO) and team-based payment among non-CEO members as an important factor in such scenarios.

There are some limitations that need to be noted. Firstly, in line with the methodology outlined by Bebchuk et al. (2011), we utilize one-year lagged measures of compensation variables to mitigate potential endogeneity concerns. However, to enhance the robustness of our findings, further analysis employing instrumental variable methods is needed. Second, consistent with other TLT compensation studies (e.g. Bertrand & Schoar, 2003; Lee et al., 2008; Bebchuk et al., 2011; Zhang, 2019), we focus on the top five highest paid executives as the TLT. We believe that a focus on a TLT with its full membership would better capture the dynamics of its members. Also, we do not consider the components payments (like bonus and equity) that have different incentive impacts on executive behavior. In future work, we will further explore the TLT compensation structure based on pay components.

Furthermore, it is important to acknowledge that the TLT pay distribution may have different effects on firms' current performance compared to their long-term prospects. Additionally, we intend to further explore how the relationship between TLT compensation and performance evolves under different contextual situations, such as an uncertain business environment or distinct business strategies. Moreover, we recognize that various team-specific characteristics, such as TLT diversity and TLT composition, may influence the impact of TLT compensation on performance (Zhang, 2019). However, acquiring such data necessitates intensive manual collection from multiple databases, which we defer to future research endeavors.

Table 3.1 Variable Definitions

Variables	Definitions
CPS	This measure is referred to CEO Pay Slice. The ratio of the CEO's total compensation divided by the entire TLT (including the CEO)'s total compensation (Becbchuk et al., 2011); "CEO" is identified by [CEOANN] in ExecuComp
Dispersion4	P This measure is referred to pay dispersion among CEO's top team. The coefficient of variation (standard deviation of compensation divided by the average) of total pay among CEO's top team (see Fredrickson et al., 2010). Total compensation is [TDC1] in ExecuComp.
High_CPS	We classify firm-years that are above the 50th percentile as firms as the High_CPS (categorical indicator=1) and other firms as the Low_CPS (categorical indicator=0).
High_Dispersion4	We classify firms that are above the median as firms as the High_Dispersion4 (categorical indicator=1) and below median as the Low_Dispersion4 (categorical indicator=0).
ROA	Operating income before depreciation [OIBD] divided by the average total assets [AT] based on the most recent two periods
Profit Margin	Operating income before depreciation [OIBD] divided by sales [SALE]
Asset Turnover	Total sales [SALE] divided by the average total assets [AT] based on the most recent two periods.
Firm Size	Natural logarithm of total assets [AT]
Leverage	The ratio of long-term debt [DLTT] to asset [AT]
Firm Age	Natural logarithm of how many years the firm has been listed on the CRSP (Becbchuk et al., 2011). We calculate the difference between facial year end date and the date in which the firm was first listed on the CRSP [BEGDAT] and use the difference divided by 365 days.
CEO Outsider	An indicator variable: 1 if the CEO never worked or worked less than one year for the firm before serving as CEO (based on [JOINED_CO] and [BECAMECEO]) (Becbchuk et al., 2011).
R&D Intensity	Research and development expenditures [XRD] divided by sales [SALE] (If firm-years have missing R&D, we set the missing values to zero).
CAPEX Intensity	CAPAX expenditure [CAPX] divided by sales [SALE]
CEO Duality	An indicator variable: 1 if the CEO simultaneously serves the Chairmen of the firm ("Chairmen" is identified by [TITLEANN]). We use "TITLEANN" information in ExecuComp to find "Chairman*" or "chmn." and so on.

Information presented in square brackets represents the item names in Compustat or ExecuComp

Table 3.2 Descriptive Statistics

Panel A: Full Sample

Variable	Mean	Q1	Median	Q3	Std dev
CPS	0.39	0.32	0.39	0.46	0.11
Dispersion4	0.33	0.17	0.28	0.42	0.22
ROA (%)	14.18	9.53	14.01	19.48	10.05
Firm Size	7.37	6.20	7.25	8.43	1.61
Leverage	0.21	0.04	0.18	0.32	0.19
Firm Age	2.98	2.48	3.09	3.66	0.82
R&D/Sales	0.06	0.00	0.00	0.05	0.14
CAPEX/Sales	0.08	0.02	0.04	0.07	0.15
CEO Outsider	15%				35%
CEO Duality	56%				50%

Panel B: Subsample

Variables	Low CPS	High CPS	Difference* High-Low	Low DISP4	High DISP4	Difference* High-Low
CPS	0.308	0.473	**0.165**	0.402	0.379	**0.023**
Dispersion4	0.352	0.299	**-0.053**	0.164	0.486	**0.322**
ROA (%)	14.16	14.78	**0.620**	14.40	14.52	0.153
Firm Size	7.157	7.819	**0.662**	7.481	7.495	0.014
Leverage	0.193	0.229	**0.036**	0.206	0.216	**0.010**
Firm Age	2.943	3.167	**0.224**	3.10	3.01	**-0.089**
R&D/Sales	0.086	0.073	**-0.013**	0.075	0.084	**0.009**
CAPEX/Sales	0.061	0.044	**-0.018**	0.056	0.049	**-0.007**
CEO Outsider	0.539	0.589	**0.050**	0.538	0.59	**0.052**
CEO Duality	0.156	0.138	**-0.018**	0.141	0.152	**0.011**

*The significant difference of mean by strategic groups are denoted in bold (at the 5% level).

Table 3.3 Correlation Matrix

	ROA	CPS	Disper-sion4	Firm Size	Firm Lev	Firm Age	Capx/ sales	R&D/ sales	Dualit-y	Outsid-er CEO
ROA		0.022	-0.005	-0.020	-0.103	-0.010	0.076	-0.090	0.055	-0.026
		0.001	0.419	0.002	0.000	0.130	0.000	0.000	0.000	0.000
CPS	0.029		-0.132	0.233	0.135	0.178	-0.052	0.004	0.057	-0.031
	0.000		0.000	0.000	0.000	0.000	0.000	0.532	0.000	0.000
Disper4	-0.001	-0.165		0.010	0.025	-0.069	0.029	-0.104	0.051	0.021
	0.903	0.000		0.110	0.000	0.000	0.000	0.000	0.000	0.001
Firm Size	0.031	0.189	0.000		0.379	0.411	0.092	-0.126	0.121	-0.134
	0.000	0.000	0.963		0.000	0.000	0.000	0.000	0.000	0.000
leverage	-0.066	0.105	0.017	0.286		0.119	0.108	-0.253	0.014	-0.099
	0.000	0.000	0.006	0.000		0.000	0.000	0.000	0.026	0.000
firm age	0.007	0.159	-0.090	0.396	0.049		-0.091	-0.063	0.136	-0.107
	0.284	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Capx/sale	-0.087	-0.049	0.031	0.043	0.125	-0.115		0.011	0.036	0.022
	0.000	0.000	0.000	0.000	0.000	0.000		0.088	0.000	0.001
RD/sale	-0.368	-0.071	-0.008	-0.205	-0.121	-0.156	0.090		-0.060	0.131
	0.000	0.000	0.208	0.000	0.000	0.000	0.000		0.000	0.000
Duality	0.053	0.049	0.042	0.128	-0.014	0.126	-0.001	-0.111		0.045
	0.000	0.000	0.000	0.000	0.025	0.000	0.847	0.000		0.000
Outsider	-0.036	-0.029	0.033	-0.137	-0.089	-0.095	-0.007	0.114	0.045	
	0.000	0.000	0.000	0.000	0.000	0.000	0.287	0.000	0.000	

This table reports correlation coefficients of main variables in the paper. Spearman correlation coefficients are presented above the diagonal and Pearson correlation coefficients are reported below the diagonal.

Table 3.4 Descriptive Analysis od the TLT Compensation and the Firm Performance

		CEO Pay Slice (CPS)		
		Low Group	High Group	Difference (High - Low)
Pay Dispersion Among CEO's Top Team (Dispersion4)	Low Group	13.880	14.824	0.944
	High Group	14.400	14.738	0.338
	Difference* (High-Low)	0.520	-0.086	

* The significant difference of means and medians by strategic groups are denoted in bold (at the 1% level).

Table 3.5 The Association between TLT compensation Structure and ROA

	(1)	(2)
Variables	ROA	ROA
High_CPS	0.847***	1.166***
	(4.41)	(4.52)
High_Dispersion4	-0.109	0.202
	(-0.63)	(0.82)
High_CPS × High_Dispersion4		-0.626**
		(-2.01)
Firm Size	0.126	0.119
	(1.05)	(0.99)
Firm Leverage	-5. 090***	-5.091***
	(-5.83)	(-5.83)
Firm Age	-0. 542***	-0.539***
	(-2.75)	(-2.74)
CAPX/Sale	-3.191***	-3.198***
	(-3.31)	(-3.32)
R&D/Sale	-33.327***	-33.325***
	(-25.22)	(-25.26)
CEO Duality	-0. 337	-0. 336
	(-1.35)	(-1.35)
CEO Outsider	-0.456	-0. 450
	(-1.10)	(-1.11)
Constant	18.814***	18.701***
	(9.17)	(9.10)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	24,647	24,647
Adjusted R-squared	0.213	0.210

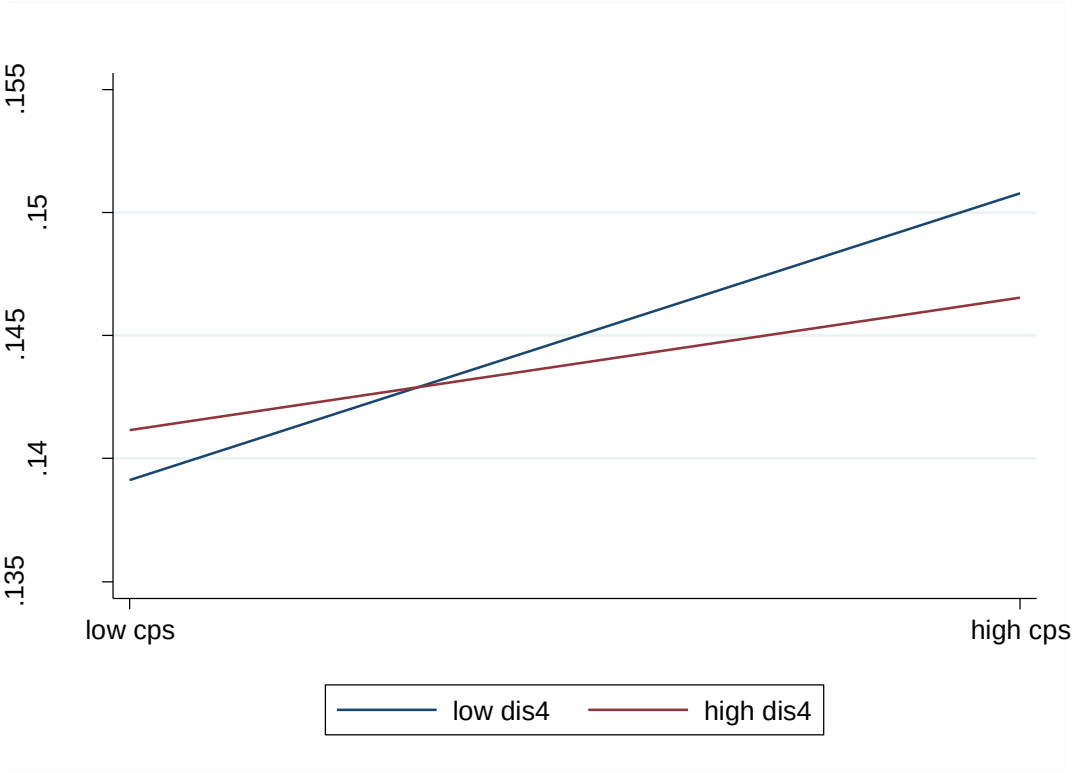
***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively

Table 3.6 The Association between TLT Compensation Structure and DuPont Components

	(1)	(2)
Variables	Profit Margin	Asset Turnover
High_CPS	1.049***	-2.083
	(2.59)	(-1.12)
High_Dispersion4	0.577	-3.748**
	(1.54)	(-2.23)
High_CPS × High_Dispersion4	-1.168**	3.108
	(-2.53)	(1.51)
Firm Size	2.173***	-7.926***
	(11.27)	(-9.51)
Firm Leverage	-2.220*	-39.758***
	(-1.77)	(-6.78)
Firm Age	-1.420***	0.671
	(-4.45)	(0.41)
CAPX/Sale	12.467***	-128.96***
	(3.95)	(-13.66)
R&D/Sale	-85.423***	-80.54***
	(-20.22)	(-11.60)
CEO Duality	-1.255***	3.482**
	(-3.29)	(2.02)
CEO Outsider	0.544	-3.970*
	(0.91)	(-1.67)
Constant	4.87	199.18***
	(1.49)	(19.79)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	24,647	24,676
Adjusted R-squared	0.372	0.477

***, **, and * denote significance at the 1%, 5% and 10% levels (two-tailed), respectively

Figure 3.1 The Association between TLT compensation Structure and ROA



Chapter 4 Balance Sheet Strength in the Oil and Gas Industry: Saving For a Rainy Day or Making Hay While the Sun Shines

4.1 Abstract

We examine how a strategic emphasis on balance sheet strength influences investment decisions and performance over time for firms operating in a cyclical environment. From a series of discussions with industry insiders and readings of disclosures for prominent oil and gas (O&G) companies in Canada, we identify two groups of upstream O&G firms based on how they match their resources and capabilities with the uncertainties posed by industry economic cycles. One group of firms borrows and invests aggressively when oil prices are strong and funds are available – "*making hay while the sun shines*", while the other group grows conservatively to build and maintain balance sheet strength – "*saving for a rainy day*". We use average cash flows to debt for each firm over time to measure emphasis on balance sheet strength and separate firms into *rainy day* and *making hay* companies. We leverage two steep price declines to observe the behavior of firms over industry cycles: one triggered by the widespread 2008 financial crisis and the other by a distinct and prolonged O&G industry downturn in 2014. While investment declined generally in both cases, we find that the decline in investment was significantly less for *rainy day* companies than *making hay* firms after the 2014 downturn. Across time, we find that *rainy day* companies make shrewder acquisitions and operate more efficiently than *making hay* companies. Nonetheless, the capital market rewards *making hay* companies with higher market valuation, but this is reduced in downturns.

4.2 Introduction

In December 2008, in the wake of the financial crisis, the oil price collapse to a low price of $31 per barrel. A 5-year run-up, to a peak of $147, was quickly erased by a demand-driven downturn in only six months (Ristanovic, 2020). After a quick recovery period, the price stabilized at around $95, before a supply-driven downturn in late 2014 slashed it to $46. Oil prices struggled through 2015 and 2016 and returned to $70 levels in 2017, but then slumped again to hit a record low with the coincidental surge in sustainability investing and the Covid-19 crisis in 2020 (Stevens, 2021). In 2022, due to geopolitical forces, the oil price bounced back to above $100, kicking off another series of ups and downs, but no one knows when these gyrations will occur or how long they will last (Garcia, 2022).

