THREE ESSAYS ON FIRM INNOVATION EFFORT: THE RELATION WITH CORPORATE GOVERNANCE, WORKFORCE DIVERSITY AND CEO DOMINANCE

NICOLETTE CHATELIER PRUGSAMATZ

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……
Nicolette Chatelier Prugsamatz
Candidate

……
Professor Roy Kouwenberg,
Ph.D., CFA
Chair and Advisor

……
Assoc. Prof. Nathasit Gerdsri, Ph.D.
Member

……
Simon Zaby, Ph.D.
Member

……
Duangporn Arbhasil, Ph.D.
Dean
College of Management
Mahidol University

……
Assoc. Prof. Yuosre Badir, Ph.D.
External Examiner

……
Assoc. Prof. Pornsit Jiraporn, Ph.D.
External Examiner

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Ph.D., CFA
Advisor

……..……..……
Duangporn Arbhasil, Ph.D.
Dean
College of Management
Mahidol University

……..……..……
Professor Roy Kouwenberg, Ph.D., CFA
Program Chair
Doctoral of Philosophy Program in Management
College of Management
Mahidol University

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Nicolette Chatelier Prugsamatz

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NICOLETTE CHATELIER PRUGSAMATZ 5649610

Ph.D. (MANAGEMENT)

THESIS ADVISORY COMMITTEE: PROF. ROY KOUWENBERG, Ph.D., CFA, ASSOC. PROF. NATHASIT GERDSRI, Ph.D., SIMON ZABY, Ph.D., YUOSRE BADIR, Ph.D., PORNSIT JIRAPORN, Ph.D.

ABSTRACT

This dissertation investigates the innovation behavior of U.S. publicly listed companies and is comprised of three studies. The first study examines whether innovation effort (i.e., investment in R&D and R&D intensity) is greater for firms showing better governance performance, and the overall impact this relationship has on firm performance. The results show a significantly negative relationship between corporate governance performance and firm innovation proxies, and no positive mediation effect of innovation effort on firm performance. The second study examines whether innovation effort is greater for firms that have stronger workforce diversity and the overall impact this relationship has on firm performance. The results show a significantly positive relationship between workforce diversity and innovation effort, but again no mediation effect of innovation effort on firm performance. And lastly, the third study addresses whether innovation effort is lower for firms exhibiting signs of higher CEO dominance and whether such CEOs can be incentivized to pursue more innovation projects with equity-linked compensation. The results show a significantly negative relationship between CEO pay slice and firm innovation effort, implying that firms with more dominant CEO's tend to have lower innovation intensity. On the other hand, CEO equity-based incentives and firm innovation effort show a significantly positive relationship, illustrating a possible mechanism to alleviate the effect of CEO dominance on innovation.

KEY WORDS: CORPORATE GOVERNANCE/ WORKFORCE DIVERSITY/ CEO DOMINANCE/ INNOVATION/ FIRM PERFORMANCE

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CHAPTER I
INTRODUCTION

This Ph.D. thesis consists of three main chapters focusing on the study of firm innovation efforts in the U.S. context, specifically among U.S. publicly listed companies. The three chapters are:

Chapter II: Corporate governance, Innovation Effort, and Firm Performance

Chapter III: Workforce Diversity, Innovation Effort, and Firm Performance

Chapter IV: CEO Dominance and Firm Innovation Effort

These three chapters span three key thematic areas that include firm level governance, diversity in the workforce and managerial behavior, highlighted by the extant literature as not only paramount to a firm's overall performance but also its long term growth. Several key observations are noted from studies addressing the role of innovation efforts in enhancing the performance of firms.

Firm innovation outputs are shown to be dependent on firm innovation efforts like R&D efforts (Acs and Audretsch, 1988; Crepon et al., 1998, Souitaris, 2002). In turn, such efforts in innovation have also been found to impact several firm performance areas. For instance, innovation effort is shown to impact a firm's credit ratings (Kraft and Czarnitzki, 2002), rates of return (Timmer, 2003), as well as product competitiveness and sales performance/growth (Yam et al., 2004; Yam et al., 2011). It has also been shown to impact the total market value of a company's equity (Zheng et al., 2010). However, to better understand the link between firm innovation effort and its effect on performance and growth, it is vital to also examine underlying factors that act as a bridge between firm innovation effort and performance.

The extant literature emphasizes the importance of understanding the sources/determinants of innovation efforts as it can shed light on the environment and capabilities a firm must retain to allow for the timely promotion of firm innovation

effort in an attempt to achieve success in the market place. The vast literature on the determinants of innovative activity, as a result of the Hicks (1932), Schumpeter (1942) and Schmookler (1966) studies, focus on the role of factors like national innovative capacity (Furman et al. 2002), market concentration (Arrow 1962), market structure and industry dynamics (Geroski 1991), technological opportunity (Jaffe 1986) and firm size (Cohen and Klepper 1996). Only very recently there is growing attention on the role of firm governance, workforce diversity and managerial behavior.

In the context of innovation, corporate governance would relate to exercising control over resource allocation, as well as the nature of an innovative investment strategy while relying on the incentives and abilities of individuals who exercise that control (O'Sullivan, 2000). Contemporary and diverse literature give due consideration to the necessity of corporate governance in the innovation effort of the firm. A key observation offered from Belloc's (2012) survey would be that within the context of profit-maximizing firms, innovation does not emerge as a consequence of technological acceptance. It appears (or fails to do so) as a result of the investment decisions (i.e., whether to invest or not) of individuals in innovative projects where such investment decisions are influenced by the existing corporate governance system.

However, various studies that have tried to relate corporate governance to innovation still lack a single rational conceptual framework to explain the corporate technological innovation phenomenon at the level of the firm. Belloc (2012) notes that the available literature on corporate governance and innovation is significantly diverse entailing mixed results that very seldom demonstrate cohesiveness. All this has led to research contributions that are disconnected while relating to several and different aspects of corporate governance. This could be a result of studies that focus on individual dimensions of corporate governance that are determined by external circumstances/factors. Such dimensions need to be studied collectively rather than in isolation to enable adequate exploration of their influence on innovation efforts of the firm (Belloc, 2012).

Aside from governance issues, issues relating to workforce diversity have also become increasingly important in recent years owing to the far reaching changes in the competitive landscape just at the start of the new millennium that profoundly transformed the corporate workplace. Revolutionary changes emerged in the global

business environment during the final decade of the last century owing to powerful political and technological forces. Several changes in the workforce composition was experienced by both developed and developing countries. This further led to an increase in heterogeneity of the labour force in terms of ethnicity, skills, gender and age, consequential of policies adopted to counteract problems like immigration and the worldwide globalization process, population aging, and anti-discrimination measures (Pedersen at al. 2008).

Workforce diversity in relation to the performance of the firm was first addressed in Penrose's work in 1959 where the author contends that the heterogeneity of the productive services available or potentially available from its resources is what makes each firm unique. A firm's human capital, which possesses a cognitive dimension (vocational training, experience) and a demographic dimension (gender, age and cultural background) is a key element of these resources (Penrose, 1959; Barney, 1991; Kerr 2008, Stuen et al., 2012). Such a resource impacts the way existing knowledge is applied and combined as well as the interaction and communication among employees within a firm (Caballaro and Jaffe 1993; Kerr and Kerr 2011).

Workforce diversity is often viewed as something positive and is frequently looked upon as a chance to enhance knowledge management and learning capabilities for improving firm productivity (Parrotta et al., 2011). It has potential of creating broader search spaces which allows the firm to be more open towards new ideas and more creativity while also improving approaches to problem solving (Ostergaard et al., 2011). In an ideal world, diversity should enhance the knowledge base of a firm as well as improve interaction between various types of knowledge and competences. A firm's knowledge base becomes more diverse as the cultural, education and ethnic background among employees become more diverse leading to possibilities for new combinations of knowledge (Schumpeter, 1934).

Diversity is predominantly relevant in the context of teams where diversity competence at the organizational and individual level is viewed as essential for remaining competitive in an increasingly global marketplace and in diverse employee labour markets (De Anca and Vazquez, 2007). While majority of traditional organizational theories are based on old bureaucratic homogenous organizations, current trends show more flat, lean and diverse-team based organizations (Cox, 1994;

Jackson & Ruderman, 1995; Rodriguez, 1998). Hence, through realization of the significance of leveraging diversity for achieving competitive advantage, firms in the United States have integrated diversity training into their orientation and development programs for employees (Holladay, Knight, Paige and Quinones 2003). Approximately two-thirds of companies offer diversity training (CBLO 2006).

Workforce diversity is also increasingly viewed as an important source of innovation effort (European Commission, 2005) where firms could benefit from the growing diverse cultural backgrounds, demographics, and knowledge bases of the workforces. And because of the growing consensus that innovation is crucial for sustainable growth and economic development, understanding the links between workforce diversity and innovation effort becomes even more relevant for policy makers. The economic literature has already considered the possibility that diversity can enhance productivity, innovation and growth, especially at the level of the firm.

Overall, the extant literature suggest that there is a small but significant 'diversity bonus' for innovation effort (Nathan and Lee, 2013). Firms having a more diverse workforce are more innovative and survive longer (Breschi et al., 2003; Suzuki and Kodama, 2004; Garcia-Vega, 2006). Such firms benefit from having complementarities that can foster development in other fields (Dosi, 1982; Quintana-Garc´ıa and Benavides-Velasco, 2008), broader organisational routines and search activities (Nelson andWinter, 1982; Dosi, 1988), higher absorptive capacity allowing for exploitation of external knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002), and better ability to exploit internal knowledge through interaction and learning (Lundvall, 1992; Woodman et al., 1993; van der Vegt and Janssen, 2003).

Nonetheless, there is still a scarcity of studies investigating the relationship between diversity and innovation effort (Bantel and Jackson, 1989; O'Reilly and Flatt, 1989; Zajac et al., 1991; van der Vegt and Janssen, 2003). The majority of studies that address the relationship between workforce diversity and firm innovation effort mainly comprise of business case studies looking at diversity specifically within top management teams (Bantel and Jackson, 1989; Knight et al. 1999; Pitcher and Smith, 2001), or compositions of work teams in general (Horwitz and Horwitz, 2007; and Harrison and Klein, 2007). Also, a paradox has emerged from a theoretical point of view where an increase in employee diversity also strengthens the need for interaction

and communication within the firm which could in turn lead to conflict and distrust (Basset- Jones, 2005). This can prevent cooperative participation in research activities, resulting in high costs related to "cross-cultural dealing" for instance (Williams and O'Reilly, 1998; Zajac et al., 1991; Lazear, 1999). Hence, this has led to no general agreement in the extant literature on which effect prevails.

Aside from governance and diversity related issues, managerial behaviour has also been highlighted as a key element in the extant literature as promoting firm level innovation effort. Despite most CEOs expressing a zealous belief in new ideas while claiming to be committed to innovation, the majority of CEOs and senior managers can also appear to be daunted by innovation. Since innovation is viewed as a high-risk, high-cost endeavour, CEOs can sometimes be reluctant to become advocates for innovation. In the context of innovation therefore, firm-specific decision making can be influenced by both managerial power and incentives. CEOs as well as other top executives are normally considered as key factors in making investment, financing and other strategic decisions. Their view of the firm therefore can have a profound impact on corporate practise and outcomes.

While in some firms CEOs can be expected to make all major decisions, in others decisions are the result of consensus among top executives. Because different individuals have different opinions, the distribution of decision-making power could impact which decisions are made within a firm. While managerial decisions may or may not impact firm outcomes, if they do then both managerial individualities and organizational variables could in turn have an effect on firm performance. In the instance where a firm's decision making power is more concentrated in the hands of the CEOs, then it can be expected that he/she would have more discretion to influence decisions. His/her opinions would in turn be reflected more directly in corporate outcomes. Such a situation has both positive and negative implications for stakeholders since such CEOs can utilize their dominant roles to either better adjust firm policy or to advance their own agendas.

Existing literature has looked extensively at how market level, industry and firm characteristics explain corporate performance. However, what has been largely ignored is the examination of the influence of individual managers in shaping these outcomes. The extant literature offers some evidence supporting the notion that

managerial behavior affects firm outcomes, especially the influence of CEO power on both corporate strategies (Brown & Sarma, 2007; Chikh & Filbien, 2011) and outcomes (Adams, Almeida, & Ferreira, 2005; Tang et al., 2011; Helft, 2014; Lee, Park, & Park, 2015). Nonetheless, neither the organizational innovation nor the governance literature offer strong evidence on whether and how powerful CEOs influence organizational innovation effort. Within the corporate governance literature, this issue has been examined under the broader "executive effects" literature. This has been done utilizing the upper echelons research tradition which contend that the personal characteristics of the CEO and other senior managers significantly affect firm strategic behavior (Crossland, Zyung, Hiller, & Hambrick, 2014).

The remaining studies investigating the impact of executive characteristics mainly focus on the impact of demographics, such as age, social class, functional background, education, and tenure (see for example, Palmer and Barber 2001; Boyd and Brown 2012; Bertrand and Schoar 2003; Barker and Mueller 2002; Auh and Menguc 2005; Bantel and Jackson 1989). However, such variables are not only imprecise proxies of executive's attitudes and values, but also tend to be noisy and inadequate (Hambrick 2007; Kashmiri and Mahajan, 2017).This has in turn created a "black box" problem (Lawrence, 1997) which has resulted in very little knowledge about the real psychological processes that drive executive choices. Therefore, exploring the role of managerial behavior, in the context of CEO power/dominance on organizational innovation effort, can allow for addressing this current gap. This is because CEOs in general have a key role to play in formulating strategic decisions since they hold a prominent structural position in the upper echelons (Crossland et al., 2014). Additionally, in terms of strategy formulation, they are also expected to maintain an active and aggressive role despite the fact that other board of directors and top management team members may also be engaged in strategic decision-making. Key stakeholders often expect CEOs to be the principal architects of the innovation agenda of the firm (Berger, Dutta, Raffel, & Samuels, 2016).

In light of the above research gaps, the current dissertation tests several hypotheses drawing on theories from both the finance and management literature to explicate the innovation behavior of firms in the U.S. context. Chapter II investigates the role of firm level corporate governance in relation to firminnovation effort and its

performance. Chapter III focuses on the relationship between firm level workforce diversity and firm innovation effort and performance. Chapter IV studies the influence of CEO dominance and CEO incentives on innovation effort.

CHAPTER II
CORPORATE GOVERNANCE, INNOVATION EFFORT, AND FIRM PERFORMANCE

2.1 Introduction

It has long been accepted that innovation is a vital element of firm and country performance, being a key driver for continuing economic growth as attempts are made to advance productivity and income levels (Cho et al., 2016; Hasan et al., 2015; Honore et al., 2015). Solow (1956) for instance, demonstrated that technological innovation was able to contribute to over 80% of the U.S.' economic growth between 1909 and 1949. His seminal paper argued that technological development is essential for sustained economic growth. Recent financial research also observe innovation to be necessary for firm value (Hall et al., 2005), competitive advantage (Porter, 1992), stock returns (Rossi, 2006) as well as firm survival (Eisdorfer and Hsu, 2011). Regardless of the importance of innovation to both firms and nations as a whole, little is known about the key factors driving innovation effort. The current study therefore aims to fill this knowledge gap by exploring how corporate governance contributes to firm innovation effort over the long-run.

The role of corporate governance in driving innovation effort at the level of the firm has been addressed in prior studies but remains divided. While some studies observe certain corporate governance mechanisms to be significant to innovation, other studies find them to be an innovation buster. One reason for this could be attributed to the fact that majority of existing studies examining this relationship focus only on individual governance provisions. Studies in the U.S. context for instance show preference for utilizing the governance index developed by Gompers et al., (2003) whose measures are mostly related to anti-takeover provisions (*see for example Becker-Blease, 2011; O'Connor and Rafferty,2012;Sapra et al; 2013).* However, it should be emphasized that modern firms these days are considered multifaceted with different types of governance mechanisms, several of which may

interact with one another (Agrawal and Knoeber, 1996; Jiraporn et al., 2013). Therefore, examining only one or a few governance mechanisms could lead to misleading or incomplete conclusions.

More recent studies have begun utilizing broad based measures of corporate governance that offer a more comprehensive and improved version of the Governance Index developed by Gompers et al., (2003). One of them being the ISS corporate governance measures developed by the Institutional Shareholder Services (ISS), that cover fifty provisions under eight governance categories namely: audit, board of directors, charter/bylaws, director education, executive and director compensation, ownership, progressive practices, and state of incorporation. ISS data is available annually (rather than biannually) for a much larger number of firms in more recent years and are much broader while still encompassing about half of the standards incorporated into the Gompers Index (Jiraporn et al., 2013). ISS data also include five of the six standards recognized as most relevant for firm value (Bebchuk et al., 2008).

Another broad-based measure of corporate governance is from the Morgan Stanley Capital International's (MSCI) environmental, social and governance (ESG) Kinder, Lyndenberg and Domini (KLD) STATS database) that collects annual data (since 1991) on a set of positive and negative governance performance indicators (in addition to environmental and social indicators), applied to a universe of publicly traded companies across the U.S. It also covers both internal and external governance mechanisms which should be considered when the effect of corporate governance is addressed (Cremers and Nair, 2005). The MSCI ESG KLD STATS data set is based on data collected from macro data at geographical or segment level from government and government databases, company disclosure (10-K, sustainability report, proxy report, AGM results, etc.), NGO and NGO datasets, academic, 1600+ media, and other stakeholder sources. It is one of the longest continuous ESG data time series available.

Studies utilizing broad based measures of corporate governance provide evidence of its effects on key corporate outcomes. Brown and Caylor (2006) for instance observe that firms demonstrating better governance are more profitable and valuable. Chung et al. (2010) also observe that better governed firms exhibit narrower spreads, a higher market quality index, smaller price impact of trades as well as lower

probability of information-based trading. Additionally, Jiraporn et al. (2011) find that firms with stronger governance demonstrate a greater propensity to pay dividends and is also associated with a higher cost of debt (Jiraporn et al., 2013) suggesting that corporate governance has a palpable effect on critical corporate outcomes like credit ratings and bond yields.

The current study expands the existing literature in several directions. First, this study contributes to the emergent literature on the determinants of corporate innovation. Majority of recent studies have focused on both managerial and firm characteristics to explain variation in innovation productivity. Most of them find firm characteristics to be a better predictor of corporate innovation outcomes. Cho et al. (2016) for example, find that in terms of being able to explain the heterogeneity in corporate innovation productivity, firm characteristic tend to dominate manager characteristics. In other words, manager quality or innovation productivity does not appear to be mainly determined by a manager's ability to innovate. Fang et al. (2013) observe stock liquidity to have a negative impact on firm innovation, interpreting that illiquidity pushes managers to focus on short-term patentable innovation while avoiding long-term patentable innovation. He and Tian (2013) find that firms having a wider analyst coverage show tendency to produce fewer patents and patents with lower impact. They argue that managers are pressured by analysts to meet a firm's short-term goals at the expense of its investment in long-term innovation projects. The current study contributes to this literature by offering evidence, based on a comprehensive and up to date panel dataset, that majority of the variation in firm innovation effort can also be explained by observable firm corporate governance behavior over time.

Second, the study adds to the literature that examines the effects of corporate governance on firm innovation. The study provides evidence encompassing both internal and external corporate governance dimensions identified by prior studies as most relevant in explaining the variation in innovation effort in the U.S. context. Majority of existing studies tend to focus more on the effects of a few corporate governance mechanisms that could help explain variation in firm innovation effort. Baysinger et al. (1991), for example, find a positive relationship between a concentration of equity among institutional investors and corporate R&D spending.

Dong and Gou (2010) observe that the number of independent outside directors have a positive and significant effect on firm R&D investment. Pro-shareholder governance practices have also been found to positively impact R&D investment (Lhuillery, 2011). Choi et al. (2012) also find executive stock option risk incentives to be positively linked with corporate innovations. Sapra et al. (2013) observe that innovation is nurtured by anti-takeover laws that are either virtually non-existent or are strong enough to significantly discourage takeovers. Such studies offer insight into the role of individual governance dimensions in driving firm innovation effort. To the best of the author's knowledge, there currently exists no study that utilizes a broad-based measure of corporate governance when addressing its relationship to firm innovation effort, especially in the U.S. context.

Finally, the study offers extended insight on the literature investigating the relative importance of the interaction effect of corporate governance and firm innovation on firm performance in the long run. For instance, Zhang's et al. (2014) observe that, during the 2007-2008 period, the R&D investment of Chinese IT-industry listed companies does not moderate, but rather mediates the relationship between corporate governance and firm performance. Thus, the current study expands prior literature in the sense that the sample utilized is not confined to a single industry or to only early-stage companies. On the other hand, it covers an extensive range of publicly-traded U.S. companies which would be more representative of the economy as a whole.

2.2 Prior Empirical Evidence

The current study is related to two main streams of existing research, namely those that address the relationship between corporate governance and firm innovation effort and those that focus on the relationship between innovation and firm performance.

2.2.1 Corporate Governance and Firm Innovation

The extant literature identifies various corporate governance factors that affects firm innovation effort, mostly related to R&D investment decisions. Some of

them include the role of board of directors (Dong and Gou, 2010), promoting shareholders rights and equitable treatment (Lhuillery, 2011), ownership structures **(**Hosono et al., 2004) as well as director salary and stock options (Chen et al., 2013). Majority tend to offer agreement as to the positive impact of effective corporate governance mechanisms on firm innovation effort. Innovation decisions are sensitive to board composition and board size while independent/outside directors versus those from the inside offer different contributions to innovation with board size impacting nature of its decision making (Shadab, 2007). Dong and Gou (2010) for instance observe that the number of independent outside directors have a positive and significant effect on R&D investments (*see also* Baysinger and Hoskisson, 1990). A plausible explanation could pertain to the characteristics of independent outside directors whom prefer R&D activities (such as from universities, research institutions, and law firms). Therefore having more independent outside directors with greater inclination for R&D activities could lead to greater R&D investment. More recent studies have also observed independent boards to increase innovation outputs of firms, such as their number of patents as well as total future citations for their patents (*see for instance* Balsmeier et al., 2016; Lu and Wang, 2017).

Lhuillery (2011) find that pro-shareholder governance practices positively impact R&D investment. Findings also support the general notion that entrenchment practices are harmful to R&D while introducing any additional shareholder-oriented practice is also related to more R&D activity and investment. Hill and Snell (1989) and Hosono et al. (2004) observe that ownership affects a firm's stance toward diversification and investment in R&D. They find a positive relationship between stock concentration and R&D investments highlighting the significance that a constituency of powerful stockholders can have on firm innovation. Chen et al. (2013) find that executive stock option risk incentives are positively linked with corporate innovations (improved product, new product, alliance, and new R&D respectively). Findings resonate observations from Rajgopal and Shevlin (2002) and Hanlon, Rajgopal, and Shevlin (2004) where incentive of executive stock options are positively linked with managerial risk-taking, as well as studies by Quinn and Rivoli (1991), Hoskisson et al. (1993), Ryan and Wiggins (2002), and Xue (2007) who find that

executive stock options can increase innovative investments through shifts in managerial risk orientation.

Also, a few external factors have also been found to positively affect firm innovation effort including the size and composition of institutional investors (Baysinger et al., 1991), as well as takeover provision protection (Becker-Blease, 2011). Baysinger et al. (1991) and Aghion et al. (2009), for example, find a positive relationship between a concentration of equity among institutional investors and corporate R&D spending suggesting that institutional stockholders positively value capital long-term R&D projects (*see also* Jarrell et al., 1985; Hansen and Hill, 1991; Kochhar & David, 1996; Eng and Shackell, 2001). Additionally, Hoskisson et al. (2002) observe that distinct types of institutional investors appear to have different preferences for corporate innovation strategies. Becker-Blease (2011) find that the greater the anti-takeover provision protection then the more the innovation efforts that can be observed across multiple specifications (see also Danielson and Karpoff, 2006; Straska and Waller, 2010; Chemmanur and Tian, 2018). Sapra et al. (2013) observe that innovation is nurtured by anti-takeover laws that are either virtually non-existent or are strong enough to significantly discourage takeovers. Honore et al. (2015) further observe that limitations of anti-takeover devices and of voting rights restrictions are negatively related to a firm's R&D intensity. This implies that if a manager feels threatened by a takeover, then he/she might not invest in long term projects such as R&D but on the other hand would go after short term investments that could enhance the market value of the firm quickly.

The available empirical evidence thus offers some evidence that both internal and external mechanisms of corporate governance interact with each other to influence a firm's tendency to invest in innovation which then influences the firm's innovation decisions and R&D expenditures (Sapra et al., 2013). Therefore, having comprehensive measures for corporate governance that include both internal and external factors could allow for more robust analysis and conclusions as to how corporate governance as a whole drives firm innovation effort.

2.2.2 Firm Innovation and Performance

While there is still a lack in consensus as to whether there exists a direct or indirect relationship between corporate governance and firm performance, the extant literature nonetheless well establishes that corporate governance does indeed influence firm performance (*see for example* Bethel & Liebeskind, 1993; Shleifer & Vishny,1997; Boone et al., 2007; Bhagat & Bolton, 2008). There is more or less agreement that effective corporate governance can for instance weaken a manager's control power that is given by shareholders and creditors who supervise the manager to ensure that he/she invest in lucrative projects (Shleifer & Vishny, 1997). Effective corporate governance can better align the interests of managers and shareholders thereby increasing the value of firms (Boone et al., 2007) because it provides useful information to investors and creditors and can therefore significantly influence performance of firms. However, not much is understood in terms of how effective corporate governance drives the relationship between firm innovation effort and its performance. More so, the available empirical evidence on firm performance from innovation effort remain mixed. Nonetheless, more studies are observing improved firm performance derived from its innovation effort.

Morbey (1988) for instance does not find any significant relationship between firm performance and R&D investment. On the other hand Ettlie (1998) observes a relationship between R&D investment and firm performance where R&D is vital for technology innovation. In turn, a firm's innovation capabilities have also been found to have a significant impact on a firm's long-term performance (Hitt et al., 1997; Yam et la., 2004; Sher and Yang, 2005). R&D active firms have been found to be a lot more efficient than others (Dilling-Hansen, Madsen, & Smith, 2003) and a firm's expenditures towards R&D appear to have a positive and significant role in influencing productivity growth (Wakelin, 2001) as well as export growth (Guan and Ma, 2003). Contributions for firms with greater R&D intensity is higher than that of firms with lower R&D investment intensity (Amir, Lev, & Sougiannis, 2000). Firm R&D activities have also been found to be significantly associated with its future growth opportunities (Deng, Lev, & Narin, 1999). While studies on innovation effort offer insight into its impact on several performance aspects of the firm, not much is known about how this relationship is driven in conjunction with existing corporate

goernance systems. Understanding corporate governance systems as a source of firm innovation effort are crucial as it allows for determining the environment a firm must possess for allowing timely investments in innovations so as to attain success in the market place.

2.3 Theoretical Framework and Hypothesis Development

2.3.1 Corporate Governance and Firm Innovation

The current study relies on the structure of the agency model developed by Aggarwal and Samwick (1999, 2003) to persuade the importance of corporate governance in innovation. Overall, the model is intended to reflect the notion that corporate governance has potential of being utilized to create an environment where the CEO is motivated and effectively supervised to innovate. The study defines corporate governance as a set of internal as well as external control mechanisms that minimize the conflicts of interest between managers and shareholders brought about by the separation of ownership and control by shareholders and managers respectively (Berle and Means,1932; Baysinger and Hoskisson, 1990; Shleifer and Vishny, 1997). The nature and direction of innovation effort can be significantly affected by a set of conditions arising as a result of various dimensions of corporate governance structures and instruments (Honore et al., 2015).

In a nutshell, agency theory addresses the universal agency relationship whereby the principal delegates work to an agent who carries out that work (Jensen and Meckling.,1976) and consequently deals with reaching a resolution to two agency problems that can arise in agency relationships. The first agency problem emerges from the separation of ownership and management (Type I) (Berle and Means, 1932; Jensen and Meckling, 1976). The second agency problem deals with conflicts of interest between controlling and non-controlling shareholders (Type II) (La Porta et al., 1999; Gilson and Gordon 2003; Bebchuk and Weisbach 2010; Eklund et al., 2013). Both Type I and Type II agency problems causes managers to behave against the best interest of shareholders. In this scenario, managers could seek private benefits (through empire building, perks, insider trading) at the expense of shareholders

(Shleifer and Vishny 1997; Hope and Thomas 2008; Jagolinzer, Larcker and Taylor 2011). This in turn leads to shareholders penalizing such firms while negatively impacting firm performance. Agency theory thus posits that firms can ease agency problems while improving performance of firms through use of different corporate governance mechanisms.

In the context of the innovating firm therefore, these two conflicts occurring between shareholders and managers can have implications for R&D decisions in several ways. The innovation goals between shareholders and managers might differ and their risks to achieve these goals may also differ. Secondly, owing to information asymmetries, it would be costly and difficult for shareholders to learn and check what managers do. To be more precise, the assumption here is that the main goal of the shareholder is to maximize the value of his/her investment in the firm while managers' goal is to keep his/her job and be well compensated. Additionally, in terms of risk profiles, the standard agency perspective assumes the shareholders' as risk-neutral since they are able to diversify their overall investment across several firms while managers on the other hand are risk-averse as they can only put their effort into one job (Honore et al., 2015). Since managers are also assumed to prefer short-term gains resulting from efficiency-seeking strategies that could hurt long-term returns, it is then expected that shareholders should promote effective corporate governance practices that create incentives among managers in order to maximize the value of their investment (Baker et al., 1988; Agrawal and Knoeber, 1996). Therefore, in the context of the innovating firm, effective corporate governance practices should eventually lead to increased R&D activity. Therefore, to test these assumptions, the following hypothesis is proposed:

Hypothesis 1: There is a positive relation between effective corporate governance and:

1.a R&D Expenditures

1.b R&D/Total Sales

1.c R&D/Total Assets

2.3.2 Corporate Governance, Firm Innovation and Performance

Furthermore, under the assumption that effective corporate governance practices should enhance R&D activity, it is therefore anticipated that this should prove beneficial to firm performance in the long run. Obtaining competitive advantage and improving firm performance in the market through enhancing a firm's innovative capability are primary objectives of R&D investment (Johnson & Pazderka, 1993). A firm is greatly dependent on endogenous innovative capability in order to gain satisfactory firm performance and long-term growth. Therefore, it would be challenging for the firm to pursue effective innovation that is not backed by sufficient and sustainability investment in innovation resources (Hitt et al., 1997). And because corporate governance deals with balancing the interests of stakeholders, including firm owners, board of directors, executives etc., so when there is close alignment of managers' and shareholders' interests, investment in innovation effort can be expected to increase (Zahra, Neubaum, & Huse, 2000). This in turn influences the firm's innovation decisions and R&D investment (Sapra et al., 2013) and consequently a firm's innovation capability.