This "oil market rollercoaster" demonstrates the nature of cyclical industries – firms are heavily impacted by industry economic cycles created by exogenous and endogenous forces that affect the balance of supply and demand (Zarnowitz, 1985; Mascarenhas & Aaker, 1989; Mathews, 2005). These cycles are unpredictable in terms of timing, amplitude, and duration, and thus impose high uncertainty on companies (Zarnowitz, 1985) – upcycles which lead to development and prosperity mingled with downturns that threaten survival. Managers in cyclical industries constantly face the challenges of making strategic decisions to grow and thrive while navigating the industry economic cycles that influence the amount and timing of future cash flows. In an uncertain business environment, an entity's long-term performance depends on not only avoiding risk but matching resources and capabilities with potential opportunities to transform risk into competitive advantages (Foster & Kaplan, 2001; Kaplan & Mikes, 2012; COSO.org, 2016; Weidemeyer & Perkin, 2021). We examine *how a strategic emphasis on balance sheet strength influences investment decisions and performance over time in an environment with*

high uncertainty and demand volatility.

We began this project by talking with senior financial executives of O&G firms, senior partners of audit firms who specialize in O&G, and consultants and analysts who follow the O&G industry. We asked these industry experts to tell us how O&G companies manage their resources through economic cycles. They described two groups of firms and told us how balance sheet strength plays a key role in how firms manage and respond to the cycles. The first group manages cycles by "*making hay* while the sun shines". The companies in the *making hay* group seek to take advantage of growth opportunities that come during periods of high oil prices, and they capitalize on these opportunities by investing aggressively during these periods. These companies communicate their intent to pursue rapid growth in their annual reports and other disclosures, drawing attention and external funding from capital market investors who are traditionally hungry for growth in the O&G sector when commodity prices are high. The *making hay* companies leverage up when funds are available to take advantage of collateral value provided by high oil prices. The *making hay* companies typify the maverick approach in the Canadian O&G industry.

The second group of companies manage the dynamic environment by "saving for a *rainy day*". The *rainy day* companies pursue deliberate growth – they invest less heavily during high commodity price periods and prepare in advance for the inevitable low-price periods by focusing their attention on building and maintaining balance sheet strength. The *rainy day* companies believe their best investment opportunities arise during downturns instead of upturns. These companies conserve their debt capacity and use high prices in an upcycle period to accumulate cash resources and build their investment capabilities. Managing and implementing a strong balance sheet is a core part of their strategy in reposing to cycles. While "*rainy day*" companies forego the opportunity for rapid growth during upcycles, they maintain strong balance sheets over

cycles. This enables them to take advantages of investment opportunities and acquire assets more affordably and selectively, especially when other firms experience funding challenges during the downturns.

We use our discussions with industry insiders and our reading of financial reports to inform and enrich our empirical analysis. We consider how a strategic emphasis on balance sheet strength influences capital investment decisions. Based on industry conventions that we learned about through interviews with industry experts and other sources, we use cash flows to debt (averaged over time) as a measure of balance sheet strength to discriminate between the two groups of companies. Then, for observing the behaviors of the two groups of firms, we focus on two distinct post-price-decline periods: one following the oil price collapse triggered by the 2008 financial crisis, and the other following the 2014 oil price decline. These two price declines were different in nature – the drop in demand triggered by the 2008 financial crisis resulted from a more general set of events that impacted all industries whereas the 2014 price collapse was caused by an increase in the oil supply that was more specific to the O&G industry. Importantly, the 2008 financial crisis had a relatively short-lived impact as oil prices rebounded quickly, while the 2014 industry downturn had a prolonged impact on all firms in the O&G industry.

Rainy day companies, which forego some investment opportunities during up-cycle periods to build and maintain balance sheet strength, can take advantage of downturn periods to invest relatively more than *making hay* companies who cut investment expenditures to raise cash and satisfy debt requirements when prices drop. Our empirical evidence indicates that investment, measured by capital expenditures (CAPEX), declined for all firms after each of the two price declines but declined significantly less for *rainy day* (high cash flows to debt) firms than for *making hay* firms in the post-2014 industry downturn.

We then compare acquisition of proven reserves per dollar of capital expenditures, as a measure of investment yield, for *rainy day* versus *making hay* firms. We find that *rainy day* firms get more proven reserves per dollar of CAPEX in general and that this difference is greater in the post-2014 decline period. This result supports the premise that *rainy day* companies tend to buy carefully and selectively and may take advantage of decline periods to acquire premium assets from *making hay* companies, resulting in higher long-term value for their acquisition expenditures. Our findings also indicate that the industry downturn in 2014 had a more pronounced impact on the behavior of O&G companies compared to the 2008 financial crisis.

Next, we test whether *rainy day* companies operate more or less efficiently than *making hay* firms across time. Companies that grow conservatively are more likely to develop human and other capabilities because they have the resources and time to expend on learning and growth that improve their internal business processes (Kaplan & Norton, 2007). In addition, because such companies make more deliberate acquisition decisions, they can be selective and buy assets that produce more efficiently. We apply data envelopment analysis (DEA) to determine a firm's relative performance in converting corporate resources and inputs into oil and gas production compared with the industry leader (Banker et al., 1984; Demerjian et al, 2012). Importantly, this measure is based on production as opposed to revenue because revenue is tied to the price of oil.

Using a two-stage DEA approach (Banker & Natarajan, 2008), we run a second-stage regression that relates the operating efficiency score obtained in the first stage to our indicator variable for *rainy day* companies and other factors that affect operating efficiency. We find that *rainy day* companies operate more efficiently than *making hay* companies. We don't see incremental effects in the twelve-month periods following the 2008 crisis and the 2014 decline but these periods are relatively short for picking up changes in operating efficiency.

While *rainy day* companies, on average, outperform *making hay* companies in terms of investment yield and operating efficiency, we observe the existence of both groups of firms. In additional analysis, we explore why both *making hay* and *rainy day* firms coexist. We examine the equity valuations of *rainy day* and *making hay* firms over economic cycles. Our findings indicate that *making hay* firms enjoy higher market values and stock returns than *rainy day* companies during "good times." However, this advantage diminishes in the post-2014 industry downturn period, where the market value of *rainy day* firms experiences a relative increase (drops less). These results suggest that *making hay* companies satisfy the market expectation for growth during up cycles but also create opportunities for *rainy day* firms during down cycles.

Making hay companies run the risk of over-commitment before a down cycle hits them. *Rainy day* companies forego some of the market rewards of expansion in an upcycle but are better positioned to survive a prolonged downcycle. The *rainy day* companies may even buy assets from *making hay* firms at "fire-sale" prices during prolonged down cycles. The parallel existence of these two groups of firms fuelled growth in the Canadian O&G industry over time. *Making hay* firms expanded the industry – some were successful and may have transformed into *rainy day* firms, others fell by the wayside, and their assets were picked up by *rainy day* firms.

The long-term success of a company depends on its ability to not only avoid risk but transform risk into competitive advantages (Foster & Kaplan, 2001; Collins & Hansen, 2011; Kaplan & Mikes, 2012; COSO.org, 2016; Weidemeyer & Perkin, 2021). This ability is noteworthy in the aftermath of the COVID-19 pandemic, as companies are more sensitive to industry cycles and there is a heightened awareness of uncertainty prevailing in the business environment (Wang, 2021; IEA 2021). Our study considers how companies respond to and manage uncertainty by matching resources and capabilities with the opportunities and risks of industry economic cycles.

Our findings highlight the use of balance sheet strength not simply as a measure of financial risk, but also as an important marker for articulating investment and operating strategy in cyclical industries.

In the next section, we describe more fully our approach for identifying two groups of companies in cyclical industries and develop our hypotheses. In the third section, we describe the research design, data, and empirical measures. In the fourth section, we describe the results obtained by estimating the empirical models. In the final section, we draw conclusions from our analysis.

4.3 Industry Economic Cycles and Balance Sheet Strength

4.3.1 Industry Economic Cycles and the Canadian Oil and Gas Industry

Industry economic cycles are caused by exogenous and endogenous forces that upset the balance of supply and demand. Those cycles are comprised of periods of growth and decline that are unpredictable in terms of timing, amplitude and duration (Zarnowitz, 1985; Mathews, 2005). “It's very volatile, so you have to manage to those cycles,” comments Canadian Natural President Tim McKay (Williams, 2022). When making strategic decisions, executives and managers in cyclical industries must deal with risk due to the uncertainty associated with industry economic cycles that depend on prevailing balances of supply and demand.

The Canadian Oil and Gas Industry provides an ideal setting for our analysis because it experiences shifts in the balance of supply and demand that result in periods of rising prices and periods of declining prices of uncertain amplitude and duration (see Figure 1). From 2003 to 2008, oil prices increased to around $136/bbl, with a peak of almost $148, due to political and economic factors including growing demand in Asia (Deutsche Bank, 2013). Then, the O&G industry

experienced major challenges posed by the demand-driven price decline after the global economic crisis in 2008, when oil prices dropped dramatically to $31/bbl (Deutsche Bank, 2013). The industry then experienced a long run-up in oil prices followed by a sharp downturn due to the supply-driven price collapse in late 2014.

Given the commodity nature of the upstream O&G industry, the price cycles are not heavily influenced by product innovations that may change the competitive landscape, enabling us to focus on the uncertainty associated with industry economic cycles as opposed to product life cycles.[16] While there is diversity in terms of the types of oil (light versus heavy oil) and the extraction technologies (conventional wells, horizontal drilling, offshore wells, oil sands), the price effects are similar for all exploration and production (E&P) companies.

4.3.2 "Making Hay While the Sun Shines" versus "Saving for a Rainy Day"

The Canadian O&G industry has been known for outspending its cash flow – the nature of the energy sector demands substantial capital investments (Potkins, 2022; Canada Energy Regulator, 2018). O&G companies generally require substantial up-front funding for activities such as oil and gas extraction, bitumen upgrading, crude oil refining, oil and gas product transportation, or power generation and distribution (Canada Energy Regulator, 2018). When launching a large-scale project, an O&G company must secure the necessary financial resources. Although the company may raise funds internally through operations or asset sales, it often seeks to acquire additional funds through capital markets (Canada Energy Regulator, 2018). O&G companies tend to outspend their cash flow, but they have different spending strategies.

[16] Some might argue that the O&G industry is in a decline phase due to the transition to renewable energy, but most experts believe that the transition will take up to 50 years while world demand for oil continues to increase. In fact, technological innovations such as cryptocurrency and artificial intelligence add to global demand for energy.

A strategy specifies how an entity accomplishes its objectives by matching capabilities with opportunities (Datar & Rajan, 2020). In a series of personal meetings, we spoke with industry experts about the differences they saw across companies in matching their resources and capabilities with the opportunities posed by industry economic cycles. We talked with current and former CEOs and CFOs of O&G firms, senior audit partners and consultants at Big Four accounting firms specializing in the O&G industry, and analysts who closely follow the industry. Our conversations were open-ended. We also read descriptions of strategies in annual reports, industry and financial magazines, and articles written on cyclical industries in both the business press and the academic literature. Our discussions and reading led us to identify two strategies that are prevalent in the O&G industry: "*making hay* while the sun shines" and "saving for a *rainy day*".

Some O&G companies grow aggressively during the up-cycle phases of industry economic cycles. "The O&G industry is obsessed with growth. Some companies cannot differentiate on margins from others, so they go after growth", one of our interviewees comments.[17] This aggressive growth is supported by the availability of funding from capital market investors and lenders who are hungry for growth in the O&G sector when demand for oil is strong and commodity prices are high (Garcia, 2022). "Prevailing energy commodity market conditions have a clear impact on capital markets" (Canada Energy Regulator, 2018). Firms have high collateralizability that enables them to borrow more from different creditors based on attractive growth plans and high commodity prices during the promising up-cycles periods (Rampini & Viswanathan, 2010). "These investors are betting on oil – they are willing to take the risks," a senior analyst told us. Some O&G companies, which are financially constrained in terms of internal capital take advantage of high oil prices to acquire external capital, including borrowing

[17] "Historically, the largest oil producers in the country were always developing new multi-billion projects to grow their operations."

from banks and bond markets (Canada Energy Regulator, 2018). Those firms convert external funding into investment to aggressively expand and generate high returns when the market conditions are favourable - *making hay* while the sun shines. However, their aggressive investment and rapid expansion sacrifice a robust balance sheet, resulting in higher debt levels and lower cash reserves.

For instance, Charger Energy Corp. (formerly Seaview) indicates that "Seaview's goal is to create sustainable and profitable growth in production and cash flow. To accomplish this, Seaview has, and will continue to pursue, aggressive, yet focused, acquisition, exploration, exploitation and development opportunities" (Annual Information Form, 2010, p.7). Similarly, PetroNova Inc. states in its annual report that "the Corporation's strategy is to develop its existing portfolio of assets and to pursue further exploration opportunities" (Annual Report 2014, p.3). A Moody's report (2016) comments that "the largest U.S. and Canadian oil exploration and production companies are paying their executives to focus on boosting production and replacing reserves, rather than conserving capital and reducing debt."

At the same time, some firms adopt a conservative attitude by investing less heavily during the upcycle phases – they hold back when the sun is shining to prepare for the next down cycle. These companies typically do not face the same financial constraints as the *making hay* companies and have internal capital that can be utilized. Instead of pursuing aggressive growth, they opt to grow at a measured pace while preserving their debt capacity and maintaining balance sheet strength defined by the level of cash flows to debt.

Companies who choose to build their balance sheet strength use the high prices in an upcycle period to accumulate cash resources, reduce debt levels, and build their investment capacity (Rampini & Viswanathan, 2010; Bakx, 2022). Some current investment and growth are

forgone as an opportunity cost of building financial strength during up-cycle periods in anticipation of future downcycles and low-price investment opportunities when they come (Rampini & Viswanathan, 2010; Bakx, 2022) – saving for a *rainy day*. Maintaining and implementing a robust balance sheet through economic cycles is not only a financial metric, it is a core competency of strategic decision-making. Crescent Point Energy Corp. emphasized this point and stated that "Every decision we make really revolves around the fundamental pillars of our strategy, one being balance sheet strength" (Earnings Call, 2020). Similarly, Encana emphasizes the importance of balance sheet strength to support their strategic pillars that assist the company to be "resilient to the cyclical nature of the oil and industry" (Encana, Annual report, 2013, 2015).

Rainy day companies need to be patient and disciplined when considering opportunities. The companies signal this strategic approach, and they connect balance sheet strength to "long-term shareholder value" in their annual reports and other disclosures to investors. "We are committed to further increasing shareholder returns while prudently investing in the business and continuing to strengthen the balance sheet" (Suncor, Sustainability report, 2022). "Net debt reduction will continue to be a focus as we further fortify the balance sheet, accelerating the pace of deleveraging outlined on Investor Day" (Suncor, 6-K report, 2021). Likewise, Encana Corporation indicates that, "despite commodity price volatility and recessionary pressures, our balance sheet remains strong, and we continue to employ a conservative capital structure" (Annual Reports, 2009, p.12).

Rainy day companies forego the opportunities of quick expansion or "seizing the moment" while building financial strength during upcycles. However, when the price of assets is low in downturns, those companies equipped with strong balance sheets are able to use their free debt capacity to expand (Reimbold, 2009; Rampini & Viswanathan, 2010). As Cenovus Energy Inc

indicates in its earnings conference call, "with regard to the strength of our balance sheet and continuing to preserve some of the cash on hand…even if prices stay in the $50 to $55 WTI range, we can self-fund the projects and the expansions that we have identified" (Earnings Call, 2015).