Moreover, innovation theory proposes that a firm's innovation capability plays a key role in its long-term performance (Hitt et al., 1997). Increasing investments in R&D can help fuel efforts in innovation (Griffith, Redding, & Van Reenen, 2004) since R&D is after all a critical element of innovation (Becker-Blease, 2011). And since innovation is key for allowing the firm to achieve its strategic competitiveness (Conner, 1991), it can therefore help a firm not only provide more valuable and differentiable products but also generates higher financial performance for the firm (Zahra, Ireland, & Hitt, 2000). All this indicates that corporate governance can indeed drive the relationship between a firm's innovation efforts and its performance and long-term growth. Zhang et al., (2014) for instance looks at whether R&D investment mediates or moderates the relationship between corporate governance and firm performance. The study shows that R&D investment, of Chinese IT-industry listed companies during the 2007-2008 period, mediates the relationship between corporate governance and firm performance.

Therefore, the current study expects R&D activity to be positively related to firm performance, while holding corporate governance constant. In sum, the following hypotheses are proposed:

Hypothesis 2: There is a positive relation between firm innovation effort and:

2.a ROA

2.b ROE

2.c EPS

If Hypothesis 1 and 2 are both supported, this is consistent with a mediation relationship: better governance leads to higher firm innovation effort, which in turn leads to better firm performance.

2.4 Sample, Data and Research Method

2.4.1 Sample Size

The current study utilizes secondary data of U.S. publicly listed companies from 1993 to 2013. Panel data on firm R&D expenditures, firm characteristics as well as financial and accounting data (reported in USD) are obtained from the merged CRSP/COMPUSTAT database. This panel dataset is then matched with MSCI's ESG KLD STAT's dataset which includes panel data on firm level corporate governance. Firms reporting zero R&D expenses are included in the final sample so as to obtain more sample observations (*see for example* Galasso and Simcoe, 2010; Aghion et al., 2009; O'Connor and Rafferty, 2012; Sapra et al., 2013; Cho et al., 2016). Final matched dataset consists of 15,761 firm year observations from 1993 to 2013, excluding firms belonging to the finance and utilities sectors.

2.4.2 Measurement of Firm Level Governance

Corporate Governance data is obtained from MSCI's ESG KLD STATS database which provides year-end scores on both positive governance performance

indicators (rated as strengths) as well as negative governance performance indicators (rated as concerns).[1] Initiated in 1991, the MSCI ESG KLD STATS is one of the longest continuous ESG data time series available. It is an annual data set comprising of positive and negative environmental, social, and governance performance indicators which are applied to a universe of public traded companies. Positive governance performance indicators [2] include limited compensation, ownership strength, reporting quality, political accountability strength, public policy, other strength. Negative governance performance indicators [3] include high compensation, ownership concern, accounting concern, reporting quality, political accountability concern, public policy concern, bribery and fraud, and other governance concerns. Corporate governance scores for the current study represents the composite corporate governance score for a firm in a given year, which includes the total number of strengths minus total number of concerns.

2.4.3 Measurement of Firm Innovation

R&D activities serve as a key component of the innovation effort of firms, as well as the most important intangible innovation expenditure (Evangelista et al.,

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[1] MSCI utilizes a binary scoring model to score its governance performance indicators. A "1" is assigned when a firm meets the assessment criteria established for an indicator. If a firm fails to meet the established assessment criteria then a "0" is assigned.

[2] Positive performance indicators are based on MSCI ESG Research's proprietary ESG Ratings model which for its governance category, includes key issues corresponding to the full range of governance risks and opportunities. Indicators are designed to capture management best practices related to governance risks and opportunities. Three components related to a company's management capabilities (i.e., Strategy & Governance, Initiative and Performance) are assessed in each key issue. Firms are normally scored on only 4-7 of the most material key issues for its primary industry. On the other hand, for some firms, it is essential to include an additional key issue if a company faces a risk or opportunity that is atypical for the industry. Aside from this, there are also a set of key issues that are applicable to all firms. A 0-10 scale is used for scoring each key issue which comprises of a management score and an exposure score. Both are also on a 0-10 scale. The scored management component of the key issue score (without subtracting for relevant ESG controversies) is used by MSCI ESG KLD STATS and is also on a 0-10 scale.

[3] Negative performance indicators are designed to offer consistent and timely assessments of controversies (related to governance for the current study) surrounding publicly traded firms. They are based on MSCI ESG Research's proprietary Impact Monitor controversies analysis. The ESG Impact Monitor's evaluation framework is guided by international norms represented in several global conventions far and wide. These include the UN Global Compact, the ILO Declaration on Fundamental Principles and Rights at Work, and the Universal Declaration of Human Rights. In terms of the evaluation process itself, MSCI ESG Research analysts investigate and assess controversies related to the impact of a firm operations and/or its products and services that supposedly are in violation of regulations, national or international laws, and/or commonly accepted global norms.

1997). R&D investment can therefore be used as a proxy for innovation effort (*see for example* Balkin, Markman, & Gomez-Mejia, 2000; Hoskisson, Hitt, Johnson, & Grossman, 2002; Miller & Del Carmen Triana, 2009). The study employs 3 proxies for innovation: R&D expenditure, R&D/total sales and R&D/total assets, the latter two representing firm R&D intensity. R&D measures the effort with which firms pursue new and modified products, or new knowledge. R&D expenditures are also empirically more appealing as efforts in R&D can be carried out rather quickly and hence are more easily linked to specific events and must be immediately expensed (Honoré et al., 2015). Therefore R&D is more observable and have greater potential of providing clear evidence of the interplay between corporate governance and firm innovation efforts.

2.4.4 Measurement of Firm Performance

The study utilizes average firm performance values for the following 5 years (i.e., t+1 to t+5) where current year performance values are excluded since research and development expenditures can be expected to decrease income for the current year. Return on Assets (ROA or net income as fraction of total assets), Return on equity (ROE or net income as fraction of shareholder's equity) and Earnings per Share (EPSFI or earnings per share *diluted* including extraordinary items) are utilized as proxies for firm performance (*see for example* Joh, 2003; Bauer et al., 2004; Sher and Yang, 2005; Reddy et al., 2010). While ROA is a key indicator of how profitable a firm's assets are in generating revenue (measured by the ratio of net profit over total assets), ROE is an important financial measure of how efficiently a firm utilizes shareholder's equity (assessed by the ratio of net profit over shareholder equity). EPSFI is another robust measure of how profitable a firm is. This is reflected by the portion of a firm's earnings, net of taxes and preferred stock dividends that is allocated to each share of common stock. All three measures are accounting based measures of profitability which is likely a better performance measure compared to stock market based measures. This is related to the fact that stock prices are not as likely to reflect all available information when inefficiency can be detected in the stock market. Also, accounting based measures of profitability are more directly related to a firm's financial survivability compared to its stock market value.

Accounting based measures also allow for the evaluation of performance of both privately held and publicly traded firms (Joh, 2003).

2.4.5 Control Variables

The study follows the innovation literature and controls for potential observable firm characteristics to account for other factors that can influence firm innovation effort and consequently firm performance. Control variables included are a firm's size, earnings intensity, advertising intensity leverage, and investment intensity (*see for example* Acs and Audretsch, 1988; Opler and Titman, 1994; Crepon et al., 1998; Srinivasan et al., 2008; Souitaris, 2002; Timmer, 2003; Hosono et al., 2004; Cho, 2016). The current study utilizes the following proxies for firm characteristics: Total Assets (firm size), EBITDA/Total Assets (earnings intensity), Advertising/ Total Assets (advertising intensity), Total Debt/Total Assets (firm leverage), and Capital Expenditures/ Total Assets (firm investment intensity). Additionally, overall awareness of firm governance-related policies and practices have increased over the years, therefore the study also controls for this variation over time in firm diversity by including year dummies. Because it is necessary to account for possible industry effects, the current study therefore controls for industry effects (in certain regressions where it is econometrically advisable to include industry dummies) by generating industry dummies corresponding to the first two digits of the standard industrial classification (SIC) code.

2.4.6 Empirical Approach

The current study uses both Ordinary Least Squares (OLS) regression and Tobit analysis (with panel-level random effects) to explore the association between corporate governance and innovation. OLS regression is utilized to test the association between corporate governance and the study's innovation proxies for the full sample, while controlling for firm characteristics. It is also utilized to test the association between the study's corporate governance and firm performance for the full sample, while controlling for firm innovation effort and firm characteristics.

An OLS regression allows for variation in the study variables, across time and across firms, with the clustering of standard errors at the firm level. However,

while an OLS regression treats the reported research and development expenses as actual values (including those below the 0 threshold) and not as the upper limit of firms investing in research and development. A drawback of such an approach is that when there is a censoring of the variable, an OLS is unable to provide consistent estimates of the parameters. Hence, coefficients generated from the analysis may not always move closer to the true population parameters as the sample size expands (see Long, 1997).

Therefore, further analysis to check for robustness is conducted utilizing Tobit analysis (with panel-level random effects) as it allows for estimating linear relationships between variables where the dependent variable is observed to have either left or right censoring (i.e., below and above censoring). In the current study's case, censoring from below, for example, takes place when firms reporting research and development expenses fall at or below the 0 threshold are censored (*see* McDonald and Moffitt, 1980). Tobit analysis is utilized to test the association between corporate governance and the study's innovation effort proxies (i.e., R&D expenditures, R&D/Total Sales and R&D/Total Assets) for the full sample, while controlling for firm characteristics. It is also utilized to test the association between the study's corporate governance and firm performance (i.e., ROA, ROE, EPSFI) for the full sample, while controlling for firm innovation effort and firm characteristics. To address outliers where applicable, 0% / 1% - 99% winsorization is undertaken (refer to Appendix B1).

2.5 Empirical Findings

The current chapter addresses two key research questions. The first research question aims to investigate the influence of corporate governance on firm innovation. The second research question aims to investigate the effects of R&D activity on firm performance while holding corporate governance at a constant. Both these questions are reflected in the study's two main hypotheses and six sub-hypotheses. The following section presents the empirical findings for the chapter while addressing the study's hypotheses utilizing two models. Model 1 provides empirical findings and addresses the study's hypotheses utilizing OLS regression

analysis. A robustness check is then conducted utilizing Model 2 (where Tobit analysis is adopted to address the same hypotheses).

Table 2.1 Summary Statistics for Full Sample

This table presents descriptive statistics of the sample which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 15,761 firm year observations of U.S. firms from 1993 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Firm level CG is measured utilizing the composite corporate governance score for a firm in a given year, which includes the total number of CG strengths minus total number of CG concerns. Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm performance is measured utilizing ROA (net income as a fraction of total assets), ROE (net income as fraction of shareholder's equity), and EPSFI (portion of a firm's earnings, net of taxes and preferred stock dividends allocated to each share of common strock). Firm characteristics included as control variables include Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

CG	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
GovScore	-0.331	0	0.710	-4	2	-0.270	3.685
Innovation Effort	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
R&D Expense	163	6.962	549	0	4146	5.581	36.972
R&D/Sales	0.045	0.005	0.082	0	0.480	2.780	12.129
R&D/Assets	0.031	0.005	0.049	0	0.239	2.053	7.154
Firm Performance	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
ROA	0.052	0.057	0.090	-0.368	0.272	-1.603	9.155
ROE	0.071	0.059	0.277	-1.648	1.548	-1.055	21.469
EPFSI	1.487	1.36	2.303	-7.74	9.47	-0.178	7.137
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
Total Assets *(log)*	7.627	7.520	1.553	2.772	13.590	0.404	2.991
EBITDA/Assets	0.147	0.140	0.089	-0.143	0.428	0.149	4.645
Advertise/Assets	0.013	0	0.031	0	0.182	3.309	14.965
Cap. Exp./ Assets	0.052	0.036	0.049	0.002	0.270	2.118	8.173
Debt/ Assets	0.172	0.145	0.174	0	0.766	0.971	3.585

Table 2.2 Summary Statistics by Corporate Governance

This table presents descriptive statistics (mean, median, standard deviation, minimum and maximum values) of the sample by weak versus moderate to strong corporate governance performing firms, based on firm year observations. This study's full sample consists of 15,761 firm year observations of U.S. firms from 1993 to 2013, excluding firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Weak (moderate to strong) corporate governance performing firms consists of firms with corporate governance scores of below zero (above zero), between 1993 and 2013. Weak performing corporate governance firms comprise of 14,438 firm year observations. Moderate to strong corporate governance firms comprise of 1,324 firm year observations.

	GovScore < 0 = 14,438			**GovScore > 0 = 1,324**		
	Mean	**Median**	**Sd**	**Mean**	**Median**	**Sd**
GovScore	-0.457	0	0.598	1.043	1	0.204
R&D Expense	158.578	7.531	530.251	213.862	2.369	721.309
R&D/Sales	0.046	0.005	0.083	0.037	0.002	0.068
R&D/Assets	0.031	0.005	0.050	0.027	0.002	0.044
ROA	0.051	0.057	0.090	0.066	0.066	0.081
ROE	0.069	0.056	0.281	0.093	0.080	0.229
EPFSI	1.470	1.37	2.319	1.673	1.32	2.112
Total Assets *(log)*	7.650	7.549	1.521	7.361	6.994	1.852
EBITDA/Assets	0.147	0.140	0.088	0.157	0.148	0.090
Advertise/Assets	0.013	0	0.030	0.016	0	0.036
Cap. Exp./Assets	0.052	0.036	0.048	0.057	0.038	0.054
Debt/ Assets	0.176	0.150	0.175	0.136	0.088	0.154

2.5.1 Descriptive Statistics

Table 2.1 displays overall summary statistics for the study's independent, dependent and control variables. Summary statistics include the mean, median, standard deviation, minimum, maximum, as well as the skewness and kurtosis values, for 15,761firm year observations across 1993 to 2013 and excludes firms from the

finance and utilities SIC industry groups.

The average score for corporate governance is -0.331 (minimum= -4 and maximum =2). It is noted that most firms in the sample are weak in their overall corporate governance with more corporate governance concerns registered for majority of firms than strengths. Table 2.2 displays overall summary statistics by a firm's corporate governance score (i.e. firms receiving a corporate governance score of above zero or otherwise) based on firm year observations. Between 1993 and 2013, based on the number of firm year observations, there is indication that less than fifty percent of the sample had a total corporate governance score of above 0. Majority of firms in the sample either did not adopt, or had very weak corporate governance related policies/practices. Overall, the statistics show that firms having a corporate governance score of zero or below have slightly lower mean values in terms of research development expenditures, as well as lower mean values on all three firm performance measures (i.e., ROA, ROE, and EPSFI).

2.5.2 OLS Regression- Model 1

In Model 1, the study's two main hypotheses and six sub-hypotheses are addressed utilizing OLS regression analysis.

2.5.2.1 Model 1a: OLS Regression- Corporate Governance and Firm Innovation Effort

Model 1a addresses Hypothesis 1 which states that there is a positive relation between corporate governance and innovation. Specifically that this relationship is positive between corporate governance and R&D expenditures, corporate governance and R&D/Total Sales, and corporate governance and R&D/Total Assets. Table 2.3 reports the OLS regression results for Corporate Governance and Innovation effort for the full sample.

Hypothesis 1a states that there is a positive relation between corporate governance and R&D expenditures. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Thus, Hypothesis 1a is supported. On the other hand, a follow up analysis by firm market capitalization, which is the total dollar market value of a firm's outstanding shares and more commonly used by the

investment community to determine a firm's size, further reveals that this result is only significant and negative for small cap firms (refer to Appendix B2).

Hypothesis 1b states that there is a positive relation between corporate governance and R&D/Total Sales. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Sales is negative. Thus, Hypothesis 1b is not supported. Furthermore, this result is significant and negative for small, mid, and large cap firms alike (refer to Appendix B3).

Hypothesis 1c states that there is a positive relation between corporate governance and R&D/Total Assets. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is negative. Thus, Hypothesis 1c is not supported. Additionally, this result if only significant and negative for small and mid-cap firms (refer to Appendix B4).

Table 2.3 OLS Regression: Corporate Governance and Innovation Effort

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 1 using a sample of 15,761 U.S. firms from 1993 to 2013. The independent variable is firm level corporate governance (GovScore). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the coloumn “Sig.”. Coefficients are shown in the column “Coef.”. A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-1331.01	0.000	0.121	0.001	0.083	0.000
GovScore	39.625	0.010	-0.007	0.000	-0.004	0.000
Total Assets *(log)*	199.413	0.000	-0.005	0.000	-0.004	0.000
EBITDA/Assets	189.068	0.118	-0.221	0.000	-0.062	0.000
Advertise/Assets	798.478	0.043	-0.037	0.374	0.020	0.480
Cap. Exp./Assets	462.760	0.068	-0.008	0.744	0.009	0.594
Debt/Assets	-377.321	0.000	-0.047	0.000	-0.033	0.000
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
R2	*0.355*	-	*0.374*	-	*0.382*	-
No. of Observations	*15761*	-	*15761*	-	*15761*	-

2.5.2.2 Model 1b: OLS Regression- Corporate Governance, Firm Innovation Effort and Performance

Model 1b addresses Hypothesis 2 which states that there is a positive relation between innovation effort and firm performance, while holding corporate governance at a constant. Specifically that this relationship is positive between innovation effort and ROA, innovation effort and ROE, and innovation effort and EPSFI. For Model 1b, R&D/Total Sales is selected as a proxy for firm innovation, for two reasons: first, to avoid multi-colinearity problems that can arise if all 3 innovation effort proxies are included; second, as corporate governance had a significant and negative effect on both R&D/Total Sales and R&D/Total Assets (in Hypothesis 1). Table 2.4 reports the OLS regression results for innovation effort and firm performance, holding corporate governance constant, for the full sample.

Hypothesis 2a states that there is a positive relation between innovation effort and ROA, while holding corporate governance constant. Based on the OLS regression results from Model 1b, R&D/Total Sales is statistically significant (P value < 0.05) but with a negative coefficient. Thus, Hypothesis 2a is not supported.

Hypothesis 2b states that there is a positive relation between innovation effort and ROE, while holding governance constant. Based on OLS regression results from Model 1b, R&D/Total Sales is not statistically significant (P value > 0.05). Thus, Hypothesis 2b is not supported.

Hypothesis 2c states that there is a positive relation between innovation effort and EPSFI, while corporate governance constant. Based on OLS regression results from Model 1b, R&D/Total Sales is statistically significant (P value < 0.05) but with a negative coefficient. Thus, Hypothesis 2c is not supported.

Table 2.4 OLS Regression: Corporate Governance, Innovation Effort and Performance

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 2 using a sample of 12,541 U.S. firms from 1993 to 2013. The independent variable is firm innovation, i.e., R&D/Total Sales. The dependent variables include average firm ROA, ROE and EPSFI for the following 5 years (i.e., excluding current year performance values). To check for the effect of firm innovation effort on the relationship between firm level corporate governance and firm performance, firm level corporate governance (GovScore) is controlled for. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are also controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	ROA		**ROE**		**EPSFI**	
R&D/Total Sales	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Constant	-0.053	0.035	-0.29858	0.000	-4.036	0.000
GovScore	0.0001	0.954	0.0003	0.946	0.094	0.019
R&D/Total Sales	-0.070	0.005	-0.130	0.076	-2.901	0.000
Total Assets *(log)*	0.002	0.005	0.0167	0.000	0.391	0.000
EBITDA/Assets	0.456	0.000	0.606	0.000	6.914	0.000
Advertise/Assets	0.101	0.006	0.189	0.347	-0.484	0.740
Cap. Exp./Assets	-0.149	0.000	-0.119	0.175	-2.709	0.001
Debt/Assets	-0.037	0.000	0.026	0.499	-0.889	0.000
Mean dependent var		0.052		0.094		1.617
R-squared		0.389		0.136		0.275
F-test		.		.		.
Akaike crit. (AIC)		-36590.096		-5268.965		49129.218
SD dependent var		0.072		0.210		2.002
Number of obs		12541		12541		12541
Prob > F		.		.		.
Bayesian crit. (BIC)		-36024.902		-4703.772		49694.412

2.5.3 Tobit Analysis- Model 2

In Model 2, to check for robustness in results, the study's two main hypotheses and six sub-hypotheses are addressed again utilizing Tobit analysis.

2.5.3.1 Model 2a: Tobit Analysis- Corporate Governance and Firm Innovation Effort

Model 2a addresses Hypothesis 1 which states that there is a positive relation between corporate governance and innovation. Specifically that this relationship is positive between corporate governance and R&D expenditures, corporate governance and R&D/Total Sales, and corporate governance and R&D/Total Assets. Table 2.5 reports the Tobit results for Corporate Governance and Innovation effort for the full sample.

Hypothesis 1a states that there is a positive relation between corporate governance and R&D expenditures. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Thus, results remain robust where Hypothesis 1a is still supported.

Hypothesis 1b states that there is a positive relation between corporate governance and R&D/Total Sales. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is negative. Thus, results remain robust where Hypothesis 1b is still not supported.

Hypothesis 1c states that there is a positive relation between corporate governance and R&D/Total Assets. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is negative. Thus, results remain robust where Hypothesis 1c is still not supported.

Table 2.5 Tobit Analysis: Corporate Governance and Innovation Effort

This table presents the Tobit estimation results as a robustness check for Hypothesis 1 using a sample of 15,761 U.S. firms from 1993 to 2013. The independent variable is firm level corporate governance (GovScore). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	*-2157.3*	0.000	0.106	0.000	0.077	0.000
GovScore	28.385	0.001	-0.012	0.000	-0.007	0.000
Total Assets *(log)*	276.268	0.000	-0.004	0.000	-0.004	0.000
EBITDA/Assets	65.080	0.344	-0.303	0.000	-0.084	0.000
Advertise/Assets	980.690	0.000	-0.023	0.502	0.052	0.01
Cap. Exp./ Assets	68.826	0.691	-0.097	0.000	-0.026	0.097
Debt/Assets	-743.680	0.000	-0.091	0.000	-0.062	0.000
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
Pseudo R2[4]	*0.0723*	-	*-8.689*	-	*-1.1928*	-
LR Chi2 (66)[5]	*10738.3*	-	*11172.22*		*11321.4*	
Prob > chi2[6]	*0.000*		*0.000*		*0.000*	
No. of Observations	*15761*	-	*15761*	-	*15761*	-

[4] This is the Tobit McFadden's pseudo R-squared, which is not an equivalent to the OLS regression and therefore does not mean what R-square means in an OLS regression (i.e., the proportion of variance of the response variable explained by the predictors). The LR Chi2 and Prob>chi2 values are therefore also reported as an alternative to the pseudo R-squared reported by Tobit.

[5] The Likelihood Ratio (LR) Chi-Square tests that at least one of the predictors' regression coefficient is not equal to zero. The degrees of freedom of the Chi-Square distribution test is the number in the parentheses and is used for testing the LR Chi- Square statistic. It is defined by the number of predictors in the model.

[6] This represents the probability of getting a LR test statistic as extreme as, or more so, than the observed statistic under the null hypothesis (i.e., that all of the regression coefficients are simultaneously equal to zero). It is the likelihood of obtaining chi-square statistics of the model or one more extreme if indeed the predictor variables have no effect. A comparison is undertaken of the p-value against a specified alpha level, which is our willingness to accept a Type I error. This is normally set at 0.05 or 0.01. The small p-value from the LR test, <0.0001, implies that at least one of the regression coefficients in the model is not equal to zero. The degree of freedom in the prior line, chi2(df) defines the parameter of the chi-square distribution that is utilized for testing the null hypothesis.

2.5.3.2 Model 2b: Tobit Analysis- Corporate Governance, Firm Innovation Effort and Performance

Model 2b addresses Hypothesis 2 which states that there is a positive relation between innovation effort and firm performance, while holding corporate governance at a constant. Specifically that this relationship is positive between innovation effort and ROA, innovation effort and ROE, and innovation effort and EPSFI. For Model 1b, R&D/Total Sales is selected as a proxy for firm innovation, for two reasons: first, to avoid multi-colinearity problems that can arise if all 3 innovation effort proxies are included; second, as corporate governance had a significant and negative effect on both R&D/Total Sales and R&D/Total Assets (in Hypothesis 1). Table 2.6 reports the Tobit results for innovation effort and firm performance for the full sample.

Hypothesis 2a states that there is a positive relation between innovation effort and ROA. Based on Tobit results from Model 2b, R&D/ Total Sales is statistically significant (P value < 0.05), but with a negative coefficient. Thus, results remain robust where Hypothesis 2a is still not supported.

Hypothesis 2b states that there is a positive relation between innovation effort and ROE. Based on Tobit results from Model 2b, R&D/ Total Sales is statistically significant (P value < 0.05), but with a negative coefficient. However, while Hypothesis 2b is still not supported, it is found that results are not robust as this relationship (even though negative) is insignificant in Model 1b.

Hypothesis 2c states that there is a positive relation between innovation effort and EPSFI. Based on Tobit results from Model 2b, R&D/Total Sales is also statistically significant (P value < 0.05) but with a negative coefficient. Thus, results remain robust where Hypothesis 2c is still not supported.

Table 2.6 Tobit Analysis: Corporate Governance, Innovation Effort and Performance

This table presents the Tobit estimation results for Hypothesis 2 as a robustness check using a sample of 12,541 U.S. firms from 1993 to 2013. The independent variable is firm innovation, i.e., R&D Expenditures (in $000,000's). The dependent variables include firm ROA, ROE and EPSFI for the following 5 years (i.e., excluding current year performance values). To check for the effect of firm innovation effort on the relationship between firm level corporate governance and firm performance, firm level corporate governance (GovScore) is controlled for. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are also controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	ROA		**ROE**		**EPSFI**	
R&D/Total Sales	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Constant	-0.053	0.000	-0.298	0.000	-4.058	0.000
GovScore	0.00002	0.981	0.0002	0.928	0.094	0.000
R&D/Total Sales	-0.070	0.000	-0.130	0.000	-2.897	0.000
Total Assets *(log)*	0.002	0.000	0.017	0.000	0.393	0.000
EBITDA/Assets	0.459	0.000	0.607	0.000	6.956	0.000
Advertise/Assets	0.010	0.000	0.190	0.028	-0.474	0.432
Cap. Exp./Assets	-0.151	0.000	-0.120	0.022	-2.711	0.000
Debt/Assets	-0.037	0.000	0.027	0.188	-0.894	0.000
Mean dependent var		0.052		0.09437		1.617
Pseudo R-squared		-0.206		-0.53225		0.075
F-test		69.673		23.58863		62.033
Akaike crit. (AIC)		-36040.669		-5084.09508		49291.288
SD dependent var		0.072		0.20968		2.002
Number of obs		12541		12541		12541
Prob > F		0.000		0.000		0.000
Bayesian crit. (BIC)		-35445.728		-4489.154		49886.229

2.6 Discussion of Empirical Findings

This following section focuses on the interpretation of the empirical results based on the chapter's two key research questions and their corresponding hypotheses. The first research question addresses the influence of corporate governance on firm innovation. The second research question considers the effects of innovation effort on firm performance while holding corporate governance at a constant. Discussion first focuses on whether empirical findings and analysis offer evidence supporting the notion that stronger corporate governance promotes greater firm innovation effort before moving on to discuss evidence on the impact of this relationship on overall firm performance.

2.6.1 Does Stronger Corporate Governance Mean Greater Firm Innovation Effort?

The study's first research question explored the impact of corporate governance on firm innovation effort in the U.S. context, drawing on data from 15,761 firm year observations from 1993 to 2013. Specifically, the first research question addresses the relationship between firm corporate governance performance and firm R&D Expenditures, R&D/Total Sales and R&D/Total Assets- the study's 3 innovation effort proxies. Based on results of the data analysis for this research question, it is found that higher governance scores is associated with higher investments in R&D but overall lower R&D intensity.

OLS results reveal a significant and positive relationship between corporate governance performance and R&D expenditures. R&D expenditures increases on average by 39,625,000 USD when corporate governance performance goes up by 1 score point. This finding is in line with studies by Lhuillery (2011), Becker-Blease (2011), Dong and Gou (2010), Aghion et al. (2009), and Baysinger et al. (1991) where a similar relationship between individual firm level corporate governance mechanisms and investments in R&D is also noted.

However, while a significant and positive relationship between corporate governance and R&D investment is found, this relationship is significant and negative for both R&D/Total Sales and R&D/Total Assets (ratios associated with firm level R&D intensity). R&D/Total Sales and R&D/Total Assets decreases, on average by

0.7% and 0.04% respectively, when corporate governance performance goes up by 1 score point. Results remain robust when modelling firms with zero R&D expenditures differently in the Tobit estimation. A significant and positive relationship between corporate governance and R&D expenditures can still be found. In the Tobit estimation, R&D expenditures increases, on average by 28,385,000 USD, when corporate governance performance goes up by 1 score point. The relationship for both R&D/Total Sales and R&D/Total Assets also remains significant and negative. R&D/Total Sales and R&D/Total Assets decreases, on average by 1.2% and 0.7% respectively, when corporate governance performance goes up by 1 score point. This result suggests that better corporate governance performance is associated with higher investments in R&D, but weaker R&D intensity of firms. In other words, the better a firm performs in meeting corporate governance yardsticks, the more likely it is to have overall lower R&D intensity despite having higher investments in R&D.