In contrast, making hay firms invest and borrow heavily due to investors' thirst for growth during upturns. However, exhausting debt capacity rather than conserving it may render them unable to seize future growth opportunities. When a downturn does occur, they adopt a "hunker down" attitude – they stop capital spending and may even be forced to scale down to survive during downturns (Rampini & Viswanathan, 2010; Domanski, 2015). This is referred to as the "fire-sales effect" (Shleifer & Vishny, 1992; Acharya et al., 2007), when firms in cyclical industries that chose to take on high debt levels sell assets to other firms that have cash or unused debt capacity. Based on the common method described by industry experts, we measure balance sheet strength as cash flows to debt to classify firms as *rainy day* companies that borrow and spend cautiously and *making hay* companies that borrow and spend aggressively across cycles.[18] We state our first hypothesis:

> **Hypothesis 1 (H1):** *Rainy day* companies (characterized by a stronger balance sheet with higher cash flows to debt over time) grow more (or contract less) than *making hay* companies during downturns.

[18] We use the ratio of debt to cash flows to classify firms as *rainy day* companies or *making hay* companies. According to our interviews and reading, this ratio is commonly used by the Canadian O&G industry as a measure of balance sheet strength. Please refer to "3.2.1. Identification of "*rainy day*" and "*making hay*" firms" for details.

4.3.3 Balance-Sheet Strength and Acquisition of Reserves

Rainy day companies tend to adopt a disciplined spending approach. These companies monitor market movements to discover ideal opportunities and buy assets opportunistically and selectively. One CFO we interviewed articulated their approach, stating, "We make all decisions based on a $45/barrel benchmark, regardless of the prevailing oil prices." This reflects their dedication to maintaining a cautious approach to "every penny" of capital spending even during "good times." In contrast, *making hay* companies take the advantages of favourable market conditions. They borrow aggressively when funding is available and adopt a more ambitious approach to spending. They aim to secure additional funding from investors and lenders by presenting appealing expansion and growth plans to investors and lenders. In contrast, *rainy day* companies, that demonstrate a patient and cautious attitude, are likely to shrewdly acquire assets (oil reserves), obtaining greater long-term value from their acquisitions.

This advantage may become even more pronounced during down-cycle periods. When the price of assets is low in downturns, *rainy day* companies equipped with strong balance sheets are "well positioned to capture upcoming acquisition opportunities" (Reimbold, 2009). In 1990, for example, companies in the airline industry with extra cash and debt capacity repeatedly said that "they are waiting for the next crunch in the industry to pick up planes and routes from all the other firms that have taken on a lot of debt" (Shleifer & Vishny, 1992, p.24). Similarly, Encana Corporation states that its balance sheet strength allows the company to capitalize on opportunities as they arise through commodity cycles (Encana Corporation Sustainability report, 2013). "We strengthened our balance sheet during the high oil price environment, while others were making unsustainable spending decisions and leveraging up. We knew it was time to prepare financially for the inevitable downturn in prices and the profitable growth opportunities that would emerge"

(Suncor, Annual Report, 2016, p.3). *Rainy day* companies take advantage of decline periods to acquire premium assets at more affordable prices from over-committed *making hay* companies who sell good assets at distressed prices to raise cash and satisfy debt requirements during downturns (Mascarenhas & Aaker, 1989; Reimbold, 2009; Campello et al., 2010). We predict that *rainy day* firms, on average, obtain greater oil reserves per dollar of capital expenditure than other firms (Mascarenhas & Aaker, 1989). We state our second hypothesis as follows:

> **Hypothesis 2 (H2):** *Rainy day* companies obtain more proven reserves per dollar of CAPEX than *making hay* companies.

4.3.4 Balance-Sheet Strength and Operating Efficiency

Disciplined growth versus aggressive growth may have operating implications. *Rainy day* companies that grow conservatively are more likely to build and develop their workforce than *making hay* companies that grow aggressively and hire or fire talent as needed. *Rainy day* companies plan for growth and put systems and processes in place to accommodate growth at a measured pace over time. They have both the resources and time to work on developing internal business processes to improve the efficiency of their operations. They may also retain specialized workers and resources during downturns. Although commodity-producing companies cannot differentiate based on products, they can differentiate based on cost and production efficiency.

As previously discussed, *rainy day* companies take advantage of downturn periods to acquire assets at low prices from overcommitted *making hay* companies (Mascarenhas & Aaker, 1989; Campello et al., 2010). Their deliberate growth may allow them to choose and acquire assets that are more efficient to operate – the lifting and production costs are lower. Suncor Energy states in its 2013 annual report (p.14) that "a strong balance sheet is expected to help us achieve our

growth goals and withstand the ups and downs of the crude oil price cycle". Encana Corporation states that its "strong balance sheet has allowed the company to survive and be resilient through commodity price cycles and maintain its position of strength" (2009 annual report) and it demonstrates the sustainability of their business model through commodity cycles (2013 annual report, p.8). Similarly, Imperial Oil Limited indicates that "Our disciplined, prudent approach and unparalleled financial strength will enable us to take advantage of a period of decreasing costs and improving labour productivity as we invest in our future" (2008 annual report, p.2). We state our third hypothesis:

> **Hypothesis 3 (H3):** *Rainy day* companies achieve higher operating efficiency than *making hay* companies.

4.4 Research Design and Empirical Measures

4.4.1 Sample Selection

Our sample is comprised of publicly traded Canadian O&G firms over the period from 2002 to 2016. We obtain annual and quarterly financial data from the CanOils Database, "which is the leading commercial database for Canadian O&G exploration and production firms" (Badia et al., 2020a, p.7). CanOils provides historical financial data of Canadian O&G firms listed on the Toronto Stock Exchange (TSX), the TSX Venture Exchange or on a U.S. exchange from the period of 2002 to 2016. In addition, CanOils includes O&G production and reserve data for companies following National Instrument 51-101 "Standards of Disclosure for Oil and Gas Activities". O&G financial data and production data are available at a quarterly frequency, and the reserve reconciliation data including acquisition of O&G reserves is available at an annual frequency.

We began our sample construction with all quarterly and annual observations obtained from the Canoils data. To increase comparability, we focus on upstream O&G companies specializing in exploration and production activities. Therefore, we deleted observations with more than 5% of the total revenue generated from non-exploration and production activities, such as refining, marketing, field gathering, trading, and sales (Badia et al., 2020a; Badia et al., 2020b). We exclude observations with zero production and remove quarterly observations with missing key financial variables. Our final sample is comprised of 6,372 firm-quarter observations (Please refer to the Table 4.2 for the sample selection table). We require data on acquisition of proven reserves to test our Hypothesis 2. However, as quarterly data is unavailable, we used annual data to for this test. Following a similar set of procedures for annual data and requiring the disclosure of reserve reconciliations, we obtain a final sample of 1,518 firm-year observations.

4.4.2 Empirical Models Specification

Identification of "Rainy Day" and "Making Hay" Firms

According to our interviews and reading, debt-to-cash flow is commonly used by the Canadian O&G industry as a measure of balance sheet strength.[19] "They (the O&G companies) all use debt to cash flows", one of the industry experts told us. "This ratio is a measure of how many times greater debt is compared to its current level of cash flow, that is, how long it will take to pay it all off based on the most recent data" (Patel & Young, 2020). "Tight management of debt and reducing cash flow risks through strategic hedging programs will be key to maintaining a strong balance sheet" (Suncor's 2005 Annual Report, p.6). DBRS, a major Canadian credit rating agency, indicates in their methodology document that, "While DBRS recognizes the importance of

[19] The industry refers to the ratio as the ratio of debt to cash flows. To avoid a discontinuity that occurs when cash flows are negative, we use the ratio of cash flows to debt in our empirical work.

traditional debt-to-capital ratios as indicators of financial leverage, the capitalized value of PP&E and book equity values may not be reflective of the true underlying value of oil and gas reserves in the ground. As a result, DBRS tends to place greater emphasis on debt-to-cash flow, interest, and fixed-charge coverage ratios as measures of balance sheet strength." (DBRS, 2009, p.16) Similarly, Evaluate Energy's senior O&G analysts (Patel & Young, 2020) comments that "The measure (debt-to-cash flow) is a good indicator of financial health of a company and is more complete than most cash flow coverage ratios in that it includes all forms of debt and takes the cash on the balance sheet into account."

Debt-to-cash flow represents a firm's ability to service debt from operating cash flows, reflecting the firm's financial strength and flexibility. *Making hay* companies tend to invest available capital, including their debt capacity, and therefore, have higher debt-to-cash flow or lower cash flows to debt. *Rainy day* firms seek to preserve financial slack, so they are characterized by lower debt-to-cash flow or higher cash flows to debt. To avoid short-term effects, we use a ranking mechanism based on cash flows to debt over the full tenure of the companies in our sample to identify firms as *rainy day* or *making hay* firms.

For each year, we ranked firms based on the ratio of total operating cash flows to debt and assigned a percentile rank to the firm for that year. Then, for each firm, we sum the percentile ranks for all years that the firm is included in the data and compute the average percentile rank of the firm for the firm's full tenure during the sample period 2002 to 2016. We classify firms that are, on average, above the 50th percentile as *rainy day* firms focused on maintaining balance sheet strength and other firms as *making hay* firms that grow aggressively. The firm-type indicator is a dummy variable, denoted as *rainy day* = 1.

Measure of Operating Efficiency

We apply data envelopment analysis (DEA) to measure how firms utilize input resources to enhance output performance relative to their industry peers. DEA is a frontier-based non-parametric method used to benchmark productive efficiency against similar firms (Charnes et al., 1978). As a non-parametric method, DEA allows for varying weights on multiple inputs in generating outcomes in contrast to financial ratios that weight inputs equally. More importantly, in a commodity industry like oil and gas, revenue is inherently tied to the high volatility in commodity price. Accordingly, using the DEA measure with production as opposed to revenue as the basis, offering a relatively stable and reliable performance measurement in the O&G industry. We follow the two-stage DEA approach described by Banker and Natarjan (2008), using DEA followed by regression analysis to evaluate how contextual variables affect productive efficiency. This approach reduces the impact of oil prices volatility and yields consistent estimators of the impact of the contextual variables on productive efficiency.

We estimate our efficiency scores using input-oriented variable returns to scale DEA (Banker, Charnes, & Cooper, 1984). The outputs are oil and gas production in barrels of oil equivalents (BOEs). Inputs are total production expenses, general and administrative expenses (G&A), and depreciation, depletion, and amortization (DD&A). All cost items are deflated by the Canadian CPI index corresponding to the end of the reporting month. We log-transformed all the input and output variables. We estimated the efficiency score for all observations in the sample period (2002–2016) for the upstream exploration and production firms. To mitigate the effect of outliers, we first estimated a pooled DEA model and excluded observations with super-efficiency (efficiency greater than 1.2) scores, as described by Banker and Chang (2006).

In the second-stage analysis, we relate the efficiency scores obtained using DEA to the *rainy day* indicator variable and other contextual variables that may influence productive efficiency, including book-to-market, *ln(BTM)*, debt-to-equity, *ln(DTE)*, to control for growth and leverage, respectively (Obreja, 2013), operating cash flows to total assets *(OCF/TA)* to control for profitability, and log of total production of O&G, *ln(Prod)*, to control for size. We also interact the *rainy day* variable with two indicator variables for periods beginning with steep price declines: one for five quarters following the 2008 financial crisis, where demand fell relative to supply, and one for five quarters following the 2014 supply driven price decline.[20]

4.5 Results of Data Analysis

4.5.1 Descriptive Statistics

Descriptive statistics are presented in Table 4.2. Panel A shows that the average (median) natural logarithm of production efficiency, *efficiency score*, is 0.83 (0.77), and its standard deviation is 0.09. The mean (median) operating cash flows to debt, *OCF/Debt*, is 0.25 (0.14), with standard deviation of 1.57 and an interquartile value of 0.20, indicating significant sample variation of operating cash flows to debt. Panel A also reports that, on average, 76 percent of our sample firm-quarter observations are for *rainy day* companies – operating cash flows to debt is on average above the 50th percentile over time.[21]

Panel B describes the descriptive statistics for the *making hay* and *rainy day* firms and shows that the two groups of firms have significantly different mean and median values (at the one

[20] We use five quarters to pick up the trough after the downturn in both cases. Our results are robust to varying the length of the trough.

[21] We identify unique firms as either *rainy day* or *making hay* (for the whole time that the firm in the data). 50% of firms are classified as *rainy day* and 50% are classified as *making hay*, but rainy firms are typically in the data longer, so we have more observations for *rainy day* than for *making hay* firms.

percent level) for most of the variables in our model (except for *ln(BTM)*). Compared with *making hay* companies, *rainy day* companies, on average, have higher efficiency scores, higher operating cash flows to debt (by construction), and lower debt-to-equity, larger market value, assets and production.

4.5.2 Analysis of Capital Expenditures Relative to Total Assets (H1)

To test Hypothesis 1, we investigate whether *rainy day* firms respond differently from *making hay* firms in the two post-price-decline periods. Table 4.3 reports the results of the OLS regression of the natural logarithm of capital expenditures on the rainy *day* indicator, interaction terms, and control variables. We use two-way clustered standard errors (by firm and month). They are robust to serial correlations of errors and correlated errors within firms.

In Table 4.3, we find that the estimated coefficient on the *rainy day* indicator is negative but not significant ($\beta = -0.065$, std. error = 0.148), indicating that, on average, the difference in the level of capital expenditures is not significantly different between *rainy day* firms and *making hay* firms in periods other than the two post-price-decline periods.[22] The first post-price-decline period (*Post 2008 Financial Crisis*) spans five quarters from September 2008 to December 2009 following the oil price collapse triggered by the 2008 financial crisis, and the second post-price-decline period (*Post 2014 Price Decline*) includes five quarters between January 2015 and March 2016 subsequent to the 2014 oil price decline. We see that the level of investment drops significantly in both post-price-decline periods. Our focus is on the interaction terms which

[22] Our premise is that *rainy day* firms grow more conservatively (in relation to their cash flows) than *making hay* firms. This does not mean that *rainy day* firms (that typically have more financial resources) spend less overall than *making hay* firms.

indicate whether *rainy day* companies invest more (contract less) than *making hay* companies during the post-price-decline periods.

The estimated coefficient for *rainy day* × *Post 2008 financial crisis* is positive but does not reach significance (β = 0.188, std. error = 0.233) at conventional levels, and the estimated coefficient of *rainy day* × *Post 2014 price decline* is significantly positive (β = 0.566, std. error = 0.216). Because these coefficients are separately incremental to the coefficient on the *rainy day* indicator and the coefficients on the two price decline variables, we see that capital expenditures drop significantly less for *rainy day* firms in the post-2014 period. In economic terms, the decline in investment for *rainy day* firms is about 76% (calculated as exp(0.566)-1) less than for *making hay* firms during the post-2014 period.

With reference to Figure 1, we note that the 2008 financial crisis and the 2014 industry downturn are distinctive events. The impact of the 2008 financial crisis on the O&G industry was less severe. While the oil price dropped from a record high of almost $140 to $40, prices started to recover quickly and rebounded to around $80 within a year.[23] For the 2014 downturn, the price dropped from a little over $100 to less than $50, came back a little, then plunged again to a low around $30 and slowly came back, with oil prices remaining low through 2015 and 2016. Consequently, the industry response to the 2014 downturn was stronger, with O&G companies implementing severe cost reductions, such as reducing capital expenditures and cutting staff (Hussain, 2015; Mortlock, 2015; Turander, 2015; IEA, 2016). In the aftermath of the post-2008 financial crisis period, *making hay* companies escaped relatively unscathed. The industry downturn of 2014 allows us to capture differences across two types of strategies. *Making hay* companies adopt a "hunker down" and survive attitude - cutting capital spending and selling assets to "weather

[23] An oil price of $80 is considered to be a good price (during the sample period) at which most companies are profitable, by our industry experts.

the storm". In contrast, with preserved cash and debt capacity, *rainy day* companies are better prepared and able to invest more during the continued darkness.