The results overall challenge the theoretical framework proposed for the current study based on agency theory. While the intention of the model is to reflect the view that corporate governance has potential of being utilized to promote an environment where the CEO is motivated and effectively supervised to innovate, results reveal otherwise. The findings suggest that shareholders could be promoting effective corporate governance practices that create incentives among managers for maximizing the value of their investment that deviates away from efficient utilization of R&D expenditures for firm innovation effort. Hence, in the context of the innovating firm, it is not always the case that effective corporate governance practices promotes efficient firm innovation effort.

The extant literature offers some evidence and discussion in line with the findings of the current study. In the context of the innovating firm, both internal and external corporate governance mechanisms could in some situations lead to decreased or more inefficient firm innovation effort. For instance, in terms of internal corporate governance mechanisms, Honore et al. (2015) find that the more consensual the vote at the shareholders assembly then the lower the R&D intensity among 177 European companies (2003-2007). This suggest that when there is a large consensus at the annual general meeting between shareholders and managers, it is likely in favor of short-term decisions as opposed to long-term projects that involve R&D investment.

The study also observes that financial performance based remuneration have a negative effect on R&D intensity of large publicly traded European companies. This suggests that even though financial incentives could align interests of shareholders and managers, incentive effects appear limited to short-term results that can lower R&D intensity.

2.6.2 How is Firm Performance Impacted?

The study's second research question further explored the impact of a firm's innovation effort on its performance, for the same panel dataset. Specifically, the second research question addresses the relationship between firm innovation and firm ROA, ROE and EPSFI (selected proxies for firm performance). Based on results of the data analysis for this research question, it is overall found that a firm's innovation effort has no positive effect on its profitability, while holding other variables constant.

The OLS results reveal a significant (but negative) relationship between R&D/Total Sales with ROA and EPSFI. Overall results are not consistent with the proposed mediation hypothesis. No effect of a firm's innovation effort on its performance is found. The results remain robust when modelling firms with zero R&D/Total Sales differently in the Tobit estimation. The relationship between R&D/Total Sales with firm ROA and EPSFI still remain significant and negative.. Findings of the study differ from the Zhang et al (2014) study that find R&D investment to mediate the relationship corporate governance and performance of Chinese listed IT firms.

Additionally, a significant and positive effect is found between firm level corporate governance performance and EPSFI. EPSFI increases on average by 9.4% when corporate governance performance goes up by 1 score point. Results remain robust when modelling firms with zero R&D expenditures differently in the Tobit estimation. A significant and positive relationship between corporate governance and EPSFI still exist. In the Tobit estimation, EPSFI increases, on average by 9.4% when corporate governance performance goes up by 1 score point.. This result offers some evidence to suggest that better alignment of incentives between shareholders and firm

management (through better corporate governance performance) leads to a focus on increasing short-term profits that deviates away from innovation effort.

Overall results offer differing evidence that lacks support for the notion that a firm's corporate governance performance plays a key role in driving the relationship between a firm's innovation efforts (i.e., increase in R&D investment) and its performance. No evidence for an overall positive relationship between firm level corporate governance and innovation effort is found in the current study. In turn, it is also found that innovation effort has no positive effect on firm profitability. Therefore, the expected mediating relationship from better corporate governance to more firm innovation effort to enhanced firm performance is not supported in the current study.

On the other hand, the empirical findings suggest that an emphasis on enhancing firm short-term profitability through improved corporate governance that better aligns incentives between shareholders and firm management comes at the expense of firm innovation. A plausible explanation for this trend could be related to the investor sentiment and the risk associated with innovation effort. While innovation can be considered a driving force for firm economic success that promotes firm value and enhance long-term growth of innovative firms, the risk and costs associated with innovation can also be anticipated to impact a firm's value and performance negatively.

Aside from the view that investment decisions are made to maximize shareholder wealth, managers may in practice have incentives to go after short-term sub-optimal investments so as to accommodate the investor sentiment. In the context of investment decisions, shareholders are viewed as risk neutral as they have the ability to diversify their overall investment across several firms. Managers on the other hand are viewed as risk-averse as a result of being able to put their effort into only one job (Honore et al., 2015). In such a situation managers would favor short term gains brought about by efficiency-seeking strategies. This could hinder innovation and long-term returns.

2.7 Conclusion and Future Research

Prior studies have investigated corporate governance and innovation effort in the U.S. context, but with a focus on individual dimensions of corporate governance, majority showing preference towards the Gompers et al., (2003) governance index whose measures are mostly related to anti-takeover provisions. This has led to diverse empirical evidence that lack overall cohesiveness. Since firms at the present time are considered more multidimensional with various types of governance mechanisms interacting with one another, the current study adopts an extended approach by utilizing a more complete measure of firm level corporate governance.

Motivated by agency theory, the current study investigates whether innovation effort (i.e., investment in R&D and R&D intensity) is greater for firms showing superior governance performance and the overall impact this relationship has on firm performance. Using a panel dataset of U.S. publicly listed companies comprising of 15,761 firm year observations for the 1993-2013 period, the study first addressed the effect of corporate governance performance on firm innovation effort and then the mediating effects of innovation effort on firm performance (while holding corporate governance at constant) through both OLS and Tobit estimations.

Results from both estimations offer three key findings, after controlling for several firm, industry and year factors. Firstly, contrary to the proposed relationship between corporate governance and innovation, the study observes an overall significantly negative relationship between corporate governance performance and firm innovation. Secondly, there is no positive mediation effect of innovation on firm performance, while holding corporate governance at a constant. Thirdly, an overall significantly positive relationship between corporate governance and firm performance is noted.

Findings of the study diverge from other studies that observe a positive relationship between corporate governance and firm innovation. Overall results not only confirm the impact of governance practices on a firm's innovation effort but also hint at the unintended consequences that corporate governance could have such as its potential in obstructing a firm's innovation projects. In principle, in the context of the innovating firm, good corporate governance can be anticipated to enhance management motivation and risk-taking which in turn increases investments in R&D

while enhancing the innovativeness of firms. However, findings from the current study suggest otherwise. It appears that shareholders could be promoting effective corporate governance practices that create incentives among managers for responding to short-term expectations of financial markets which is detrimental to long-term R&D activity.

Honore et al. (2015) offer an additional explanation for this trend. Certain governance trends may not be suitable for highly R&D intensive firms while governance provisions that emphasize financial control and contestability within the ownership base of firms could inevitably discourage risk-taking and innovation. Hence, the empirical findings may also be mirroring a trend that had emerged after the SOX reforms were introduced in the U.S. that led to the reduction in R&D activity of publicly-listed companies (*see for example* Bargeron et al., 2010; Cohen et al., 2009).

Findings of the current study offer several possible avenues for future research. Future studies considering the relation between corporate governance and innovation could address separately the impact of internal versus external corporate governance mechanisms which could offer better insight into the role and influence of each on firm innovation effort. Additionally, future studies can also address the overall mediating effects of innovation effort utilizing firm performance measures that better captures overall firm long-term performance and growth as well as shareholder value creation.

CHAPTER III
WORKFORCE DIVERSITY, INNOVATION EFFORT, AND FIRM PERFORMANCE

3.1 Introduction

Though it is believed that innovation requires smarter people and better ideas, this notion, despite being intuitive, overlooks what could be the most potent but least understood force, i.e., diversity. While at first glance diversity, which include differences such as in race, gender, ethnicity, physical capabilities, sexual orientation, social or political differences, might have little to do with innovation, however the key to innovation, in economic terms, rests inside the heads of people, the more diverse the better. Hence, any understanding of innovation's role in economic growth should focus on both diversity as well as ability despite their link not being immediately obvious (Page, 2007).

A tacit understanding of diversity's role in innovation is revealed in both the intellectual landscape and policies of successful companies. The works of Florida (2002, 2005) and Nalebuff and Ayres (2003) all touch on the link between diversity and innovation. Some of the innovation policies of Toyota Motor Corp. and Google Inc., for instance, demonstrate a similar understanding that differences in the composition of their work forces ultimately boosts bottom lines (Page, 2007). Moreover, issues concerning workforce diversity have garnered much attention in recent years. Numerous developed and developing countries have experienced an evolution in workforce composition which has brought about rising heterogeneity of the labor force in terms of age, genders, skills, ethnicity, etc. This is partially the result of policies adopted to counteract issues like the aging population, discrimination, immigration, as well as globalization (Pedersen et al., 2008). The promotion of workforce diversity is viewed as an opportunity to enhance learning and knowledge management capabilities which then boosts firm productivity (Parrotta et al., 2011).

Increasingly, workforce diversity is believed to be an important source of innovation (Parrotta et al., 2012).

Even though majority of managers accept the notion that employers benefit from a diverse workforce, this can be challenging to prove or even quantify, especially when it relates to assessing how diversity impacts a firm's ability to innovate. Nonetheless, new research is beginning to offer compelling evidence that diversity indeed unlocks innovation and is another key driver for market growth (Hewlett et al., 2013). A survey by the European Commission (2005) for instance, found that innovation was a key benefit of having diversity policies and practices. Additionally, workplace diversity related to gender and age (Cady and Valentine, 1999; Galia and Zenou, 2012), culture (Richard, 2000; Niebuhr, 2010; Lee and Nathan, 2011; Ozgen et al., 2011; Bosetti et al., 2012;), ethnicity (Cady and Valentine, 1999; Nathan, 2011; Parrotta et al., 2012; Lee, 2014), social background (Qian and Stough, 2011), experience and education (Auh and Menguc, 2005; Talke et al., 2010; Talke et al., 2011; Østergaard et al., 2011) have all been linked to firm innovation, with the majority of studies observing potential benefits of having an increased diverse workforce.

If this is the case then firms could indeed benefit from an increase in diverse social and cultural backgrounds, as well as demographic and knowledge bases of the workforce. Furthermore, as there is prevalent consensus that innovation is crucial for sustainable growth and economic development, understanding the link between workforce diversity and innovation also proves essential for policy makers (Parrotta et al., 2012). While the empirical literature offers evidence of the potential benefits of workforce diversity unlocking firm innovation, much of the evidence is derived mainly from business case studies focusing specifically on discussing top management team diversity (Bantel and Jackson, 1989; Knight et al., 1999; Pitcher and Smith, 2001) or work-team compositions (Horwitz and Horwitz, 2007; and Harrison and Klein, 2007).This could be attributed to a scarcity in comprehensive employer-employee data offering a notable amount of firm level labor force composition information as well as variations in research aims and approaches. Nonetheless, a few recent studies have been able to utilize more comprehensive datasets spanning longer periods to address the diversity-innovation relationship in the

context of European developed economies (*see for example* Østergaard 2011; Parrotta et al., 2012).

The current study extends the ongoing debate on diversity and firm innovation and expands the existing literature in several directions. First, the study contributes to the emergent literature on the determinants of corporate innovation. Majority of recent studies have focused on both managerial and firm characteristics and behavior to explain variation in innovation productivity. Most of them find that firm characteristics are a better predictor of corporate innovation outcomes. Cho et al. (2016) for example, observe that managerial characteristics better explain the heterogeneity in corporate innovation productivity compared to firm characteristics. A few studies have begun to address the direct relationship between employee characteristics and firm innovation. Parrotta et al. (2012) for instance, find that ethnic diversity among employees plays an important role in propelling a firm's innovation outcomes. The current study contributes to this growing literature by offering evidence and explaining the firm diversity-innovation phenomenon with a focus on employee characteristics in the U.S. context.

Second, the study adds to the literature that examines the effects of workforce diversity on firm innovation. Majority of existing studies tend to focus more on the effects of a few diversity measures that could help explain variation in firm innovation effort. The current study operationalizes its workforce diversity variable from the Morgan Stanely Capital International (MSCI-formerly known as Kinder, Lyndenberg and Domini Research and Analytics or KLD) Environmental, Social and Governance (ESG) Statistical Tool for Analyzing trends (STATS) database. MSCI ESG KLD STATS is considered the "gold standard" of CSR databases (Chatterji, Levine, and Toffel 2009; Wood 2010) and keeps track of several dimensions of CSR, including workforce diversity policies. Moreover, prior academic research contends that commitment to diversity and inclusiveness is an important aspect of CSR (Snider, Hill, and Martin 2003; Colgan 2011). The MSCI ESG KLD STATS database not only offers a greater sample of companies with publicly available data and a longer time-series of observations but also includes data on a broad set of CSR metrics. To the best of the author's knowledge, there currently exists no study

that utilizes a broad-based measure of workforce diversity when addressing its relationship to firm innovation effort in the U.S. context.

Finally, the study offers added insight on the literature investigating the relative importance of the interaction effect of work force diversity and firm innovation on firm performance in the long run. For instance, Blazovich et al. (2013) utilizes a sample of 4,619 firm-year observations from 1996 to 2009 with complete data from the MSCI ESG KLD STATS, Compustat Fundamentals Annual, Risk Metrics Governance and Directors, and Compustat Execucomp Annual Compensation databases to examine the relationship between gay-friendly corporate policies (a subset of MSCI workforce diversity policies), and firm performance outcomes. The study finds that higher firm value and productivity is linked to the presence of gay-friendly policies. Specifically, firms that implement such policies are observed to have higher firm value, productivity, and profitability and vice versa. Firm value and profitability benefits that are related to gay-friendly policies also appear larger for companies with demand for highly skilled labor. However, the extent to which workforce diversity explains the variation between the innovation effort and firm performance relationship has yet to be examined. Thus, the current study expands prior literature by utilizing an extensive range of publicly-traded U.S. companies across several industries and across a longer-time series, which would not only be more representative of the economy as a whole but will enable more robust findings and analysis of the diversity-innovation nexus.

3.2 Prior Empirical Evidence

The current study is related to two main streams of existing research, namely those that address the relationship between workforce diversity and firm innovation and those that focus on the relationship between workforce diversity and firm performance.

3.2.1 Workforce Diversity and Firm Innovation

The notion of diversity holds much significance in a wide range of scientific disciplines (Stirling, 2007). The extant literature highlights the positive link

between diversity in the firm's knowledge base and their innovative capabilities. Some studies contend that firms that are technologically diverse are more innovative and survive longer (Breschi et al., 2003; Suzuki and Kodama, 2004; Garcia-Vega, 2006) while others argue that skills, experience, and diversity of knowledge among employees could benefit from complementarities that allows for nurturing development in other fields (Dosi, 1982; Quintana-Garcıa and Benavides-Velasco, 2008).Such firms can also be expected to have more ability in exploiting internal knowledge through interaction and learning (Lundvall, 1992; Woodman et al., 1993; van der Vegt and Janssen, 2003), as well as wider organizational routines and search activities (Nelson and Winter, 1982; Dosi, 1988), and greater absorptive capacity to enable the firm to exploit external knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002).

Such theories offer the suggestion that workforce diversity should indeed prove beneficial to the innovation effort of the firm. Diversity in the workforce is often considered to be valuable since it could generate broader search space and make firms more open towards new ideas and become more creative. Ideally, diversity should enhance a firm's knowledge base while increasing the interaction between various types of competencies and knowledge (Ostergaard et al., 2011). As cultural, educational and ethnic backgrounds among the workforce becomes more diverse so does the knowledge base of the firm. This in turn enables possibilities for new combinations of knowledge (Schumpeter, 1934).