4.5.3 Analysis of Acquisition of Proven Reserves (H2)

We test Hypothesis 2 by investigating whether *rainy day* firms make shrewder acquisitions that is whether the value of proven oil reserves acquired per dollar of capital expenditure is, on average, higher for *rainy day* than for *making hay* firms. We use annual data due to the unavailability of quarterly data for the acquisition of proven reserves. We present our findings in Table 4.4A, comprised of two columns. In Column (1), we estimate an OLS model with the log of acquired reserves plus one, *ln(Ac.Proven),* as the dependent variable and include *ln (CAPEX)* as a moderating variable. This allows us to capture the difference in proven reserves acquired based on net capital expenditures for the two groups of companies. In Column (2), we re-run the regression of *ln(CAPEX)* from Table 4.3 using annual data.

We see in column (1) that the coefficient on *ln(Capex)* is 0.929 (std. error = .187), which represents the elasticity of proven reserves acquisition to capital expenditure for *making hay* firms in non-crisis periods. This means that when capital expenditure increases by 1%, the acquisition of proven reserves increases by 0.929% (calculated as $1.01^{0.929}$-1) for *making hay* firms. For *rainy day* firms, it is 1.07% (calculated as $1.01^{(0.929+0.142)}$-1). During non-crisis periods, *rainy day* firms acquire 0.14% (calculated as $1.01^{0.142}$-1) more proven reserves for a similarly large increase in capital expenditure (e.g. 1% increase in capital expenditure) than *making hay* firms. This indicates that *rainy day* firms buy more conservatively (at lower prices) in general than *making hay* firms.

We see that the elasticity of acquisition of proven reserves to capital expenditures is lower in general after both the 2008 price decline and the 2014 price decline. This lower elasticity is

likely due to a greater emphasis on developing existing reserves versus acquisition of new reserves in the post-price-decline periods.[24] We also see that the coefficient for the three-way interaction *ln(Capex) × rainy day × post 2014 Price Decline* is significantly positive (β = 0.077, std. error = 0.032), indicating that the elasticity declined less for *rainy day* firms versus *making hay* firms after the 2014 price decline, consistent with more buying of reserves for the *rainy day* versus *making hay* firms in that period. In Column (2), we find continued support for our first hypothesis that the decline in capital spending is significantly less for *rainy day* firms after the 2014 price decline when we use annual versus quarterly data. The coefficient on *rainy day × Post 2014 Price Decline* is 0.689 (std. error = 0.323) for the annual data.

To enhance interpretation of the three-way interaction results, we provide a sub-group analysis of the elasticity of acquisition of proven reserves (*ln(Ac.Proven)*) to capital expenditure (*ln(CAPEX)*) for the two strategy groups (*rainy day* firms or *making hay* firms) across three types of periods. The elasticity numbers are calculated based on the coefficients derived from the regression analysis in Table 4.5A and the results are presented in Table 4.4B.

Column (3) shows the differences in the elasticity for each of the three periods. As noted above, the difference in elasticity between *rainy day* firms and *making hay* firms is 0.14% for the non-crisis period. We see that this difference increases to 0.25% for the post-2008 period and 0.22% for the post-2014 period, indicating that the acquisition advantage for the *rainy day* firms increases in the post-price-decline periods.

[24] Capital expenditures include both costs of acquiring and developing reserves. Development costs naturally lag acquisition costs.

4.5.4 Analysis of Production Efficiency (H3)

Next, we test Hypothesis 3 by examining whether *rainy day* companies operate more or less efficiently than *making hay* firms over time. We apply a two-stage DEA approach in this analysis and report the results of the second stage estimation in Table 4.5.[25] A positive association between *rainy day* and the *efficiency score* obtained in the first stage indicates that *rainy day* companies outperform *making hay* companies in general in terms of operating efficiency. The estimated coefficient on *rainy day* is statistically significant and positive in columns (1) to (3), supporting H3.

We also see that the estimated coefficients on *Post 2014 Price Decline* are significantly positive, indicating higher efficiency scores in the aftermath of the price decline, possibly due to cost-cutting and enhanced technology. Industry experts told us that E&P companies seek substantial cost reductions from suppliers and reduce headcount when oil prices fall. We do not see incremental improvements in efficiency for *rainy day* companies in the two post-price-decline periods. This is not surprising because *making hay* companies aggressively manage costs during the post-price-decline periods.

We recognize that the higher operating efficiency achieved by *rainy day* companies over time may be partially attributed to their ability to take advantage of the decline periods to acquire premium assets from over-committed *making hay* companies. Such assets are more efficient to operate so the lifting costs are lower. *Rainy day* firms are also able to make investments in their labour force and develop new technology that positions them to operate more efficiently (Bromiley2008).

[25] Efficiency score is mechanically positively correlated with ln(prod) because the output variables in the DEA estimation are oil and gas production. Therefore, our efficiency score analyses omit the log of total production.

4.5.5 Additional Analysis

While the industry experts we talked to were unanimous in their identification of the two strategies, they were equivocal in saying which group would on average have stronger performance over time. In fact, each group of companies relies on the presence of the other group. *Making hay* companies that seek to take advantage of high oil prices receive strong capital support to fund their investments. They seize current expansion opportunities and earn market rewards for growing during up-cycles. *A making hay* company that experiences sustained growth and hits only minor decline periods would earn high cumulative returns over time. Such companies hope that O&G prices remain high for a sufficiently long period of time that they can recover much of their investment before a prolonged downturn occurs.

However, no one can predict how long the favourable pricing will persist. The concern of *making hay* companies is the risk of being caught unawares when the clouds come, and the sun disappears. Making aggressive investments is a risky gamble – some companies spin into financial distress if a downturn hits when they are vulnerable. High commodity prices allow them to borrow more ex ante but decrease net worth ex post (Rampini & Viswanathan, 2010). When a downturn does occur, *making hay* firms adopt a hunker down and survive attitude – they stop capital spending and may sell premium assets to get cash (Campello et al., 2010); they seek refuge from capital suppliers such as relaxation of debt covenants and relief from debt servicing; they cut employee headcount to minimum levels and roll back salaries, wages and bonus pay in various ways (Hussain, 2015; Mortlock, 2015; Campello et al., 2010). Ultimately, they may rely on *rainy day* companies to buy their assets.

Rainy day companies, in contrast, choose to build financial strength during the up-cycle periods. They focus on using the high prices to accumulate cash resources and augment balance

sheet strength. They forego some of the market rewards of expansion and resist pressure from the capital markets in an up-cycle, leaving more growth opportunities for *making hay* companies. If oil prices do remain high for a long period of time, those *rainy day* companies miss growth opportunities and lose support from investors who are getting high returns from growth during upturns. The *rainy day* strategy requires commitment and discipline.

While the *rainy day* companies on average outperform the *making hay* companies in terms of acquiring assets and operating efficiency, we see that both groups of firms exist, largely because of financing opportunities that *making hay* companies take advantage of during up-cycles. The *rainy day* companies tie balance sheet strength to "long-term shareholder value" in their annual reports and other disclosures to investors. For example, Suncor indicates in its sustainability report that it needs "a strong balance sheet to fund investments in climate, air, reclamation, biodiversity, people and communities" (Sustainability report, 2023). "Our existing strengths provide timely and prudent investments in new technology, decarbonisation, and "a prosperous and sustainable future" (Suncor, Sustainability report, 2023).

Analysis of Market Value and Stock Returns

In Table 4.6, we examine whether *rainy day* companies earn different market values and stock returns compared to *making hay* firms over the cycles. In Column (1), we observe a significantly negative coefficient for *rainy day* (β = -0.189, std. error =0.065), indicating that, on average, the market value of *rainy day* firms is lower than that of *making hay* companies. However, the coefficient for *rainy day* × *Post 2014 Price Decline* is significantly positive at 0.279. This suggests that this advantage of *making hay* firms in market value diminishes in the post-2014 decline period, when *rainy day* firms have a relative increase in value. We observe similar results for stock returns in Column (2), the stock returns of *making hay* firms are higher than *rainy day*

companies during non-crisis periods.[26] However, this advantage is lost in the post-2014 decline period where the stock returns of *rainy day* firms increased disproportionately. These findings imply that the market tends to value aggressive growth when commodity prices are high.

Standard Deviation Analysis

In this supplementary analysis, we investigate the stability of balance sheet strength over time and its relationship with capital expenditure. We compare the standard deviation of cash flows to debt at the firm level with the median standard deviation of cash flows to debt. When the standard deviation is lower than the median, we set a value of 1, indicating more stable balance sheet strength over time; when it exceeds the median, we give a value of 0, indicating more volatile balance sheet strength over time. We examine the relation between this *stability indicator* and *ln(CAPEX),* after controlling for *rainy day* indicator, interaction terms, and control variables. We present the findings in Table 4.7.

Our analysis indicates that the estimated coefficient for the *stability indicator* × *Post 2008 financial crisis* is not significant. However, the estimated coefficient of the *stability indicator* × *Post 2014 price decline* is significantly positive at 0.483 (std. error = 0.211).[27] This suggests that companies with stable balance-sheet strength (lower standard deviation of cash flows to debt) tend to invest more during the post-2014 industry downturn period. However, companies with less stable balance-sheet strength are less likely to invest and may even sell during such periods. This result is similar to our finding that *rainy day* companies invest more when prices are down during

[26] Lagged log market value is included to control for a size effect on stock returns. Log change of total assets is included to account for the effect of asset growth in the model.
[27] This analysis is robust if we sue alternative definitions of *rainy day* companies using different cut-offs (terciles and quartiles)

the post-2014 industry downturn period. It suggests that stability of balance sheet strength is another important dimension of investment strategy.

To enhance the interpretation of the results, we conducted a comparative analysis of capital expenditure relative to benchmark firms during the post-2014 industry downturn period, using the coefficients presented in Table 4.7. Our benchmark group comprises *making hay* firms with *unstable* balance sheet strength. *Making hay* firms with *stable* balance sheet strength invest 42% (calculated as exp(0.483-0.135)-1) more than benchmark firms. For *rainy day* firms with *unstable* balance sheet strength, their investment is 58% higher than the benchmark firms (calculated as exp(0.535-0.078)-1). Conversely, *rainy day* companies with *stable* balance sheet strength invest 124% more than the benchmark firms (calculated as exp(0.535+0.483-0.078-0.135)-1). These findings suggests that inconsistent execution of balance sheet strength prevents firms from effectively navigating economic cycles.

4.5.6 Robustness Tests

In our analysis, we classified unique firms as either "*rainy day*" or "*making hay*" based on the 50th percentile. We conduct robustness tests by exploring alternative definitions of *rainy day* companies using different cutoffs (terciles and quartiles). For instance, firms are categorized into linear transformed tercile groups based on the firm's average percentile rank of operating cash flows to total debt for the years the firm is included in the dataset. If the average percentile rank is above the 33rd percentile, the firm is classified as a *rainy day* company. Using this alternative measure of *rainy day* companies, we find (Table 4.8) that the estimated coefficient for *rainy day* × *Post 2008 financial crisis* is positive but not significant (β =0.292, std. error = 0.331) and the estimated coefficient of *rainy day* × *Post 2014 price decline* is significantly positive at 0.776

(std. error = 0.274), consistent with Table 4.3, indicating that *rainy day* companies invest more when prices are down during the post-2014 period than *making hay* firms.

In untabulated results, employing this alternative measure, our findings of Table 4.5A are robust that *rainy day* firms acquire more proven reserves (elasticity of proven reserves to change in CAPEX is greater) in general. Consistent with Table 4.4B, we find that *making hay* firms exhibit lower elasticity than *rainy day* firms over the non-crisis, post 2008 financial crisis and post 2014 industry crisis periods. Consistent with Table 4.5, we find that *rainy day* firms operate more efficiently than *making hay* firms over the sample period using the alternative measure. We also find that the market value and stock returns of *rainy day* firms are lower than those of *making hay* companies in the non-crisis periods, but *rainy day* firms' stock returns decline less in the post-2014-price-decline period.

4.6 Conclusions

Our research investigates how a strategic emphasis on balance sheet strength affects investment decisions and performance over time in an environment with high uncertainty and demand volatility. As a cyclical industry, the O&G industry is known for its pursuit of growth and investment opportunities. During prosperous times, when the sun is shining and prices are high, the industry experiences high returns on investment and has access to additional capital. But when the rain comes, and prices decline, companies lose those returns and access to capital. However, no one can predict when the rain will come.

“Having that balance sheet strength was extremely important, especially as we went through the really dark days” (Gonzales, 2002). We learned that balance sheet strength, measured by debt to cash flows, is a key accounting metric used by *rainy day* firms to strategically respond

to and manage uncertainty. Such companies maintain balance sheet strength (high cash flow to debt over time) in upcycles to prepare for downcycles and potentially seize growth opportunities in periods following sharp price declines, whereas *making hay* companies take advantage of growth opportunities when the market is strong, and capital is available.

By using the financial and production data of the Canadian O&G companies, we find *rainy day* companies, who focused on maintaining and implementing balance sheet strength, invest more or contract less than *making hay* companies during the post-2014 industry downturn period. We then find that *rainy day* firms on average, make shrewder acquisitions – obtain higher value of proven oil reserves acquired per dollar of capital expenditures, than *making hay* firms. This investment advantage is further enhanced after the sharp decline in oil prices in 2014. This result suggests that *rainy day* companies tend to invest carefully and selectively, and they may even take advantages of opportunities during industry downturns to acquire high-quality assets from companies who committed too much while enjoying favourable market conditions, which leads to greater value for their investment expenditures.

Moreover, using a two-stage DEA approach, we find that *rainy day* firms achieve higher production efficiency on average than *making hay* firms. We believe that the higher operating efficiency achieved by *rainy day* companies may be partially attributed to their ability to take advantage of the decline periods to acquire premium assets from over-committed *making hay* companies. Such assets are more efficient to operate so the lifting costs of oil production is lower. *Rainy day* firms are also able to make investments in their labour force and develop new technology that positions them to operate more efficiently, especially in downturns (Bromiley, Navarro, & Sottilem 2008). This is the learning and growth part of a balanced scorecard (Kaplan & Norton 2007). As Imperial Oil Limited states, “our disciplined, prudent approach and

unparalleled financial strength will enable us to take advantage of a period of decreasing costs and improving labor productivity as we invest in our future." (2008 Annual Report, p.2).

While the *rainy day* companies on average outperform the *making hay* companies in terms of acquiring assets and operating efficiency, we see that both groups of firms exist, largely because of financing opportunities that are available to *making hay* companies during up-cycles. We test and find that the capital market rewards making hay companies with higher market valuation, but this is reduced in downturns. *Making hay* companies earn market rewards for growth during upcycles but run the risk of over-commitment before a down cycle hits them. *Rainy day* companies forego some of the market rewards of expansion in an upcycle but are better positioned to survive a prolonged downcycle. The parallel existence of these two groups of firms fuelled growth in the Canadian O&G industry over time. *Making hay* firms expanded the industry – some were successful and may have transformed into *rainy day* firms, others fell by the wayside, and their assets were picked up by *rainy day* firms.

When we began our study, a senior audit partner told us that managing growth through the industry cycles is the most important problem facing the industry. This is a precarious industry. Van Wielingen (2015) reports that, of 50 companies listed in the O&G index 20 years ago, only a few remain today. An analyst we interviewed told us that to get out in front of other companies, a company may go after a long-term project that requires big initial investment and puts debt on the balance sheet. These projects have big potential payoffs but expose the company in the short term. "This works well as long as prices are strong but if prices drop, they lose cash flow from the other assets and end up in a precarious financial position."

In the post-COVID-19 era, the heightened awareness of uncertainty in the business environment along with increased sensitivity to business and industry cycles present challenges

and impose demands on corporate managers and investors when making business decisions. In an uncertain business environment, an entity's long-term performance depends on its ability to not only avoid risk but better identify and take advantage of opportunities (Ernst & Young, 2012; FSN Research, 2016; CPA Canada, 2017; HBR.org, 2018; Agrawal, Grube, & Hill, 2021). Our study examines how a strategic emphasis on balance sheet strength affects investment decisions and performance over time in an uncertain environment. Our study demonstrates that balance sheet strength is a key strategic indicator that goes beyond financial risk to provide information about asset acquisition and operating efficiency. Our analysis suggests that the effective management of balance sheets provide companies with the capability to transform threats into opportunities across various economic cycles.

Our study has limitations that should be noted. First, the paper focuses on a measure of balance sheet strength, cash flows to debt (averaged over time), based on industry conventions, to differentiate between the two groups of companies in terms of their different emphases on managing industry economic cycles. Other important factors, such as a company's culture, innovation, and leadership style in managing industry economic cycles, were not considered explicitly. Future research may explore alternative methods for dividing groups, such as using textual analysis to capture other aspects. Second, while the DEA method is commonly used to measure operating performance, it has limitations in accurately reflecting a company's overall efficiency since it's based on the input and output variables used in the analysis. We suggest future research include additional inputs, such as investments in technology, to evaluate overall performance. Third, our focus in this study is on the commodity industry. Future research may expand this analysis to other cyclical industries, such as innovative industries where rapid changes in technology fuel product life cycles. Last, research may also look for other ways in which

accounting plays a strategic role. In fact, we see some evidence of this in the conservatism literature, where researchers use measures of timely loss recognition to group firms and find evidence of performance differences based on accounting choices (Kravet, 2014; García Lara et al., 2016). Such research may link accounting choices to strategic variables.

Table 4.1 Variable Definitions

Variables	Definitions
rainy day or making hay	Company type based on the firm's average percentile rank of operating cash flows to total debt for the years the firm is in the data. If the average percentile rank is above the 50^{th} percentile, the firm is classified as rainy day. An indicator variable: 1 for rainy day (above the 50^{th} percentile) and 0 for making hay.
Efficiency score	Efficiency score estimated from input-oriented variable returns to scale data envelopment analysis. Outputs are oil and gas production in BOE, inputs are total production expenses, general and administrative expenses, depreciation, depletion and amortization. All costs items are deflated by Canadian CPI index corresponding to the reporting month end. We log-transform all input and output variables.
ln(BTM)	Book value of total shareholder equity divided by market value of equity at the end of the quarter (year)
ln(DTE)	Book value of total debt divided by book value of equity at the end of the quarter (year)
OCF/AT	Operating cash flows divided by total assets
OCF/Debt	Operating cash flows divided by total debts
ROA	Operating profit dived by total assets
ln(AT)	log of total assets at the end of the quarter
ln(MV)	log of market value of equity at the end of the quarter
ln(Prod)	log of total production of oil and gas in BOE
Ret	Quarterly stock return defined as the change in the quarterly market value divided by the market value at the end of the previous quarter, $(MV_q-MV_{q-1})/MV_{q-1}$
Δln(AT)	log of total assets at the end of the quarter – log of total assets at the end of the previous quarter
ln(CAPEX)	log of (net capital expenditure including property and corporate acquisitions and net of dispositions net of dispositions +1)
ln(Ac.Proven)	log of (total acquisition of proven reserves +1)
Post 2008 Financial Crisis	Indicator variable = 1 if the fiscal quarters or years end between December 2008 and December 2009, and 0 otherwise.
Post 2014 Price Decline	Indicator variable = 1 if the fiscal quarters or years end between March 2015 and March 2016, and 0 otherwise.

Table 4.2 Descriptive Statistics

Panel A: Full Sample						
Quarter Variables	Firm-quarters	Mean	Q1	Median	Q3	Std dev
Efficiency score	6,372	0.83	0.77	0.83	0.89	0.09
ln(BTM)	6,372	-0.34	-0.87	-0.38	0.15	0.9
ln(DTE)	6,372	-1.05	-1.59	-0.96	-0.43	1.15
ln(Capex)	6,372	8.95	7.55	9.33	10.83	2.96
OCF/AT	6,372	0.03	0.01	0.03	0.05	0.03
OCF/Debt	6,372	0.25	0.05	0.14	0.25	1.57
ROA	6,372	-0.01	-0.02	0.00	0.02	0.11
ln(AT)	6,372	12.34	10.78	12.29	13.88	2.23
ln(MV)	6,372	11.97	10.25	11.96	13.73	2.45
ln(Prod)	6,372	8.15	6.65	8.18	9.79	2.35
Ret	6,306	0.09	-0.17	0.00	0.19	0.95
Δ*ln(AT)*	6,372	0.06	-0.02	0.02	0.08	0.41
rainy day	6,372	0.76	1.00	1.00	1.00	0.43
Annual Variables	Firm-years	Mean	Q1	Median	Q3	Std dev
ln(Capex)	1,518	10.79	9.48	10.95	12.38	2.50
ln(Ac.Proven)	1,518	8.36	0.00	11.49	14.83	7.19
Panel B: Sub-sample	Rainy day		Making hay			
Quarter Variables	Firm-quarters	Mean	Firm-quarters	Mean	Diff	p-value
ln(efficiency)	4,850	0.85	1,522	0.76	0.09	<0.01
ln(BTM)	4,850	-0.36	1,522	-0.30	-0.06	0.06
ln(DTE)	4,850	-1.10	1,522	0.87	-1.97	<0.01
ln(Capex)	4,850	9.50	1,522	7.18	2.32	<0.01
OCF/AT	4,850	0.04	1,522	0.00	0.04	<0.01
OCF/Debt	4,850	0.33	1,522	-0.01	0.34	<0.01
ROA	4,850	0.00	1,522	-0.05	0.05	<0.01
ln(MV)	4,850	12.51	1,522	10.25	2.26	<0.01
ln(Prod)	4,850	8.74	1,522	6.25	2.49	<0.01
Ret	4,742	0.08	1,486	0.12	-0.04	0.29
Δ*ln(AT)*	4,796	0.057	1,510	0.063	-0.006	0.70
Annual Variables	Firm-years	Mean	Firm-years	Mean	Diff	p-value
ln(Capex)	1,181	11.26	337	9.17	2.09	<0.01
ln(Ac.Proven)	1,181	9.25	337	5.25	4.00	<0.01

Table 4.3 Analysis of Capital Expenditures

	ln(Capex)	
Variables	Coefficient	Std error
rainy day	-0.065	(0.148)
Post 2008 Financial Crisis	-0.593**	(0.255)
Post 2014 Price Decline	-1.118***	(0.315)
rainy day × Post 2008 Financial Crisis	0.188	(0.233)
rainy day × Post 2014 Price Decline	0.566***	(0.216)
ln(BTM)	-0.103	(0.105)
OCF/AT	-5.876**	(2.532)
ln(DTE)	-0.226***	(0.041)
ln(Prod)	0.978***	(0.033)
Constant	1.009***	(0.254)
Num. obs.	6,372	
Adj. R^2	0.562	

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4.4 Acquisition of Proven Reserves with Capital Expenditures

Panel A: OLS Regression	(1) ln(Ac.Proven)		(2) ln(Capex)	
Variables	Coeff.	Std. error	Coeff.	Std. error
ln(Capex)	0.929***	(0.187)		
ln(Capex) × rainy day	0.142***	(0.047)		
ln(Capex) × Post 2008 Financial Crisis	-0.242***	(0.076)		
ln(Capex) × Post 2014 Price Decline	-0.265***	(0.038)		
ln(Capex) × Rainy day × Post 2008 Financial Crisis	0.104	(0.090)		
ln(Capex) × Rainy day × Post 2014 Price Decline	0.077**	(0.032)		
Rainy day			0.161	(0.180)
Post 2008 Financial Crisis			-1.064***	(0.171)
Post 2014 Price Decline			-0.918***	(0.329)
Rainy day × Post 2008 Financial Crisis			0.215	(0.141)
Rainy day × Post 2014 Price Decline			0.689**	(0.323)
ln(BTM)	-0.160	(0.276)	-0.217***	(0.076)
OCF/AT	-6.115***	(2.135)	-2.287***	(0.748)
ln(DTE)	-0.123	(0.278)	-0.440***	(0.070)
ln(Prod)	0.534**	(0.228)	0.946***	(0.034)
Constant	-6.437***	(0.970)	3.409***	(0.041)
Num. obs.	1,518		1,518	
Adj. R^2	0.270		0.715	

Panel B: 2 by 3 Analysis

Sample Period	(1) Making Hay	(2) Rainy Day	(3) Diff. (2) – (1)
Non-Crisis Period	0.93***	1.07***	0.14***
	(0.19)	(0.18)	(0.05)
Post 2008 Financial Crisis	0.69***	0.93***	0.25***
	(0.19)	(0.20)	(0.09)
Post 2014 Price Decline	0.66***	0.88***	0.22***
	(2.47)	(0.20)	(0.05)

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4.5 Analysis of Operating Efficiency

	(1) Efficiency Score	(2) Efficiency Score	(3) Efficiency Score
Variables	Coeff. (Std. error)	Coeff. (Std. error)	Coeff. (Std. error)
Rainy day	0.068***	0.069***	0.067***
	(0.010)	(0.010)	(0.010)
Post 2008 Financial Crisis		0.000	-0.003
		(0.005)	(0.008)
Post 2014 Price Decline		0.050***	0.039***
		(0.007)	(0.012)
Rainy day × Post 2008 Financial Crisis			0.005
			(0.007)
Rainy day × Post 2014 Price Decline			0.016
			(0.012)
ln(BTM)	0.000	-0.002	-0.002
	(0.004)	(0.004)	(0.004)
OCF/AT	0.820***	0.838***	0.844***
	(0.110)	(0.111)	(0.111)
ln(DTE)	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)
Constant	0.760***	0.755***	0.756***
	(0.008)	(0.008)	(0.008)
Num. obs.	6,372	6,372	6,372
Adj. R^2	0.287	0.304	0.304

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4.6 Analysis of Market Value and Stock Returns

	(1) ln(MV)	(2) Ret
Variables	Coeff. (Std. error)	Coeff. (Std. error)
Rainy day	-0.189***	-0.126*
	(0.065)	(0.069)
Post 2008 Financial Crisis	-0.243**	0.131
	(0.099)	(0.088)
Post 2014 Price Decline	-0.437***	-0.137
	(0.131)	(0.104)
Rainy day × Post 2008 Financial Crisis	0.141	0.118
	(0.120)	(0.139)
Rainy day × Post 2014 Price Decline	0.279***	0.264**
	(0.108)	(0.118)
ln(BTM)	-0.754***	-0.315
	(0.027)	(0.289)
OCF/AT	-5.536***	-0.388***
	(0.982)	(0.062)
ln(DTE)	-0.308***	1.053***
	(0.020)	(0.395)
ln(Prod)	0.994***	-0.371***
	(0.014)	(0.057)
ROA		-2.418**
		(1.057)
$\ln(MV)_{t-1}$		-0.128***
		(0.017)
$\Delta\ln(AT)$		0.373***
		(0.059)
Constant	3.625***	1.528***
	(0.117)	(0.305)
Num. obs.	6,372	6,227
Adj. R^2 (full model)	0.936	0.148

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4.7 Standard Deviation of Balance Sheet Strength

	ln(Capex)	
Variables	Coefficient	Std error
Rainy day	-0.078	(0.151)
Post 2008 Financial Crisis	-0.641***	(0.227)
Post 2014 Price Decline	-1.384***	(0.344)
Rainy day × Post 2008 Financial Crisis	0.192	(0.232)
Rainy day × Post 2014 Price Decline	0.535**	(0.210)
Stability Indicator	-0.135	(0.160)
Stability Indicator × Post 2008 Financial Crisis	0.069	(0.211)
Stability Indicator × Post 2014 Price Decline	0.483**	(0.211)
ln(BTM)	-0.100	(0.104)
OCF/AT	-5.973**	(2.536)
ln(DTE)	-0.219***	(0.041)
ln(Prod)	0.985***	(0.035)
Constant	1.060***	(0.252)
Num. obs.	6,371	
Adj. R^2	0.563	

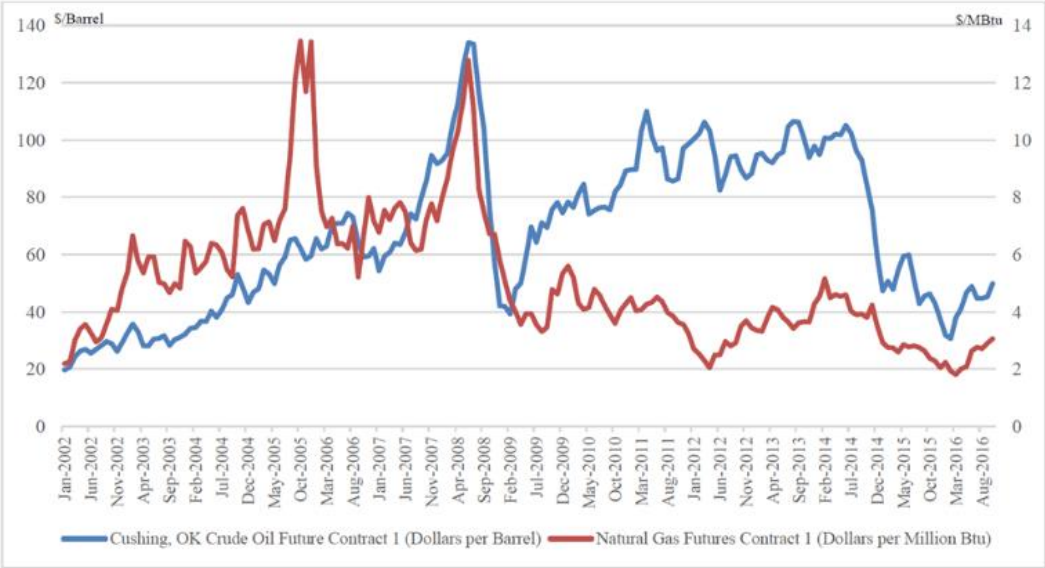
***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4.8 Robustness Test Using Tercile Cut-off

	ln(Capex)	
Variables	Coefficient	Std error
Transformed rainy day tercile	-0.227	(0.203)
Post 2008 Financial Crisis	-0.644**	(0.259)
Post 2014 Price Decline	-1.220***	(0.297)
Transformed rainy day tercile × Post 2008 Financial Crisis	0.292	(0.331)
Transformed rainy day tercile × Post 2014 Price Decline	0.776 ***	(0.274)
ln(BTM)	-0.103	(0.103)
OCF/AT	-5.494**	(2.478)
ln(DTE)	-0.233***	(0.041)
ln(Prod)	0.983***	(0.030)
Constant	1.058***	(0.257)
Num. obs.	6,372	
Adj. R^2	0.563	

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Figure 4.1 Oil and gas prices from 2002 to 2016



Data Source: Energy Information Admiration

Chapter 5 Conclusions

Navigating uncertainty while making management decisions presents an important challenge for executives and managers. Yet, this topic has received limited attention in the management accounting literature. My dissertation investigates management decision-making and firm performance within uncertain environments from three perspectives: The first study investigates how stress, represented by constrained conditions, influences organizational performance. In the second study, we analyse the compensation structure of the top leadership team, a group responsible for steering the organization through uncertain times. The third study focuses on the oil and gas industry, known for uncertainty as the nature of business, and examines how a strategic focus on balance sheet strength influences investment decisions and performance. Through my research, I aim to provide insights for both practitioners and scholars.