Existing studies present empirical evidence in support of the benefits of several diversity measures related to the demographics of the workforce on firm innovation. Østergaard et al. (2011) for instance, examines the effect of employee diversity on innovation. Utilizing survey data from 1,648 Danish firms, the study observes that firms with a more balanced gender composition are found more likely to innovate compared to those with higher concentrations in one gender. Firms having a higher number of employees with higher education and diversity in the types of education are also found to be more likely to innovate (*see also* Galia and Zenou, 2012). Several other studies have also noted cultural diversity in terms of race/ethnicity to be beneficial to innovation. Cady and Valentine (1999) for instance conduct a field study of 50 teams in a division of a high-tech Fortune 500 company

and found that as racial diversity increased, the quantity of ideas that contributed to innovation increased.

Similarly, Niebuhr (2010) explores the importance of workforce cultural diversity, for a cross-section of German regions, in relation to innovation output. Findings from the study indicate that diversity matters for innovation effort at the regional level. The empirical evidences points to the differences in knowledge and capabilities of workers from diverse cultural backgrounds that could augment performance of regional R&D sectors. The benefits of diversity therefore seems to outweigh the negative effects. Ozgen et al. (2011) also examine the impact of cultural diversity on innovation by constructing and analyzing a unique linked employer-employee micro-dataset of 4582 firms, based on survey and administrative data obtained from Statistics Netherlands. The study finds strong evidence that firms employing a more diverse foreign workforce are more innovative, especially in terms of product innovations (*see also* Parrotta et al., 2012).

Lee and Nathan (2011) investigates whether culturally diverse firms in London are more innovative by focusing on the role of migrant and minority business owners/ partners based on a survey of 7,400 firms in 2005-7 . The study also finds some evidence to suggest that firms that are diverse tend to be more innovative. Also, small but robust effects are observed for diversity of the management team on the creation and implementation of new products and processes are noted (*see also* Lee and Nathan, 2010; Nathan, 2011; Lee, 2014). Bosetti et al. (2012) analyzes the effects of skilled migration on patenting and citations of scientific publications among 20 European countries. The study observes skilled migrants to positively contribute to the knowledge formation in host countries as they add to the pool of skills in destination markets. They are also found to positively affect native's productivity as new ideas are likely to arise through the interaction of diverse cultures and diverse approaches in problem solving.

Additionally, a few studies have also highlighted the benefits of social diversity on innovation. Qian and Stough (2011) for example, discuss two measures of social diversity that frequently appear in the literature, i.e., the gay index and the Country of Birth (CoB) index, and compares their effects on regional innovation effort. The study distinguishes social diversity from tolerance or openness and contend

that the gay index can better represent tolerance or openness while the CoB index can serve as a better proxy for social diversity. The study finds that the CoB index positively and significantly impacts innovation. The available empirical evidence thus offers some evidence of how inherent and acquired diversity in the workforce could prove beneficial to a firm's innovation effort.

3.2.2 Workforce Diversity and Firm Performance

The link between workforce diversity and firm performance was addressed in Penrose's (1959) work where it is argued that the heterogeneity of the productive services available or potentially available from its resources is what gives each firm its unique character. A key element of these resources is the human capital resources of a firm (Penrose, 1959; Barney, 1991). Such resources possesses not only a cognitive dimension (for example vocational training and experience) but also a demographic dimension (for example gender, age, and cultural background). These dimensions impact how existing knowledge is applied and combined as well as the interaction and communication betweenemployees. There is more or less agreement among studies that greater diversity in the workplace can prove beneficial to overall firm performance.

Richard (2000) for instance examines the relationship between cultural diversity, business strategy and firm performance (i.e., productivity, return on equity and market performance) in the banking industry. The study finds cultural diversity to overall add value as well as contribute to a firm's competitive advantage (*see also* Richard et al., 2004). Joshi, Hui and Jackson (2006) utilized measures like management composition of work units, work team compositions, individual demographic attributes, and sales performance to explore whether in-group/out-group dynamics of diverse workgroups contribute to sales performance differences between members of higher-status majorities and lower-status minorities. The study finds evidence to support this relationship based on a sample of 437 teams in 46 units of a large US firm. Richard et al. (2007) observe racial diversity to display a curvilinear positive relationship to intermediate firm performance (i.e., labor productivity and Tobin's q) at low or high levels of diversity. A positive correlation between racial diversity and long-term firm performance was also noted. Blazovich et al. (2013) also

observe that the presence of gay-friendly policies (a proxy for social diversity) is associated with higher firm value and productivity and note that firms implementing (discontinuing) these policies experience increases (decreases) in firm value, productivity, and profitability. Firm-value profitability benefits that are related with gay-friendly policies are also larger for companies with demand for highly skilled labor.

While the literature agrees on the potential benefits of diversity in the workforce, there is still not much understanding as to its relationship with firm performance especially in the context of the innovating firm. The extant literature in general observes improved firm performance derived from its innovation effort. Ettlie (1998) for instance observes a relationship between R&D investment and firm performance where R&D is vital for technology innovation. In turn, a firm's innovation capabilities have also been found to have a significant impact on a firm's long-term performance (Hitt et al., 1997; Yam et la., 2004; Sher and Yang, 2005). R&D active firms have been found to be a lot more efficient than others (Dilling-Hansen, Madsen, & Smith, 2003) and a firm's expenditures towards R&D appear to have a positive and significant role in influencing productivity growth (Wakelin, 2001) as well as export growth (Guan and Ma, 2003). Contributions for firms with greater R&D intensity is higher than that of firms with lower R&D investment intensity (Amir, Lev, & Sougiannis, 2000). Firm R&D activities have also been found to be significantly associated with future growth opportunities (Deng, Lev, & Narin, 1999). Because workforce diversity is found to be favorable to both firm innovation effort as well as performance, and innovation effort has also been observed to positively impact firm performance, it can therefore be anticipated that in the context of the innovating firm, workforce diversity should be able to explain (to a certain extent) the variation in the innovation-performance relationship.

3.3 Theoretical Framework and Hypothesis Development

3.3.1 Workforce Diversity and Firm Innovation

Motivated by a resource-based view of diversity (*see for example* Richard, 2000) the current study argues that diversity in the workforce serves as a source of sustained competitive advantage because it creates value that is both difficult to imitate and rare. Strategic human resource management theorists for instance contend that a means of gaining competitive advantage is through one of a company's most important assets which is its people. Resources allow a firm to have long lasting competitive advantage if they have no direct substitutes, are hard to duplicate, remain scarce, and allow firms to pursue opportunities (Barney, 1991; Lado, Boyd, & Wright, 1992). Because other sources of competitive advantage, such as physical and technological resources, have become easier to imitate, the key differentiating factor between firms can be how human resources work within an organization (Pfeffer, 1994). The idea behind human capital is that individuals have the necessary knowledge, experience, and skills for providing economic value to firms. Barney and Wright (1998) for instance contend that, in order to contribute to sustainable competitive advantage, human capital must be rare, difficult to imitate, and must create value.

Because diversity unlocks innovation and drives market growth (Hewlett et al., 2013) it can therefore serve as a key source for a firm's competitive advantage. Innovation often relies on groups of individuals in a firm. Various types of individual knowledge come into play to create new ideas or knowledge within the context of a firm's multifaceted social system. Therefore, within a firm, composition of individuals is a key factor for understanding innovation. This is because diversity of a firm's employee composition ultimately contributes to diversity in its knowledge base. Since innovation is a process that is interactive, enabling employees to interact in groups while developing, discussing, modifying and realizing new ideas, diversity in groups can therefore be anticipated to influence innovation effort (van der Vegt and Janssen, 2003). Heterogeneity among workers in terms of skills, education and more broadly in knowledge among employees appear to be beneficial rather than detrimental to the innovation process (Parrotta et al., 2012).

Differences in demographics such as age may also facilitate the innovation process because there exist complementarities between human capital of younger and older workers. Younger employees for instance may have knowledge of new technologies and IT, while older employees may possess better understanding and experience with the intra-firm structures and operating processes (Lazear, 1998). People of different cultural backgrounds may also provide diverse perspectives, valuable ideas, and problem-solving abilities and in turn facilitate the achievement of optimal creative solutions, therefore stimulating the innovation process (Watson et al. 1993; Drach-Zahavy and Somech, 2001; Hong and Page, 2001 and 2004). For instance, people of different ethnic backgrounds may possess knowledge about global markets and customers tastes so they could stimulate firms to improve or develop products sold abroad (Osborne, 2000; Berliant and Fujita, 2008). Therefore, since diversity affects the way knowledge is generated and applied in the innovation process, diversity in the workforce should therefore generally have a positive effect on innovation effort (Østergaard et al., 2011). To test this assumption, the following hypothesis is proposed:

Hypothesis 1: There is a positive relation between workforce diversity and:

1.a R&D Expenditures

1.b R&D/Total Sales

1.c. R&D/Total Assets

3.3.2 Workforce Diversity and Firm Innovation and Performance

Additionally, Miller and Shamsie (1996) contend that scholars taking a resource-based view should consider the contexts within which various kinds of resources will have the best influence on performance, for example comparing predictable and uncertain environments. The resource-based view often ignores the social context (for example strategy, structure, and environment) within which resources are embedded. Additionally, how context influences sustainable firm differences is also not taken into account of (Ginsberg, 1994; Jackson & Schuler, 1995; Oliver, 1997). Barney and Wright (1998) also contend that a firm must be position to exploit and benefit from its resources so as to allow for any characteristic

of a firm's human resources to contribute to its sustained competitive advantage (i.e., in terms of rareness, imitability, and value). Since innovation efforts constitutes part of a firm's business strategy so consideration must be given to this fact when examining how firm performance could benefit from diversity given its business strategy.

Several studies suggest the importance of accounting for additional contextual variables when investigating the effects of diversity on firm performance. Firms adopting a growth strategy look to gain from the transfer of skills such as technical expertise or managerial know-how while spreading risks over a broader base. Internal growth could involve investing in expansion that requires the selling of current products in additional geographic markets (Pearce,1982; Suresh & Orna, 1989). Firms growing in such a fashion can therefore benefit from market-related advantages obtained from cultural diversity for instance (Cox, 1994). Growth strategies can also involve acquiring additional business divisions through diversification, defined as the acquisition of businesses that are related to current product lines or that offer new products (Pearce, 1982; Suresh & Orna, 1989). Growth strategies should be pursued when firms have both the capital and the human talent required to successfully manage and expand the firm. A business pursuing a growth strategy could therefore benefit from employees who are flexible in their thinking and are not likely to be concerned about departing from the status quo (Schuler and Jackson, 1987). In this context, a diverse workforce, where a firm's human capital would bring together different skills, judgment and abilities of its employees, can be anticipated to allow the firm to achieve enhanced performance and growth by unlocking a firm's innovation process.

Therefore, the current study expects R&D activity to be positively related to firm performance, while holding firm level workforce diversity constant. In sum, the following hypotheses are proposed:

Hypothesis 2: There is a positive relation between firm innovation effort and:

2.a ROA

2.b ROE

2.c. EPS

If Hypothesis 1 and 2 are both supported, this is consistent with a mediation relationship: stronger workforce diversity leads to higher firm innovation effort, which in turn leads to better firm performance.

3.4 Sample, Data and Empirical Approach

3.4.1 Sample Size

The current study utilizes secondary data of US publicly listed companies from 1992 to 2013. Panel data on firm R&D expenditures, firm characteristics as well as financial and accounting data (reported in USD) are obtained from the merged CRSP/COMPUSTAT database. This panel dataset is then matched with MSCI's ESG STAT's dataset which includes panel data on firm level workforce diversity. Firms reporting zero R&D expenses are included in the final sample so as to obtain more sample observations (*see for example* Galasso and Simcoe, 2010; Aghion et al., 2009; O'Connor and Rafferty, 2012; Sapra et al., 2013; Cho et al., 2016). Final matched dataset consists of 14,250 firm year observations from 1992 to 2013, excluding firms belonging to the finance and utilities sectors.

3.4.2 Measurement of Firm Level Workforce Diversity

Data on workforce diversity are obtained from the MSCI ESG KLD STATS database where diversity is one among 13 ESG related performance dimension that is assessed based on strength and concern ratings. MSCI rates strengths and concerns in the first 7 dimensions while providing exclusionary screens (i.e., controversial business involvement indicators) in the final 6 dimensions where firms can only register concerns in those categories. The diversity-related measure includes a total of 9 strength areas[7]: CEO is a woman or a member of a minority group,

[7] Positive performance indicators are based on MSCI ESG Research's proprietary ESG Ratings model which for its diversity category, includes key issues corresponding to the full range of firm level workforce diversity risks and opportunities. Indicators are designed to capture management best practices related to diversity risks and opportunities. Three components related to a company's management capabilities (i.e., Strategy & Governance, Initiative and Performance) are assessed in each key issue. Firms are normally scored on only 4-7 of the most material key issues for its primary industry. On the other hand, for some firms, it is essential to include an

company has made notable progress in the promotion of women and minorities, board of directors gender balance, company has outstanding employee benefits or other programs addressing work/life concerns, companies with a demonstrably strong record on purchasing from or contracting with women- and/or minority-owned businesses, company has implemented innovative hiring programs; other innovative human resource programs for the disabled, company has implemented notably progressive policies toward its gay and lesbian employees, company has policies related to employment of underrepresented groups, company has made a notable commitment to diversity that is not covered by other MSCI ratings. Companies receive a score of 1 for meeting an assessment criteria established for a particular strength indicator and zero otherwise. Hence, a company can receive a minimum score of 0 on diversity strength or a maximum score of 7.

Similarly, MSCI also assesses firm diversity based on the number of registered concerns [8] in a given year. Concern areas include controversies related to workforce diversity, non-representation, board of directors' diversity, representation of minorities on the board, and other concerns. Companies receive a score of 1 for every registered concern and zero otherwise (minimum score is 0 and maximum score is 5). As a proxy for workforce diversity, the study adopts MSCI's total number of diversity strengths minus total number of diversity concerns. Because indicators related to a company having gay and lesbian policies and employment of underrepresented groups were only introduced in 1995 and 2010, respectively, therefore both indicators are excluded from MSCI's total number of diversity strengths that cover the 1991 to 2013 period.

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additional key issue if a company faces a risk or opportunity that is atypical for the industry. Aside from this, there are also a set of key issues that are applicable to all firms. A 0-10 scale is used for scoring each key issue which comprises of a management score and an exposure score. Both are also on a 0-10 scale. The scored management component of the key issue score (without subtracting for relevant ESG controversies) is used by MSCI ESG KLD STATS and is also on a 0-10 scale.

[8] Negative performance indicators are designed to offer consistent and timely assessments of controversies (related to diversity for the current study) surrounding publicly traded firms. They are based on MSCI ESG Research's proprietary Impact Monitor controversies analysis. The ESG Impact Monitor's evaluation framework is guided by international norms represented in several global conventions far and wide. These include the UN Global Compact, the ILO Declaration on Fundamental Principles and Rights at Work, and the Universal Declaration of Human Rights. In terms of the evaluation process itself, MSCI ESG Research analysts investigate and assess controversies related to the impact of a firm operations and/or its products and services that supposedly are in violation of regulations, national or international laws, and/or commonly accepted global norms.

3.4.3 Measurement of Firm Innovation

R&D activities serve as a key component of the innovation effort of firms, as well as the most important intangible innovation expenditure (Evangelista et al., 1997). R&D investment can therefore be used as a proxy for innovation effort (*see for example* Balkin, Markman, & Gomez-Mejia, 2000; Hoskisson, Hitt, Johnson, & Grossman, 2002; Miller & Del Carmen Triana, 2009). The study employs 3 proxies for innovation: R&D expenditure, R&D/total sales and R&D/total assets, the latter two representing firm R&D intensity. R&D measures the effort with which firms pursue new and modified products, or new knowledge. R&D expenditures are also empirically more appealing as efforts in R&D can be carried out rather quickly and hence are more easily linked to specific events and must be immediately expensed (Honoré et al., 2015). Therefore R&D is more observable and have greater potential of providing clear evidence of the interplay between corporate governance and firm innovation efforts.

3.4.4 Measurement of Firm Performance

The study utilizes average firm performance values for the following 5 years (i.e., t+1 to t+5) where current year performance values are excluded since research and development expenditures can be expected to decrease income for the current year. Return on Assets (ROA or net income as fraction of total assets), Return on equity (ROE or net income as fraction of shareholder's equity) and Earnings per Share (EPSFI or earnings per share *diluted* including extraordinary items) are utilized as proxies for firm performance (*see for example* Joh, 2003; Bauer et al., 2004; Sher and Yang, 2005; Reddy et al., 2010). While ROA is a key indicator of how profitable a firm's assets are in generating revenue (measured by the ratio of net profit over total assets), ROE is an important financial measure of how efficiently a firm utilizes shareholder's equity (assessed by the ratio of net profit over shareholder equity). EPSFI is another robust measure of how profitable a firm is. This is reflected by the portion of a firm's earnings, net of taxes and preferred stock dividends that is allocated to each share of common stock. All three measures are accounting based measures of profitability which is likely a better performance measure compared to stock market based measures. This is related to the fact that stock prices are not as

likely to reflect all available information when inefficiency can be detected in the stock market. Also, accounting based measures of profitability are more directly related to a firm's financial survivability compared to its stock market value. Accounting based measures also allow for the evaluation of performance of both privately held and publicly traded firms (Joh, 2003).

3.4.5 Control Variables

The study follows the innovation literature and controls for potential observable firm characteristics to account for other factors that can influence firm innovation effort and consequently firm performance. Control variables included are a firm's size, earnings intensity, advertising intensity leverage, and investment intensity (*see for example* Acs and Audretsch, 1988; Opler and Titman, 1994; Crepon et al., 1998; Srinivasan et al., 2008; Souitaris, 2002; Timmer, 2003; Hosono et al., 2004; Cho, 2016). The current study utilizes the following proxies for firm characteristics: Total Assets (firm size), EBITDA/Total Assets (earnings intensity), Advertising/ Total Assets (advertising intensity), Total Debt/Total Assets (firm leverage), and Capital Expenditures/ Total Assets (firm investment intensity).

Additionally, overall awareness of firm diversity-related policies and practices have increased over the years, therefore the study also controls for this variation over time in firm diversity by including year dummies. Also, because it is necessary to account for possible industry effects, the current study therefore controls for industry effects (in certain regressions where it is econometrically advisable to include industry dummies) by generating industry dummies corresponding to the first two digits of the standard industrial classification (SIC) code.

The current study also controls for overall firm level CSR in follow-up regression analysis to account for variation in effects between diversity-related CSR and overall firm level CSR which have also been found to influence both firm innovation (*see* Bocquet et al., 2011; Luo and Du, 2015;) and firm performance (*see* Jiraporn et al., 2014). CSR scores for the current study represents the composite corporate social responsibility score for a firm in a given year, which includes the total number of strengths minus total number of concerns.

3.4.6 Empirical Approach

The current study uses both Ordinary Least Squares (OLS) regression and Tobit analysis (with panel-level random effects) to explore the association between workforce Diversity and Innovation. OLS regression is utilized to test the association between Diversity and the study's innovation effort proxies for the full sample, while controlling for firm characteristics. It is also utilized to test the association between the study's innovation effort proxies and firm performance for the full sample, while controlling for diversity and firm characteristics. A follow up OLS regression analysis is conducted for the full sample while controlling for a firm's CSR as a robustness check.

An OLS regression allows for variation in the study variables, across time and across firms, with the clustering of standard errors at the firm level. However, while an OLS regression treats the reported research and development expenses as actual values (including those below the 0 threshold) and not as the upper limit of firms investing in research and development. A drawback of such an approach is that when there is a censoring of the variable, an OLS is unable to provide consistent estimates of the parameters. Hence, coefficients generated from the analysis may not always move closer to the true population parameters as the sample size expands (see Long, 1997).

Therefore, further analysis to check for robustness is conducted utilizing Tobit analysis (with panel-level random effects) as it allows for estimating linear relationships between variables where the dependent variable is observed to have either left or right censoring (i.e., below and above censoring). In the current study's case, censoring from below, for example, takes place when firms reporting research and development expenses fall at or below the 0 threshold are censored (*see* McDonald and Moffitt, 1980). Tobit analysis is utilized to test the association between Diversity and the study's innovation effort proxies (i.e., R&D expenditures, R&D/Total Sales and R&D/Total Assets) for the full sample, while controlling for firm characteristics. It is also utilized to test the association between the study's innovation effort proxies and firm performance (i.e., ROA, ROE, EPS) for the full sample, while controlling for diversity and firm characteristics. To address outliers where applicable, 1%-99% winsorization is undertaken (refer to Appendix C1).

3.5 Empirical Findings

The current chapter addresses two key research questions. The first research question aims to investigate the influence of workforce diversity on firm innovation. The second research question aims to investigate the effects of R&D activity on firm performance while holding firm level workforce diversity at a constant. Both these questions are reflected in the study's two main hypotheses and six sub-hypotheses. The following section presents the empirical findings for the chapter while addressing the study's hypotheses utilizing three models. Model 1 provides empirical findings and addresses the study's hypotheses utilizing OLS regression analysis. A robustness check is then conducted utilizing Model 2 (where Tobit analysis is adopted to address the same hypotheses) and Model 3(where both OLS and Tobit estimations are utilized while controlling for a firm's CSR).

3.5.1 Descriptive Statistics

Table 3.1 displays overall summary statistics for the study's independent, dependent and control variables. Summary statistics include the mean, median, standard deviation, minimum, maximum, as well as the skewness and kurtosis values, for 14,250 firm year observations across 1992 to 2013 and excludes firms from the finance and utilities SIC industry groups. The average score for diversity is 0.022 (minimum= -3 and maximum =7) while the average score for CSR is -0.223 (minimum = -11 and maximum = 19). It is noted that most firms in the sample are weak in not just their overall CSR but also specifically in diversity.

Table 3.2 displays overall summary statistics by a firm's diversity score (i.e. firms receiving a diversity score of above zero or otherwise) based on firm year observations. Between 1992 and 2013, based on the number of firm year observations, there is indication that less than fifty percent of the sample had a total diversity score of 1 and above. Majority of firms in the sample either did not adopt, or had very weak diversity-related policies/practices. Overall statistics show that firms having a diversity strengths score of zero or below have slightly lower mean values in terms of research development expenditures, as well as on all three firm performance measures (i.e., ROA, ROE, and EPSFI).

Table 3.1 Summary Statistics for Full Sample

This table presents descriptive statistics of the sample which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 14,250 firm year observations of U.S. firms from 1992 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Firm level workforce diversity is measured utilizing the composite diversity score for a firm in a given year, which includes the total number of diversity strengths minus total number of diversity concerns. Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm performance is measured utilizing ROA (net income as a fraction of total assets), ROE (net income as fraction of shareholder's equity), and EPSFI (portion of a firm's earnings, net of taxes and preferred stock dividends allocated to each share of common strock). Firm characteristics included as control variables include Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

Diversity and CSR	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
Diversity	0.023	0	1.385	-3	7	1.140	5.160
CSR	-0.223	-1	2.664	-11	19	1.456	8.253
Innovation Effort	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
R&D Expense	175.403	26.3	560.606	0	4269	5.653	37.734
R&D/Sales	0.310	0.036	1.288	0	10.553	6.690	49.887
R&D/Assets	0.072	0.033	0.107	0	0.630	2.883	12.945
Firm Performance	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
ROA	32.407	5.532	106.041	-102	754.183	4.862	29.923
ROE	0.022	0.029	0.390	-2.202	1.453	-2.316	17.667
EPFSI	0.996	0.85	2.048	-5.8	7.99	0.236	5.426
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
Total Assets *(log)*	6.953	6.770	1.758	-0.021	13.590	0.462	3.082
EBITDA/Assets	80.037	16.447	216.257	-20.509	1574	5.117	32.031
Advertise/Assets	6.251	0	23.290	0	170.717	5.502	35.213
Debt/ Assets	0.159	0.105	0.182	0	0.826	1.300	4.464
Cap.Exp./ Assets	22.469	4.543	57.591	0.025	414.987	4.945	30.246

Table 3.2 Summary Statistics by Diversity

This table presents descriptive statistics (mean, median, standard deviation, minimum and maximum values) of the sample by weak versus moderate to strong workforce diversity performing firms, based on firm year observations. This study's full sample consists of 14,250 firm year observations of U.S. firms from 1992 to 2013, excluding firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Weak (moderate to strong) workforce diversity performing firms consists of firms with diversity scores of below zero (above zero), between 1992 and 2013. Weak performing workforce diversity firms comprise of 10,265 firm year observations. Moderate to strong workforce diversity firms comprise of 3,985 firm year observations.

	Diversity < 0 = 10,265			**Diversity > 0 = 3985**		
	Mean	**Median**	**Sd**	**Mean**	**Median**	**Sd**
Diversity	-0.659	-1	0.702	1.781	1	1.137
CSR	-0.973	-1	1.855	1.709	1	3.365
R&D Expense	71.405	22	214.852	443.291	60.013	951.558
R&D/Sales	0.339	0.0385	1.351	0.234	0.033	1.105
R&D/Assets	0.077	0.0344	0.114	0.060	0.030	0.086
ROA	12.597	4.235	50.492	83.435	18.377	173.302
ROE	0.005	0.025	0.407	0.066	0.043	0.338
EPFSI	0.858	0.71	1.956	1.351	1.25	2.230
Total Assets (log)	6.566	6.475	1.468	7.946	8.011	1.932
EBITDA/Assets	36.199	12.352	97.529	192.961	52.648	353.629
Advertise/Assets	2.149	0	8.959	16.816	0.163	39.728
Debt/ Assets	0.154	0.085	0.187	0.171	0.144	0.169
Cap. Exp. /Assets	12.101	3.257	33.407	49.179	14.143	89.423

3.5.2 OLS Regression- Model 1

In Model 1, the study's two main hypotheses and six sub-hypotheses are addressed utilizing OLS regression analysis.

3.5.2.1 Model 1a: OLS Regression- Workforce Diversity and Firm Innovation Effort

Model 1a addresses Hypothesis 1 which states that there is a positive relation between workforce diversity and innovation. Specifically that this relationship is positive between diversity and R&D expenditures, diversity and R&D/Total Sales, and diversity and R&D/Total Assets. Table 3.3 reports the OLS regression results for Diversity and Innovation effort for the full sample.

Hypothesis 1a states that there is a positive relation between workforce diversity and R&D expenditures. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Thus, Hypothesis 1a is supported. A follow up analysis by firm market capitalization, which is the total dollar market value of a firm's outstanding shares and more commonly used by the investment community to determine a firm's size, further reveals that this result is significant and positive for small, mid, and large cap firms alike (refer to Appendix C2).

Hypothesis 1b states that there is a positive relation between workforce diversity and R&D/Total Sales. Based on OLS regression results from Model 1a, this relationship is not statistically significant (P value > 0.05). Thus, Hypothesis 1b is not supported. On the other hand, with a follow up analysis by firm market capitalization, it is observed this result is only significant and positive for mid cap firms (refer to Appendix C3).

Hypothesis 1c states that there is a positive relation between workforce diversity and R&D/Total Assets. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is positive. Thus, Hypothesis 1c is supported. Additionally, this result if only significant and positive for small and mid-cap firms (refer to Appendix C4).

Table 3.3 OLS Regression: Diversity and Innovation Effort

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 1 using a sample of 14,250 U.S. firms from 1992 to 2013. The independent variable is firm level workforce diversity (Diversity). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	3.933	0.973	1.687	0.000	0.304	0.000
Diversity	40.507	0.000	0.021	0.150	0.005	0.000
Total Assets *(log)*	36.631	0.001	-0.215	0.000	-0.031	0.000
EBITDA/ Assets	1.974	0.000	-1.1E-05	0.942	2.29E-05	0.132
Advertise/Assets	1.791	0.276	-0.001	0.252	-0.00003	0.762
Debt/ Assets	-137.203	0.001	0.289	0.054	0.014	0.241
Cap. Exp. /Assets	-1.463	0.103	0.002	0.000	0.0002	0.000
Industry Dummy	Yes		Yes		Yes	
Year Dummy	Yes		Yes		Yes	
R2	*0.630*		*0.174*		*0.388*	
No. of Observations	*14,250*		*14,250*		*14,250*	

3.5.2.2 Model 1b: OLS Regression- Workforce Diversity, Firm Innovation Effort and Performance

Model 1b addresses Hypothesis 2 which states that there is a positive relation between innovation effort and firm performance, while holding workforce diversity constant. Specifically that this relationship is positive between innovation effort and ROA, innovation effort and ROE, and innovation effort and EPSFI. For Model 1b, R&D/Total Assets is selected as a proxy for firm innovation, for two reasons: first, to avoid multi-colinearity problems that can arise if all 3 innovation effort tproxies are included; second, as workforce diversity had a positive effect on R&D/Total Assets (in Hypothesis 1), consistent with the hypothesized mediation relation. Table 3.4 reports the OLS regression results for firm innovation effort and firm performance for the full sample.

Hypothesis 2a states that there is a positive relation between innovation effort and ROA. Based on OLS regression results from Model 1b, R&D/Total Assets is not statistically significant (P value > 0.05). Thus, Hypothesis 2a is not supported.

Hypothesis 2b states that there is a positive relation between innovation effort and ROE. Based on OLS regression results from Model 1b, R&D/Total Assets is statistically significant (P value < 0.05), but with a negative coefficient. Thus, Hypothesis 2b is not supported.

Hypothesis 2c states that there is a positive relation between innovation effort and EPSFI. Based on OLS regression results from Model 1b, R&D/Total assets is statistically significant (P value < 0.05), but with a negative coefficient. Thus, Hypothesis 2c is not supported.