In times of uncertainty, managing stress is crucial. It not only affects the well-being of managers and employees but also impacts engagement and productivity. Though predominantly explored in medical and psychological areas, stress isn't solely an individual state; rather, how individuals perceive and react to stress greatly influences organizations. My first study takes a step towards exploring the influence of stress from a resource-constraints perspective. Different from previous research relying on surveys or interviews, we adopt a textual-analysis measure to objectively assess the intensity of constraints as a predictor of stress at the firm level (Bodnaruk et al., 2015). This approach may provide opportunities for empirical management accounting research to examine conditions and mechanisms that affect how stress influence performance at the organizational level.

Drawing from the Yerkes-Dodson (1908) Law, the first study proposes and documents that while stress activated by constraints initially enhances performance by motivating productivity

and innovation, it eventually leads to disengagement and hampers performance. The results have implications to applying management accounting tools such as target setting, performance measurement, incentive structuring, and budgetary control. Our study highlights the importance of properly setting targets or incentive to effectively motivate, challenge and evaluate people to create a positive stress environment. A certain level of tightness in standards can motivate full participation and involvement that leads to higher returns.

"No one yet has figured out how to manage people effectively into battle; they must be led." This military analogy by Kotter (1990, 2017) illustrates the vital role of leadership in navigating uncertainties. While companies recognize the importance of attracting and retaining leaders with exceptional talent or leadership skills, especially during challenging times (Cooper, 2001; Aguinis & O'Boyle, 2014; Li et al., 2020; Finn et al., 2020; Forster 2020; Birshan, 2022), literature presents conflicting results on their performance (Pfeffer, 2001; Khurana, 2002). My second study recognizes the importance of both the CEO's unique contribution and the dynamics among members in the CEO's top team. These results suggest that team leader compensation and a team-based pay structure play a complementary role in impacting firm performance. Effectively coping with uncertainties requires leadership that relies on collective efforts from executives within the CEO's top team, and vice versa.

Nowhere is uncertainty more salient than in the context of cyclical industries. Up-cycles lead to investment and development and down-cycles threaten company survival, upend employees, upset supply chains and impact communities. The stakeholders—investors, managers, employees, suppliers - engaged in cyclical industries willingly embrace risk and must bear the consequences. Navigating through economic cycles in these industries involves myriad dimensions and complexities.

My third study is to navigate the role of accounting information in assisting decision mating in a cyclical industry. Adopting a combined methodology, we used discussions with industry insiders and reading of financial reports to inform and enrich my empirical analysis. My study demonstrates that balance sheet strength, measured by debt to cash flows, is a key accounting metric used by rainy day firms to strategically respond to and manage uncertainty. Balance sheet strength serves as a strategic indicator that goes beyond financial risk to facilitating the development, communication and execution of strategies for dealing with uncertainty associated with industry cycles. Capturing and understanding the ways that accounting plays a role in strategic management provides an interesting lens for discussing and describing the impact of accounting in the modern setting of global uncertainty.

In today's volatile environment, “leaders need new operating models to respond quickly to the rapidly shifting environment and sustain their organizations through the trials ahead” (Finn et al., 2020). My dissertation takes steps toward exploring management decision-making in such uncertain conditions. However, there are several limitations worth noting. Firstly, my first study investigates stress triggered solely by resource constraints, neglecting other critical factors like company culture, structure, and leadership style that may also contribute to stress but were not explicitly considered. Further empirical analysis of how stress influences firm performance could investigate additional factors impacting this relationship.

Moreover, consistent with the practices of other TLT compensation studies, we solely focus on the top five highest paid executives when constructing TLT. However, based on our dataset, it is evident that 37% of total sample reports compensation for six or more executives. We believe that a focus on a TLT with its full members would better capture the dynamics of its members. Lastly, my third study focuses exclusively on the Oil and Gas industry. Future research

may expand this analysis to other cyclical industries, such as innovative industries where rapid changes in technology fuel product life cycles. Expanding the scope of analysis to diverse industries would provide a more comprehensive understanding of management decision-making amid uncertainty.

Reference List

Abernethy, M. A., Kuang, Y. F., & Qin, B. (2019). The relation between strategy, CEO selection, and firm performance. *Contemporary Accounting Research*, *36*(3), 1575-1606.

Abramis, D. J. (1994). Relationship of job stressors to job performance: Linear or an inverted-U?. *Psychological reports*, *75*(1), 547-558.

Acar, O. A., Tarakci, M., & Van Knippenberg, D. (2019 November). Why Constraints Are Good for Innovation. *Harvard Business Review*, 11.

Acar, O. A., Tarakci, M., & Van Knippenberg, D. (2019). Creativity and innovation under constraints: A cross-disciplinary integrative review. *Journal of Management*, *45*(1), 96-121.

Acharya, V. V., Bharath, S. T., & Srinivasan, A. (2007). Does industry-wide distress affect defaulted firms? Evidence from creditor recoveries. *Journal of Financial Economics*, 85(3), 787-821.

Achor, S., & Gielan, M. (2015). Make Yourself Immune to Second-hand Stress. *Harvard Business Review*, *2*.

Adams, R. B., Almeida, H., & Ferreira, D. (2005). Powerful CEOs and their impact on corporate performance. *Review of Financial Studies*, 18(4), 1403-1432.

Aggarwal, R. K., & Samwick, A. A. (2003). Performance incentives within firms: The effect of managerial responsibility. *The Journal of Finance*, 58(4), 1613-1650.

Agrawal, A., Grube, C., & Hill, M. (2021 October). Mastering change: The new CFO mandate. *McKinsey*. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/mastering-change-the-new-cfo-mandate

Aguinis, H., & O'Boyle, E. (2014). Star performers in twenty first century organizations. *Personnel Psychology*, 67 (2), 313–350.

Aiken, C. B., & Keller, S. P. (2007). The CEO's role in leading transformation. *McKinsey Quarterly*. 27.

Albort-Morant, G., Ariza-Montes, A., Leal-Rodríguez, A., & Giorgi, G. (2020). How does positive work-related stress affect the degree of innovation development?. *International Journal of Environmental Research and Public Health*, *17*(2), 520.

Amabile, T. (1996). *Creativity in context*. Boulder, CO: Westview Press.

Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in organizational behavior*, 36, 157-183.

An, W., Zhao, X., Cao, Z., Zhang, J., & Liu, H. (2018). How bricolage drives corporate entrepreneurship: The roles of opportunity identification and learning orientation. *Journal of Product Innovation Management*, 35(1), 49-65.

Ancona, D. (2005). Leadership in an Age of Uncertainty. *Center for Business Research Brief*, *6*(1), 1-3.

Anderson, C. R. (1976). Coping behaviors as intervening mechanisms in the inverted-U stress-performance relationship. *Journal of Applied Psychology*, *61*(1), 30.

Anderson, M., Hyun, S., Muslu, V., & Yu, D. (2023). Earnings prediction with DuPont components and calibration by life cycle. *Review of Accounting Studies*, 1-35

APA.org. (2017). APA *Stress in America*™ Survey: US at 'Lowest Point We Can Remember;' Future of Nation Most Commonly Reported Source of Stress. https://www.apa.org/news/press/releases/2017/11/lowest-point.

APA.org. (2021). Stress in America™ 2021: Pandemic impedes basic decision-making ability. https://www.apa.org/news/press/releases/2021/10/stress-pandemic-decision-making

Arsenault, A., & Dolan, S. (1983). The role of personality, occupation and organization in understanding the relationship between job stress, performance and absenteeism. *Journal of Occupational Psychology*, *56*(3), 227-240.

Aschbacher, K., O'Donovan, A., Wolkowitz, O. M., Dhabhar, F. S., Su, Y., & Epel, E. (2013). Good stress, bad stress and oxidative stress: insights from anticipatory cortisol reactivity. *Psychoneuroendocrinology*, *38*(9), 1698-1708.

Atkinson, A. A., Banker, R. D., Kaplan, R. S., & Young Mark, S. (1997). *Management Accounting*, Upper Saddle River.

Badia, M., Barth, M. E., Duro, M., & Ormazabal, G. (2020a). Firm risk and disclosures about dispersion of asset values: Evidence from oil and gas reserves. *The Accounting Review,* 95(1), 1-29.

Badia, M., Duro, M., Jorgensen, B. N., Ormazabal, G., & Christensen, H. B. (2020b). The informational effects of tightening oil and gas disclosure rules. *Contemporary Accounting Research* 37(3), 1720-1755.

Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative science quarterly*, 50(3), 329-366.

Bakx, K. (2022 August). Record profits for the oil patch will boost government revenues too. *CBC News.*

Banker, R. D., & Chang, H. (2006). The super-efficiency procedure for outlier identification, not for ranking efficient units. *European Journal of Operational Research,* 175(2), 1311-1320.

Banker, R. D., & Natarajan, R. (2008). Evaluating contextual variables affecting productivity using data envelopment analysis. *Operations Research*, 56(1), 48-58.

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, 30(9), 1078-1092.

Bebchuk, L. A., & Grinstein, Y. (2005). Firm expansion and CEO pay. *National Bureau of Economic Research*, Working papers. https://www.nber.org/papers/w11886

Bebchuk, L. A., Cremers, K. M., & Peyer, U. C. (2011). The CEO pay slice. *Journal of Financial Economics*, 102(1), 199-221.

Beehr, T. A. (1976). Perceived situational moderators of the relationship between subjective role ambiguity and role strain. *Journal of applied psychology*, *61*(1), 35.

Bertrand, M., & Schoar, A. (2003). Managing with style: The effect of managers on firm policies. *Quarterly Journal of Economics*, 118, 1169–1208.

Bill Saporit, B. (2019, May 17). C.E.O. Pay, America's Economic 'Miracle'. *The New York Times.* https://www.nytimes.com/2019/05/17/opinion/ceo-pay-raises.html

Birshan. M., Seth. I., & Sternfels. B. (2022 , August 29) Strategic courage in an age of volatility. McKinsey Quarterly. https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/strategic-courage-in-an-age-of-volatility

Bloom, M., & Michel, J. M. (2002). The relationships among organizational context, pay dispersion, and managerial turnover. *Academy of Management Journal*, 45(1), 33-42.

Bloom, M. (1999). The performance effects of pay dispersion on individuals and organizations. *The Academy of Management Journal*, 42(1), 25-40.

Bodnaruk, A., Loughran, T., & McDonald, B. (2015). Using 10-K text to gauge financial constraints. *Journal of Financial and Quantitative Analysis*, *50*(4), 623-646.

Brahma, S., & Economou, F. (2023). CEO power and corporate strategies: a review of the literature. *Review of Quantitative Finance and Accounting*, 1-75.

Bromiley, P., Navarro, P., & Sottile, P. (2008). Strategic business cycle management and organizational performance: a great unexplored research stream. *Strategic Organization*, 6(2), 207-219.

Bromwich, M. (1990). The case for strategic management accounting: the role of accounting information for strategy in competitive markets. *Accounting, Organizations and Society*, *15*(1-2), 27-46.

Buchanan, D. A., & Huczynski, A. A. (2010). *Organizational Behaviour*. Harlow: Financial Times.

Bugeja, M., Matolcsy, Z., & Spiropoulos, H. (2017). The CEO pay slice: Managerial power or efficient contracting? Some indirect evidence. *Journal of Contemporary Accounting & Economics*, 13(1), 69-87.

Bunce, D., & West, M. A. (1996). Stress management and innovation interventions at work. *Human relations*, *49*(2), 209-232.

CIMA. (2015). Management accounting in Support of the Strategic Management process.https://www.cimaglobal.com/Documents/Thought_leadership_docs/Management%20and%20financial%20accounting/Academic-Research-Report-Strategic-Management-Process.pdf

Caglar, D., Mani, M., & Peters, J. (2015). The Redefined No of the CFO. *Strategy +Business*, Issue 78.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of financial Economics*, *97*(3), 470-487.

Canada Energy Regulator. (2018). Market snapshot: How are energy projects financed? *Canada Energy Regulator*. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2018/market-snapshot-how-are-energy-projects-financed.html?=undefined&wbdisable=true

Carpenter, M. A., & Sanders, W. M. (2002). Top management team compensation: The missing link between CEO pay and firm performance?. *Strategic Management Journal*, 23(4), 367-375.

Castanias, R. P., & Helfat, C. E. (1991). Managerial resources and rents. *Journal of management*, 17(1), 155-171.

Castanias, R. P., & Helfat, C. E. (2001). The managerial rents model: Theory and empirical analysis. *Journal of Management*, 27(6), 661-678.

Cenovus Energy Inc. (2015, July 30). *Q2 2015 Earnings Call*. https://wrds-www.wharton.upenn.edu/text-search/ciq-transcript-search/results/846966

Chamorro-Premuzic, T. (2020). 5 Ways Leaders Accidentally Stress Out Their Employees. *Harvard Business Review*, 4.

Chang, K. J., Chichernea, D. C., & HassabElnaby, H. R. (2014). On the DuPont analysis in the health care industry. *Journal of Accounting and Public Policy*, 33(1), 83-103.

Charger Energy Corp. (2011). *2011 Annual Information Form.* http://www.crescentpointenergy.com/invest/financial-reports

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429-444.

Chen, S. S., & Wang, Y. (2012). Financial constraints and share repurchases. *Journal of Financial Economics*, *105*(2), 311-331.

Chen, Z., Huang, Y., & Wei, K. C. (2013). Executive pay disparity and the cost of equity capital. *Journal of Financial and Quantitative Analysis*, 48(03), 849-885.

Clifton, J. (2022 June). The World's Workplace Is Broken -- Here's How to Fix It. https://www.gallup.com/workplace/393395/world-workplace-broken-fix.aspx

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological bulletin*, *98*(2), 310.

Collins, J., & Hansen, M. T. (2011). *How to Manage Through Chaos.* https://www.jimcollins.com/article_topics/articles/how-to-manage-through-chaos.html

ComPsych.com. (2017) More than One-third of Employees Say “People Issues” Cause the Most Stress at Work. https://www.compsych.com/press-room/press-article?nodeId=5e35641b-dfe3-4e87-9066-66c420b0a234

Connelly, B. L., Tihanyi, L., Crook, T. R., & Gangloff, K. A. (2014). Tournament theory thirty years of contests and competitions. *Journal of Management*, 40(1), 16-47.

Conyon, M. J., Peck, S. I., & Sadler, G. V. (2001). Corporate tournaments and executive compensation: Evidence from the UK. *Strategic Management Journal*, 22(8), 805-815.

Cooper, C. L., & Marshall, J. (1976). Occupational sources of stress: A review of the literature relating to coronary heart disease and mental ill health. *Journal of occupational psychology*, *49*(1), 11-28.

Cooper, C. L., Dewe, P. J., & O'Driscoll, M. P. (2001). Organizational stress: A review and critique of theory, research, and applications.

Cooper, R. K., & Kaplan, R. S. (1992). Activity-based systems: Measuring the costs of resource usage. *Accounting horizons*, *6*(3), 1-13.

Cooper, R., & Kaplan, R. S. (1991). Profit priorities from activity-based costing. *Harvard business review*, *69*(3), 130-135.

Cooper, R. K. (2001). Excelling under pressure: increasing your energy for leadership and innovation in a world of stress, change and unprecedented opportunities. *Strategy & Leadership*, 29(4), 15-20.

Corbett, M. (2015). From law to folklore: work stress and the Yerkes-Dodson Law. *Journal of Managerial Psychology*.

Core, J. E., Holthausen, R. W., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics*, 51(3), 371-406.

COSO.org. (2016). *Enterprise Risk Management — Aligning Risk with Strategy and Performance.* https://www.coso.org/Documents/COSO-ERM-Exec-Summary-draft-Post-Exposure-Version.pdf

CPA Canada. (2017 July). *Business Resilience and Risk Management for CPAs.* https://www.cpacanada.ca/en/connecting-and-news/news/professional-news/2017/july/business-resilience-and-risk-management-for-cpas

CPA Canada. (2021 August). *In a Post-COVID World, CPAs Can Become an Organization's GPS.* https://www.cpacanada.ca/en/news/accounting/the-profession/2021-08-11-cpa-as-gps

Craig, W. (2018 June). The Importance of Creating Sustainable Employees in the Workplace. *Forbes.com.* https://www.forbes.com/sites/williamcraig/2018/06/19/the-importance-of-creating-sustainable-employees-in-the-workplace/?sh=705a83e77285.

Crescent Point Energy Corp. (2020, October 29). *Q3 2020 Earnings Call*. (CIQ Transcripts Search) https://wrds-www.wharton.upenn.edu/text-search/ciq-transcript-search/results/2175518

Dai. (2018). Special Report: Spurring Motivation, Not Stress. https://www.kornferry.com/institute/motivation-stress-innovation

Datar, S., & M. Rajan. (2020). *Horngren's Cost Accounting*, 17th Edition, Pearson.

Davies, R., & Huey, D. (2017, February 1). Why CFOs need a bigger role in business transformations. *McKinsey & Company.* https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/why-cfos-need-a-bigger-role-in-business-transformations

Davis, I., & Dickson, T. (2014). Lou Gerstner on corporate reinvention and values. *McKinsey Quarterly*, 3, 123-129.

Dawson, J. E., Messé, L. A., & Phillips, J. L. (1973). Effect of instructor-leader behavior on student performance. *Nursing Research*, *22*(3), 274.

DBRS. (2009). *Rating Oil and Gas Companies*. https://www.dbrs.com/research/147812/rating-oil-and-gas-companies-archived.pdf

Demerjian, P., Lev, B., & McVay, S. (2012). Quantifying managerial ability: A new measure and validity tests. *Management Science*, 58(7), 1229-1248.

Demerjian, P., Lev, B., Lewis, M., & S. McVay. (2013). Managerial ability and earnings quality. *The Accounting Review*, 88(2), 463-498.

Deutsche Bank. (2013). *Oil & Gas for Beginners*. https://www.wallstreetoasis.com/files/DEUTSCHEBANK-AGUIDETOTHEOIL%EF%BC%86GASINDUSTRY-130125.pdf

Dickens, C. (1859). *A Tale of Two Cities: a story of the French Revolution*. Createspace Independent Publishing Platform.

Domanski, D., Kearns, J., Lombardi, M. J., & Shin, H. S. (2015). Oil and debt. *BIS Quarterly Review*, March.

Driskell, J. E., & Salas, E. (1991). Group decision making under stress. *Journal of Applied Psychology*, *76*(3), 473.

Eavis, P. (2014, April 13). Executive pay: Invasion of the supersalaries. *The New York Times*. http://www.nytimes.com/2014/04/13/business/executive-pay-invasion-of-the-supersalaries.html

Eavis. P. (2019, May 24) It's Never Been Easier to Be a C.E.O., and the Pay Keeps Rising. *The New York Times*. https://www.nytimes.com/2019/05/24/business/highest-paid-ceos-2018.html

Edwards, J. R. (1992). A cybernetic theory of stress, coping, and well-being in organizations. *Academy of management review*, *17*(2), 238-274.

Encana Corporation. (2009). *2009 Annual Report.* https://www.encana.com/pdf/investors/financial/annual-reports/2009/annual-report-2009.pdf

Encana Corporation. (2013). *2013 Annual Report.* https://www.encana.com/pdf/sustainability/corporate/reports/

Encana Corporation. (2013). *2013 Sustainability Report.* https://www.encana.com/pdf/sustainability/corporate/reports/sustainability-report-2013.pdf

Encana Corporation. (2015). *2015 Annual Report.* https://www.encana.com/pdf/sustainability/corporate/reports/

Eriksson, T. (1999). Executive compensation and tournament theory: Empirical tests on Danish data. *Journal of labor Economics*, 17(2), 262-280.

Ernst & Young. (2010). Views. Vision. Insights. The evolving role of today's CFO. http://www.ey.com/GL/en/Issues/Managing-finance/The-DNA-of-the-CFO---perspectives-on-the-evolving-role

Ernst & Young. (2012). *Beyond Growing a Place for Integrity.* 12th Global Fraud Survey. https://www.yumpu.com/en/document/view/22435409/growing-beyond-a-place-for-integrity-ernst-young

Ernst, H., Kahle, H. N., Dubiel, A., Prabhu, J., & Subramaniam, M. (2015). The antecedents and consequences of affordable value innovations for emerging markets. *Journal of Product Innovation Management*, 32(1), 65-79.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of financial economics*, *43*(2), 153-193.

Farkas, C.M., & Wetlaufer. S. (1996). The Ways Chief Executive Officers Lead. *Harvard Business Review*, 5-6.

Fernandez, R., (2016). Help your team manage stress, anxiety, and burnout. *Harvard Business Review*, *53*(6).

Fink, G. (2016). Stress, definitions, mechanisms, and effects outlined: Lessons from anxiety. In Stress: Concepts, cognition, emotion, and behavior (pp. 3-11). Academic Press.

Finkelstein, S., Hambrick, D. C., & Cannella, A. A. (2009). *Strategic leadership: Theory and research on executives, top management teams, and boards.* Oxford University Press.

Finn. P., Myscore. M., & Usher. O. (2020, November 2). When nothing is normal: Managing in extreme uncertainty. *McKinsey &Company*. https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/when-nothing-is-normal-managing-in-extreme-uncertainty

Fletcher, D., Hanton, S., & Mellalieu, S. D. (2008). *An organizational stress review: Conceptual and theoretical issues in competitive sport*. New York, NY: Nova Science Publishers.

Forbs.com. (2009, September 30). Six Ways to Beat Executive Job Stress. https://www.forbes.com/2009/09/30/executive-job-stress-leadership-ceonetwork-ccl.html?sh=6c04c8a55faf.

Forster. D. (2020, March 12). Leading Through Uncertainty. *Harvard Business Review*, 3. https://www.harvardbusiness.org/leading-through-uncertainty/

Foster, R. & Kaplan, S. (2001). *Creative Destruction: Why Companies that are Built to Last Underperform the Market—and How to Successfully Transform Them.* New York: Doubleday.

Frank, R. H. (1985). Choosing the right pond: Human behavior and the quest for status. Oxford University Press.

Fredrickson, J. W., Davis‐Blake, A., & Sanders, W. M. (2010). Sharing the wealth: social comparisons and pay dispersion in the CEO's top team. *Strategic Management Journal*, 31(10), 1031-1053.

Friedman, H. S., & Riggio, R. E. (1981). Effect of individual differences in nonverbal expressiveness on transmission of emotion. *Journal of Nonverbal Behavior*, *6*(2), 96-104.

Frydman, C., & Saks, R. E. (2010). Executive compensation: A new view from a long-term perspective, 1936–2005. *Review of Financial Studies*, hhp120.

FSN Research. (2016, June 1). *The Future of the Finance Function: Survey 2016.* https://fsn.co.uk/app/uploads/2018/10/Future-of-the-Finance-Function-Survey-2016.pdf

Gallup.com. (2022). *State of the Global Workplace Report 2022*. https://www.gallup.com/workplace/393623/state-global-workplace-report 2022.aspx?elqTrackId=3e23fdb2887f4bde973488822eaac8d9&elq=33ee04ea4524401497 6d010734d9f717&elqaid=8826&elqat=1&elqCampaignId=

Ganesh, R., Mahapatra, S., Fuehrer, D. L., Folkert, L. J., Jack, W. A., Jenkins, S. M., ... & Sood, A. (2018). The stressed executive: sources and predictors of stress among participants in an executive health program. *Global advances in health and medicine, 7*, 2164956118806150.

García Lara J.M., García Osma B., & Penalva, F. (2016). Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics*, 61(1), 221–238.

Garcia, L. (2022, March 28). Higher prices spark investors' interest in oil, gas strategies. *Wall Street Journal*. https://www.wsj.com/articles/higher-prices-spark-fresh-investor-interest-in-oil-and-gas-11648465202

Garg, A., Ghosh, D., Hudick, J., & Nowacki, C. (2003). Roles and practices in management accounting today: results from the 2003 IMA-E&Y survey. (Cost Management). *Strategic Finance*.

Goleman, D. (2006). Aiming for the Brain's Sweet Spot. *The New York Times*. https://archive.nytimes.com/opinionator.blogs.nytimes.com/2006/12/27/aiming-for-the-brains-sweet-spot/

Gonzales, L. (2020, September 29). Strong balance sheet key to ConocoPhillips managing "really dark days" of oil downturn. *NGI*. https://www.naturalgasintel.com/strong-balance-sheet-key-to-conocophillips-managing-really-dark-days-of-oil-downturn/

Haans, R. F., Pieters, C., & He, Z. L. (2016). Thinking about U: Theorizing and testing U‐and inverted U‐shaped relationships in strategy research. *Strategic management journal*, *37*(7), 1177-1195.

Hackman, J. R., & Wageman, R. (2004). When and how team leaders matter. *Research in organizational behavior*, *26*, 37-74.

Hagel III, J., Brown, S. J., & Davison, L. (March 04, 2010). The Best Way to Measure Company Performance. *Harvard Business Review*, 3.

Hagel, J., Brown, J. S., Samoylova, T., Lui, M., Damani, A., & Grames, C. (2013). Success or struggle: ROA as a true measure of business performance. *Report 3 of the 2013 Shift Index series*.

Hambrick, D. C. (1994). Top management groups: A conceptual integration and reconsideration of the team label. *Research in Organizational Behavior*, 16, 171-214.

Hambrick, D. C. (1995). Fragmentation and the other problems CEOs have with their top management team. *California Management Review*, 37(3), 110-128.

Hambrick, D. C. (1997). Corporate coherence and the top management team. *Strategy & Leadership*, 25(5), 24-29.

Harrison, D. A., & Klein, Katherine J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *The Academy of Management Review*, 32 (4), 1.

Hasan, I., Hoi, C. K. S., Wu, Q., & Zhang, H. (2020). Is social capital associated with corporate innovation? Evidence from publicly listed firms in the US. *Journal of Corporate Finance*, 62, 101623.

Hatton, C., Brown, R., Caine, A., & Emerson, E. (1995). Stressors, coping strategies and stress‐related outcomes among direct care staff in staffed houses for people with learning disabilities. *Mental Handicap Research*, *8*(4), 252-271.

HBR. (2018, October 11). *The CFO's Changing Role: Building the Future.* https://hbr.org/webinar/2018/10/the-cfos-changing-role-building-the-future

HBR.org (2022) How to Overcome Your Fear of the Unknown. https://hbr.org/2022/07/how-to-overcome-your-fear-of-the-unknown

HBR.org. (2020 May). The Big Idea Series/ Managing in an Anxious World. https://hbr.org/2020/05/leading-through-anxiety?ab=seriesnav-bigidea;

Henderson, A. D., & Fredrickson, J. W. (2001). Top management team coordination needs and the CEO pay gap: A competitive test of economic and behavioral views. *Academy of Management Journal*, 44(1), 96-117.

Hockey, G. R. J. (1997). Compensatory control in the regulation of human performance under stress and high workload: A cognitive-energetical framework. *Biological psychology*, *45*(1-3), 73-93.

Huang, L. (2020, January 28). Constraints Don't Have to Be Constraining. *Harvard Business Review*, 1.

Humphrey, S. E., & Aime, F. (2014). Team microdynamics: Toward an organizing approach to teamwork. *Academy of Management Annals*, 8(1), 443-503.

Hussain, Y. (2015, April 7) Canada's oil, gas companies lack long-term strategy amid price plunge, survey shows. *Financial Post.* http://business.financialpost.com/news/energy/canadas-oil-gas-companies-lack-long-term-strategy-amid-price-plunge-survey-shows

IEA. (2016 November). *World Energy Outlook 2016.* https://www.iea.org/reports/world-energy-outlook-2016

IEA. (2021, March 17). *Oil Markets Face Uncertain Future After Rebound from Historic Covid-19 Shock.* https://www.iea.org/news/oil-markets-face-uncertain-future-after-rebound-from-historic-covid-19-shock

Imperial Oil Limited. (2008). *2008 Annual Report.* http://www.imperialoil.ca/en-ca/company/investors/reports-and-filings

Jackson, S. E. (1992). Consequences of group composition for the interpersonal dynamics of strategic issue processing. *Advances in Strategic Management*, 8(3), 345-382.

Jensen, M. C., & Murphy, K. J. (1990). Performance pay and top-management incentives. *Journal of Political Economy*, 225-264.

Kahn, S. E., & Long, B. C. (1988). Work-related stress, self-efficacy, and well-being of female clerical workers. *Counselling Psychology Quarterly*, *1*(2-3), 145-153.

Kale, J. R., Reis, E., & Venkateswaran, A., (2009). Rank-order tournaments and incentive alignment: the effect on firm performance. *The Journal of Finance*, 64(3), 1479-1512.

Kale, J. R., Reis, E., & Venkateswaran, A., (2009). Rank-order tournaments and incentive alignment: the effect on firm performance. *The Journal of Finance*, 64(3), 1479-1512.

Kaplan, R. S., & Mikes, A. (2012e). Managing risks: a new framework. *Harvard Business Review*, 90(6), 48-60.

Kaplan, R. S., & Norton, D. P. (2007). *Balanced Scorecard.* In Das Summa Summarum des Management.

Kaplan, S. N., & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints?. *The quarterly journal of economics*, *112*(1), 169-215.

Keller, S., & Meaney, M. (2017). Attracting and retaining the right talent. *McKinsey & Company*, 24.

Kelloway, E. K., Nielsen, K., & Dimoff, J. K. (Eds.). (2017). *Leading to occupational health and safety: How leadership behaviours impact organizational safety and well-being*. John Wiley & Sons.

Khurana, R. (2002). The curse of the superstar CEO. *Harvard Business Review*, 80(9), 60-67.

Kim, H., Kim, H., & Lee, P. M. (2008). Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. *Organization Science*, *19*(3), 404-418.

Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2017). Technological innovation, resource allocation, and growth. *The Quarterly Journal of Economics*, 132(2), 665-712.

Kornferry.com. (2018) Workplace Stress Continues to Mount. https://www.kornferry.com/insights/this-week-in-leadership/workplace-stress-motivation.

Kotter, J. P. (1999). What Leaders Really Do. *Harvard Business Review.*

Kotter, J. P. (2017). What Leaders Really Do. *Leadership Perspectives* (pp. 7-15). Routledge.

Kravet, T.D. (2014). Accounting conservatism and managerial risk-taking: Corporate acquisitions. *Journal of Accounting and Economics*, 57, 218–240.

Lamont, O., Polk, C., & Saaá-Requejo, J. (2001). Financial constraints and stock returns. *The review of financial studies*, *14*(2), 529-554.

Langfield‐Smith, K. (2008). Strategic management accounting: how far have we come in 25 years?. *Accounting, Auditing & Accountability Journal*.

Law, K. K., & Mills, L. F. (2015). Taxes and financial constraints: Evidence from linguistic cues. *Journal of Accounting Research*, *53*(4), 777-819.

Lazarus, R. S. (1991). Cognition and motivation in emotion. *American psychologist*, 46(4), 352.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* Springer publishing company.

Lazear, E. P. (1989). Pay equality and industrial politics. *Journal of Political Economy*, 97(3), 561-580.

Lazear, E. P. (2018). Compensation and incentives in the workplace. *Journal of Economic Perspectives*, 32(3), 195-214.

Lazear, E., & Rosen S. (1981). Rank order tournaments as optimum labor contracts. *Journal Political Economy*, 89(5), 841–864.

Lee, K. W., Lev, B., & Yeo, G. H. H. (2008). Executive pay dispersion, corporate governance, and firm performance. *Review of Quantitative Finance and Accounting*, 30(3), 315-338.

Lerner, J., & Seru, A. (2017). *The use and misuse of patent data: Issues for corporate finance and beyond* (No. w24053). National Bureau of Economic Research.

Li, F., Li, T., & Minor, D. (2016). CEO power, corporate social responsibility, and firm value: A test of agency theory. *International Journal of Managerial Finance*, 12(5), 611-628.

Li, N., Zhao, H. H., Walter, S. L., Zhang, X. A., & Yu, J. (2015). Achieving more with less: Extra milers' behavioral influences in teams. *Journal of Applied Psychology*, 100(4), 1025.

Li, Y., Li, N., Li, C., & Li, J. (2020). The boon and bane of creative "stars": A social network exploration of how and when team creativity is (and is not) driven by a star teammate. *Academy of Management Journal*, 63(2), 613-635.

Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U‐shaped relationship. *Oxford bulletin of economics and statistics*, *72*(1), 109-118.

Ling, Y. A. N., Simsek, Z., Lubatkin, M. H., & Veiga, J. F. (2008). Transformational leadership's role in promoting corporate entrepreneurship: Examining the CEO-TMT interface. *Academy of Management Journal*, 51(3), 557-576.

Liu, K. (2014). Human capital, social collaboration, and patent renewal within US pharmaceutical firms. Journal of management, 40(2), 616-636.

Main, B., O'Reilly, C., & Wade, J. (1993). Top executive pay: Tournament or teamwork? Journal of Labor Economics, 11(4), 606-628.

Mascarenhas, Briance, and David A. Aaker. "Strategy over the business cycle." *Strategic Management Journal* 10.3 (1989): 199-210.

Mathews, J. A. (2005). Strategy and the crystal cycle. *California Management Review*, 47(2), 6-32.

McGrath, J. G. (1976). Sress and behabior in organizations. *Handbook of Industrial and Oranizational Psychology*.

Meglino, B. M. (1977). Stress and performance: Are they always incompatible? *Supervisory Management*, 22(3), 2–12

Moody's.com. (2016, July 21). *E&P Companies are Still Paying Executives to Pump More Oil, Even After Price Slump.* https://www.moodys.com/research/Moodys-EP-companies-are-still-paying-executives-topump- more--PR_352449

Moore, S. (2019, October 29). *Innovate in a Resource-Constrained Environment.* https://www.gartner.com/smarterwithgartner/innovate-resource-constrained-environment

Moran, G. (2018). *How you deal with stress can ruin your employees' jobs.* https://www.fastcompany.com/90272147/how-managers-deal-with-stress-impacts-their-employees.

Mortlock, L. (2015, September 25). Cost management will separate the winners and the losers in the downturn. *Alberta Oil.* http://www.albertaoilmagazine.com/2015/09/managing-beyond-the-bottom-line/

Murphy, K. J. (1999). Executive compensation. *Handbook of Labor Economics*, 3, 2485-2563.

Murphy, K. J., & Zabojnik, J. (2004). CEO pay and appointments: A market-based explanation for recent trends. *American Economic Review*, 94(2), 192-196.

Murray, F. & Johnson, E. (April 05, 2021). Innovation Starts with Defining the Right Constraints. *Harvard Business Review*, 4.

Muse, L. A., Harris, S. G., & Feild, H. S. (2003). Has the inverted-U theory of stress and job performance had a fair test?. *Human Performance*, *16*(4), 349-364.

Nawaz, S. (2019). When Managers Take Their Stress Out on Their Employees. *Harvard Business Review*, 5.

Nohria, N., & Gulati, R. (1996). Is slack good or bad for innovation?. *Academy of management Journal*, *39*(5), 1245-1264.

Ntim, C. G., Lindop, S., Thomas, D. A., Abdou, H., & Opong, K. K. (2019). Executive pay and performance: The moderating effect of CEO power and governance structure. *The International Journal of Human Resource Management*, 30(6), 921-963.

Obreja, I. (2013). Book-to-market equity, financial leverage, and the cross-section of stock returns. *The Review of Financial Studies*, 26(5), 1146-1189.

Parasuraman, S., & Alutto, J. A. (1984). Sources and outcomes of stress in organizational settings: Toward the development of a structural model. *Academy of Management Journal*, *27*(2), 330-350.

Patel, A. & Young, M. (2020, March 24). Riding the low price environment – Companies with lowest debt to cash flow ratio. *JWNENERGY.* https://www.jwnenergy.com/article/2020/3/24/riding-low-price-environment-companies-lowest-debt/

Pearlin, L. I. (1989). The sociological study of stress. *Journal of health and social behavior*, 241-256.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *The Review of financial studies*, *22*(1), 435-480.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies*, 22(1), 435-480.

PetroNova Inc. (2014). *2014 MD&A.* http://www.sedar.com/GetFile.do?lang=EN&docClass=7&issuerNo=00030609&issuerType=03&projectNo=02338932&docId=3718438

Pfeffer, J. (2001). Fighting the war for talent is hazardous to your organization's health. *Organizational Dynamics*, 29: 248–259.

Pfeffer, J. (2018). Dying for a paycheck: How modern management harms employee health and company performance—and what we can do about it.

Pfeffer, J., & Langton, N. (1993). The effect of wage dispersion on satisfaction, productivity, and working collaboratively: Evidence from college and university faculty. *Administrative Science Quarterly*, 38 (3), 382-407.

Pindek, S., Howard, D. J., Krajcevska, A., & Spector, P. E. (2019). Organizational constraints and performance: an indirect effects model. *Journal of Managerial Psychology*.

Potkins, M. (2022, July 4). Capital spending not increasing as fast as profits. *Financial Post*. https://financialpost.com/commodities/energy/oil-gas/canadian-oil-and-gas-companies-slash-capital-spending-by-more-than-half-boc-survey-finds

Radian Group Inc. (2016). 2016 Proxy Statement. http://www.radian.biz/page?name=SECFilings

Rampini, A. A., & Viswanathan, S. (2010). Collateral, risk management, and the distribution of debt capacity. *The Journal of Finance* 65(6): 2293-2322.

Reeves, M., Nanda, S., Whitaker, K., & Wesselink, E. (2020). Becoming an all-weather company. *Boston Consulting Group*, *9*, 20. https://www.bcg.com/publications/2020/how-to-become-an-all-weather-resilient-company.

Reimbold, G. (2009, February 28). Bullish opportunities in a bear market. *OGJ*. https://www.ogj.com/home/article/17295086/bullish-opportunities-in-a-bear-market

Ridge, J. W., Hill, A. D., & Aime, F. (2017). Implications of multiple concurrent pay comparisons for top-team turnover. *Journal of Management*, 43(3), 671-690.

Ristanovic, A. (2020, June 1). Major oil market crashes in history. *Oil and Energy Online*. https://oilandenergyonline.com/articles/all/major-oil-market-crashes-history/

RoseBush, J.S. (2012). Why Great Leaders Are in Short Supply. *Harvard Business Review*, 3.

Sanfilippo, M. (2022 August). Stressed Out! Unrealistic Expectations Put the Pressure on Workers. https://www.businessnewsdaily.com/8486-effects-workplace-stress.html.

Schuler, R. S. (1980). Definition and conceptualization of stress in organizations. *Organizational behavior and human performance*, *25*(2), 184-215.

Selye, H. (1976). Stress without distress. In *Psychopathology of human adaptation* (pp. 137-146). Springer, Boston, MA.

Senge, P. M. (1996). *Leading learning organizations: The bold, the powerful, and the invisible. Cambridge,* MA: Center for Organizational Learning, Massachusetts Institute of Technology.

Shahab, Y., Ntim, C. G., Ullah, F., Yugang, C., & Ye, Z. (2020). CEO power and stock price crash risk in China: Do female directors' critical mass and ownership structure matter?. *International Review of Financial Analysis*, 68, 101457.

Shahab, Y., Ntim, C. G., Ullah, F., Yugang, C., & Ye, Z. (2020). CEO power and stock price crash risk in China: Do female directors' critical mass and ownership structure matter?. International Review of Financial Analysis, 68, 101457.

Sheikh, S. (2019). An examination of the dimensions of CEO power and corporate social responsibility. *Review of Accounting and Finance, 18*(2), 221-244.

Sheridan, J. E., & Vredenburgh, D. J. (1979). Structural model of leadership influence in a hospital organization. *Academy of Management Journal*, *22*(1), 6-21.

Shleifer, A., & Vishny, R. W. (1992). Liquidation values and debt capacity: A market equilibrium approach. *The Journal of Finance* 47(4): 1343-1366.

Siegel, P. A., & Hambrick, D. C. (1996). Business strategy and the social psychology of top management teams. *Advances in strategic management*, *13*, 91-119.

Siegel, P., and Hambrick, D. (2005). Pay disparities within top management groups: evidence of harmful effects on performance of high-technology firms. *Organization Science*, 16(3), 259-274.

Simmonds, K. (1981) Strategic management accounting, *Management Accounting (UK)*, 59 (4): 26–29.

Sonnentag, S., & Frese, M. (2013). *Stress in organizations*. John Wiley & Sons, Inc..

Stevens, P. (2021, July 6). Oil touches six-year high after OPEC fails to get deal, then turns negative. *CNBC Markets*. https://www.cnbc.com/2021/07/05/oil-prices-jump-to-multiyear-highs-after-opec-talks-yield-no-production-deal-.html

Stress.org. (2017). Change at Work Linked to Employee Stress, Distrust and Intent to Quit, New Survey Finds. https://www.apa.org/news/press/releases/2017/05/employee-stress

Suncor Energy Inc. (2003). *2003 Annual Report*. https://sustainability.suncor.com/2014/pdf/Annual_Report_2003_EN.pdf

Suncor Energy Inc. (2005). *2005 Annual Report*. https://sustainability.suncor.com/2006/pdf/Annual_Report_2005_EN.pdf

Suncor Energy Inc. (2016). *2016 Annual Report*. https://sustainability.suncor.com/2017/pdf/Annual_Report_2016_EN.pdf

Suncor Energy Inc. (2021). 6-K Report. From SEC.gov.

Suncor Energy Inc. (2022). *2022 Reports on Sustainability*. https://sustainability-prd-cdn.suncor.com/-/media/project/suncor/files/investor-centre/annual-report-2022/2022-annual-report-en.pdf?modified=20230306223235

Suncor Energy Inc. (2023). *2023 Reports on Sustainability*. https://sustainability-prd-cdn.suncor.com/-/media/project/ros/shared/documents/reports-on-sustainability/2023-report-on-sustainability-en.pdf?modified=20230921204601

Sutton, R. I., & Hargadon, A. (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, 685-718.

The New York Times.com (2021, April 26). How companies explain their C.E.O.s' big pay packages in the pandemic. *The New York Times.* https://www.nytimes.com/2021/04/26/business/how-companies-explain-their-ceos-big-pay-packages-in-the-pandemic.html

Turander, E. (2015, February 3). 'Knee-jerk' reactions to the falling oil price as confidence drops by more than 37% in just three months. *DNV GL - Oil & Gas News.*

https://www.dnvgl.com/news/new-report-highlights-oil-and-gas-industry-split-over-cost-management-strategies-for-tackling-downturn-8418

Van Wielingen, Mac. (2015). The evolving role of the corporate board: Governance, strategy and the imperative of performance. *Stewardship Review*, Conference Board of Canada.

Voss, G. B., Sirdeshmukh, D., & Voss, Z. G. (2008). The effects of slack resources and environmental threat on product exploration and exploitation. *Academy of Management journal*, *51*(1), 147-164.

Wade, J., and O'Reilly, C. (2006). Overpaid CEOs and underpaid managers: fairness and executive compensation. *Organization Science*, 17 (5), 527-544.

Wang, W. (2021, July 28). The oil and gas sector in Canada: A year after the start of the pandemic. *Statistics Canada - Economic and Social Reports*. https://www150.statcan.gc.ca/n1/pub/36-28-0001/2021007/article/00003-eng.htm

Weidemeyer, F., & Perkins B. (2021, February 2021). *The CEO Imperative: Rebound to More Sustainable Growth.* Ernst and Young. https://www.ey.com/en_ca/ceo/the-ceo-imperative-rebound-to-more-sustainable-growth

Weinberg, & Cooper, C. (n.d.). Why are these times so stressful? In *Stress in Turbulent Times* (pp. 21–38). Palgrave Macmillan UK.

Weiss, M., Hoegl, M., & Gibbert, M. (2017). How does material resource adequacy affect innovation project performance? A meta-analysis. *Journal of Product Innovation Management*, 36: 842-863.

Westman, M., & Eden, D. (1996). The inverted-U relationship between stress and performance: A field study. *Work & Stress*, *10*(2), 165-173.

White, L. (2009). Resource consumption accounting: Manager‐focused management accounting. *Journal of Corporate Accounting & Finance*, *20*(4), 63-77.

Whited, T. M., & Wu, G. (2006). Financial constraints risk. *The Review of Financial Studies*, *19*(2), 531-559.

Whitler, K. A., & Kersey, G. (2021, June 5) What Is the Executive Leadership Team? 33 Board and C-Level Leaders Explain. *Forbes.* https://www.forbes.com/sites/kimberlywhitler/2021/06/05/what-is-the-executive-leadership-team-33-board-and-c-level-leaders-explain/?sh=452860df6dbf

Williams, N. (2022, March 3). As world scrambles for oil, Canadian producers reluctant to spend on growth. *Reuters.* https://www.reuters.com/business/energy/world-scrambles-oil-canadian-producers-reluctant-spend-growth-2022-03-03/

World Bank. (2017). *Uganda Economic Update, December 2017: Accelerating Uganda's Development, Ending Child Marriage, Educating Girls*. World Bank.

Wu, C.-H., Parker, S. K., & De Jong, J. P. J. (2014). Need for cognition as an antecedent of individual innovation behavior. *Journal of Management*, 40: 1511-1534.

Yanadori, Y., & Cui, V. (2013). Creating incentives for innovation? The relationship between pay dispersion in R&D groups and firm innovation performance. *Strategic Management Journal*, 34(12), 1502-1511.

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Punishment: Issues and experiments*, 27-41.

Zaleznik, A. (1981). Managers and leaders: are they different?. *JONA: The Journal of Nursing Administration*, *11*(7), 25-31.

Zaleznik, A. (2004). Managers and leaders. *Harvard Business Review*, 1.

Zarnowitz, V. (1985). Recent work on business cycles in historical perspective: a review of theories and evidence. *Journal of Economic Literature*, 23(2), 523-580.

Zhang, D. (2019). Top management team characteristics and financial reporting quality. *The Accounting Review*, 94(5), 349-375.199-1228.