Table 3.4 OLS Regression: Diversity, Innovation Effort and Performance

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 2 using a sample of 11,275 U.S. firms from 2000 to 2012. The independent variable is firm innovation effort (R&D/Total Assets). The dependent variables include firm ROA, ROE and EPSFI for the following 5 years (i.e., excluding current year performance values). To check for the effect of firm innovation effort on the relationship between firm level workforce diversity and firm performance, firm level workforce diversity (Diversity) is controlled for. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are also controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

OLS	ROA		ROE		EPSFI	
R&D/Total Assets	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Constant	-39.318	0.018	-0.106	0.012	-1.860	0.000
Diversity	2.103	0.015	0.012	0.003	-0.022	0.450
R&D/Total Assets	9.525	0.185	-0.837	0.000	-3.340	0.000
Total Assets *(log)*	6.632	0.000	0.024	0.000	0.426	0.000
EBITDA/Assets	0.485	0.000	0.0001	0.003	0.002	0.000
Advertise/Assets	-0.208	0.165	-0.0001	0.839	-0.009	0.003
Debt/Assets	-36.006	0.000	0.046	0.324	-0.986	0.000
Cap. Exp./Assets	-0.177	0.019	-0.0005	0.002	-0.004	0.024
Mean dependent var		39.068		0.042		1.204
R-squared		0.849		0.168		0.314
F-test		.		.		.
Akaike crit. (AIC)		117129.075		3908.113		42063.711
SD dependent var		111.481		0.314		1.876
Number of obs		11275		11275		11275
Prob > F		.		.		.
Bayesian crit. (BIC)		117590.886		4369.925		42525.522

3.5.3 Tobit Analysis- Model 2

In Model 2, to check for robustness in results, the study's two main hypotheses and six sub-hypotheses are addressed again utilizing Tobit estimations.

3.5.3.1 Model 2a: Tobit Analysis- Workforce Diversity and Firm Innovation Effort

Model 2a addresses Hypothesis 1 which states that there is a positive relation between workforce diversity and innovation. Specifically that this relationship is positive between diversity and R&D expenditures, diversity and R&D/Total Sales, and diversity and R&D/Total Assets. Table 3.5 reports the Tobit results for Diversity and innovation effort for the full sample.

Hypothesis 1a states that there is a positive relation between workforce diversity and R&D expenditures. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Thus, results remain robust where Hypothesis 1a is still supported.

Hypothesis 1b states that there is a positive relation between workforce diversity and R&D/Total Sales. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Sales is positive. However, while Hypothesis 1b is supported, it is found that results are not robust as this relationship (even though positive) is insignificant in Model 1a.

Hypothesis 1c states that there is a positive relation between workforce diversity and R&D/Total Assets. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is positive. Thus, results remain robust where Hypothesis 1c is still supported.

Table 3.5 Tobit Analysis: Diversity and Innovation Effort

This table presents the Tobit estimation results as a robustness check for Hypothesis 1 using a sample of 14,250 U.S. firms from 1992 to 2013. The independent variable is firm level workforce diversity (Diversity). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-91.988	0.315	1.828	0.000	0.333	0.000
Diversity	44.726	0.000	.0240	0.032	0.007	0.000
Total Assets *(log)*	39.400	0.000	-.232	0.000	-0.034	0.000
EBITDA/ Assets	1.934	0.000	.00003	0.772	0.00003	0.000
Advertise/ Assets	3.097	0.000	-.001	0.117	-0.0001	0.154
Debt/ Assets	-142.691	0.000	.263	0.000	0.011	0.033
Cap.Exp. /Assets	-0.829	0.000	.002	0.000	0.0002	0.000
Industry Dummy	Yes		Yes		Yes	
Year Dummy	Yes		Yes		Yes	
Pseudo R2[9]	*0.089*		*0.115*		*-0.969*	
LR Chi2 (61)[10]	*16724.56*		*5309*		*10180.21*	
Prob > chi2[11]	*0.000*		*0.000*		*0.000*	
No. of Observations	*14,250*		*14,250*		*14,250*	

[9] This is the Tobit McFadden's pseudo R-squared, which is not an equivalent to the OLS regression and therefore does not mean what R-square means in an OLS regression (i.e., the proportion of variance of the response variable explained by the predictors). The LR Chi2 and Prob>chi2 values are therefore also reported as an alternative to the pseudo R-squared reported by Tobit.

[10] The Likelihood Ratio (LR) Chi-Square tests that at least one of the predictors' regression coefficient is not equal to zero. The degrees of freedom of the Chi-Square distribution test is the number in the parentheses and is used for testing the LR Chi- Square statistic. It is defined by the number of predictors in the model.

[11] This represents the probability of getting a LR test statistic as extreme as, or more so, than the observed statistic under the null hypothesis (i.e., that all of the regression coefficients are simultaneously equal to zero). It is the likelihood of obtaining chi-square statistics of the model or one more extreme if indeed the predictor variables have no effect. A comparison is undertaken of the p-value against a specified alpha level, which is our willingness to accept a Type I error. This is normally set at 0.05 or 0.01. The small p-value from the LR test, <0.0001, implies that at least one of the regression coefficients in the model is not equal to zero. The degree of freedom in the prior line, chi2(df) defines the parameter of the chi-square distribution that is utilized for testing the null hypothesis.

3.5.3.2 Model 2b: Tobit Analysis- Workforce Diversity, Firm Innovation Effort and Performance

Model 2b addresses Hypothesis 2 which states that there a positive relation between innovation effort and firm performance, while holding workforce diversity at a constant. Specifically that this relationship is positive between innovation effort and ROA, innovation effort and ROE, and innovation effort and EPSFI. For Model 1b, R&D/Total Assets is selected as a proxy for firm innovation, for two reasons: first, to avoid multi-colinearity problems that can arise if all 3 innovation effort proxies are included; second, as workforce diversity had a positive effect on R&D/Total Assets (in Hypothesis 1), consistent with the hypothesized mediation relation. Table 3.6 reports the Tobit results for innovation effort and firm performance for the full sample.

Hypothesis 2a states that there is a positive relation between innovation effort and ROA. Based on Tobit results from Model 2b, R&D/Total Assets is statistically significant (P value < 0.05), with a positive coefficient. However, while Hypothesis 2a is supported, it is found that results are not robust as this relationship (even though positive) is insignificant in Model 1b.

Hypothesis 2b states that there is a positive relation between innovation effort and ROE. Based on Tobit results from Model 2b, R&D/Total Assets is statistically significant (P value < 0.05), but with a negative coefficient. Thus, results remain robust where Hypothesis 2b is still not supported.

Hypothesis 2c states that there is a positive relation between innovation effort and EPSFI. Based on Tobit results from Model 2b, R&D/Total Assets is statistically significant (P value < 0.05), but with a negative coefficient. Thus, results remain robust where Hypothesis 2c is still not supported.

Table 3.6 Tobit Analysis: Diversity, Innovation Effort and Performance

This table presents the Tobit estimation results for Hypothesis 2 as a robustness check using a sample of 11,275 U.S. firms from 2000 to 2012. The independent variable is firm innovation effort (R&D/Total Assets). The dependent variables include firm ROA, ROE and EPSFI for the following 5 years (i.e., excluding current year performance values) . To check for the effect of firm innovation effort on the relationship between firm level workforce diversity and firm performance, firm level workforce diversity (Diversity) is controlled for. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are also controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	ROA		ROE		EPSFI	
R&D/Total Assets	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Constant	-39.236	0.003	-0.106	0.000	-1.858	0.000
Diversity	2.102	0.000	0.012	0.000	-0.021	0.120
R&D/Total Assets	9.475	0.005	-0.840	0.000	-3.342	0.000
Total Assets *(log)*	6.622	0.000	0.024	0.000	0.426	0.000
EBITDA/Assets	0.486	0.000	0.0002	0.000	0.002	0.000
Advertise/Assets	-0.209	0.000	-0.0001	0.590	-0.009	0.000
Debt/Assets	-36.012	0.000	0.046	0.102	-0.986	0.000
Cap. Exp./Assets	-0.177	0.000	-0.0005	0.000	-0.004	0.000
Mean dependent var		39.068		0.042		1.204
Pseudo R-squared		0.154		0.342		0.092
F-test		326.704		75.407		93.274
Akaike crit. (AIC)		117110.702		4140.616		42114.310
SD dependent var		111.481		0.314		1.876
Number of obs		11275		11275.000		11275.000
Prob > F		0.000		0.000		0.000
Bayesian crit. (BIC)		117623.826		4661.071		42627.434

3.5.4 Controlling for CSR-Model 3

In Model 3, to conduct an additional check on robustness, the study's two main hypotheses and six sub-hypotheses are addressed again utilizing tobit estimations, while controlling for a firm's CSR.

3.5.4.1 Model 3a: Tobit Analysis- Workforce Diversity and Firm Innovation Effort

Model 3a addresses Hypothesis 1 which states that there is a positive relation between workforce diversity and innovation, while controlling for a firm's CSR. Specifically that this relationship is positive between diversity and R&D expenditures, diversity and R&D/Total Sales, and diversity and R&D/Total Assets. Table 3.7 reports the Tobit results for Diversity and Innovation, while controlling for a firm's CSR for the full sample.

Hypothesis 1a states that there is a positive relation between workforce diversity and R&D expenditures. Based on Tobit results, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Also CSR is statistically significant (P value < 0.05) with a positive coefficient. Thus, results are robust to the inclusion of CSR as the relationship between workforce diversity and R&D expenditures is significant and positive in Model 1a and Model 2a.

Hypothesis 1b states that there is a positive relation between workforce diversity and R&D/Total Sales. Based on Tobit results , this relationship is not statistically significant (P value > 0.05). Also CSR is statistically significant (P value > 0.05) with a positive coefficient. Thus, results are robust to the inclusion of CSR where Hypothesis 1b is still not supported as in Model 1a and Model 2a.

Hypothesis 1c states that there is a positive relation between workforce diversity and R&D/Total Assets. Based on Tobit results, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is positive. Also CSR is not statistically significant (P value > 0.05). Thus, results are robust to the inclusion of CSR where Hypothesis 1c is still supported as in Model 1a and Model 2a.

Table 3.7 Tobit Analysis: Diversity and Innovation Effort (with CSR)

This table presents the Tobit estimation results as a robustness check for Hypothesis 1 while controlling for CSR as a robustness check using a sample of 14,250 U.S. firms from 1992 to 2013. The independent variable is firm level workforce diversity (Diversity). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm Size , Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-26.583	0.771	1.871	0.000	0.336	0.000
Diversity	16.416	0.000	0.006	0.686	0.006	0.000
CSR	19.722	0.000	0.013	0.044	0.0006	0.151
Total Assets *(log)*	42.401	0.000	-0.231	0.000	-0.035	0.000
EBITDA/Assets	1.912	0.000	0.00003	0.847	0.00004	0.000
Advertise/Assets	2.933	0.000	-0.001	0.088	-0.00008	0.128
Debt/ Assets	-138.469	0.000	0.266	0.000	0.012	0.031
Cap.Exp./ Assets	-0.720	0.000	0.002	0.000	0.0002	0.000
Industry Dummy	Yes		Yes		Yes	
Year Dummy	Yes		Yes		Yes	
Pseudo R2	*0.090*		*0.1154*		*-0.9701*	
LR Chi2 (62)	*16858.54*		*5313.04*		*10182.27*	
Prob > chi2	*0.000*		*0.000*		*0.000*	
No. of Observations	*14,250*		*14,250*		*14,250*	

3.5.4.2 Model 3b: Tobit Analysis- Workforce Diversity, Firm Innovation Effort and Performance

Model 3b addresses Hypothesis 2 which states that there is a positive relation between innovation effort and firm performance, while holding workforce diversity constant, and controlling for a firm's CSR. Specifically that this relationship is positive between innovation effort and ROA, innovation effort and ROE, and innovation effort and EPSFI. For Model 3b, R&D/Total Assets is selected as a proxy for firm innovation. Table 3.8 reports the Tobit analysis results for innovation effort and firm performance, holding workforce diversity constant, and controlling for a firm's CSR for the full sample.

Hypothesis 2a states that there is a positive relation between innovation effort and ROA. Based on Tobit results, RD/Total Assets is statistically significant (P value < 0.05) with a positive coefficient. CSR is statistically significant (P value < 0.05) with a positive coefficient. However, while Hypothesis 2a is supported, it is found that results are not robust as this relationship (even though positive) is insignificant in Model 1b while significant in Model 2b.

Hypothesis 2b states that there is a positive relation between innovation effort and ROE. Based on Tobit results, RD/Total Assets is statistically significant (P value < 0.05), but with a negative coefficient. CSR is also statistically significant (P value < 0.05) with a positive coefficient. Thus, results are robust to the inclusion of CSR where Hypothesis 2b is still not supported (as in in Model 1b and 2b).

Hypothesis 2c states that there is a positive relation between innovation effort and EPSFI. Based on Tobit results, RD/Total Assets is statistically significant (P value < 0.05) but with a negative coefficient. CSR on the other hand is not statistically significant (P value > 0.05). Thus, results are robust to the inclusion of CSR where Hypothesis 2c is still not supported (as in Model 1b and 2b).

Table 3.8 Tobit Analysis: Diversity, Innovation Effort and Performance (with CSR)

This table presents the Tobit estimation results for Hypothesis 2 while controlling for CSR as a robustness check using a sample of 11,275 U.S. firms from 2000 to 2012. The independent variable is firm innovation effort (R&D/Total Assets). The dependent variables include firm ROA, ROE and EPSFI for the following 5 years (i.e., excluding current year performance values). To check for the effect of firm innovation effort on the relationship between firm level workforce diversity and firm performance, firm level workforce diversity (Diversity) is controlled for. Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are also controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	ROA		**ROE**		**EPSFI**	
R&D/Total Assets	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Constant	-33.235	0.011	-0.093	0.001	-1.803	0.000
Diversity	-0.775	0.225	0.006	0.047	-0.048	0.010
CSR	1.989	0.000	0.004	0.001	0.018	0.055
R&D/Total Assets	9.276	0.006	-0.840	0.000	-3.344	0.000
Total Assets *(log)*	7.059	0.000	0.025	0.000	0.430	0.000
EBITDA/Assets	0.484	0.000	0.0002	0.000	0.002	0.000
Advertise/Assets	-0.221	0.000	-0.0001	0.483	-0.009	0.000
Debt/Assets	-35.347	0.000	0.047	0.092	-0.980	0.000
Cap. Exp./Assets	-0.165	0.000	-0.0005	0.000	-0.004	0.000
Mean dependent var	39.068		0.042		1.204	
Pseudo R-squared	0.154		0.343		0.092	
F-test	331.335		75.888		91.888	
Akaike crit. (AIC)	117034.852		4132.818		42111.273	
SD dependent var	111.481		0.314		1.876	
Number of obs	11275		11275		11275	
Prob > F	0.000		0.000		0.000	
Bayesian crit. (BIC)	117555.306		4653.273		42631.728	

3.6 Discussion of Empirical Findings

This following section focuses on the interpretation of the empirical results based on the chapter's two key research questions and their corresponding hypotheses. The first research question addresses the influence of workforce diversity on firm innovation. The second research question considers the effects of firm innovation effort on firm performance while holding workforce diversity at a constant. The discussion first focuses on whether the empirical findings and analysis offer evidence supporting the notion that stronger workforce diversity promotes greater firm innovation effort before moving on to discuss evidence on the impact of this relationship on overall firm performance.

3.6.1 Does More Workforce Diversity mean Greater Firm Innovation Effort?

The study's first research question explored the impact of workforce diversity on firm innovation effort in the U.S. context, drawing on data from 14,250 firm year observations from 1992 to 2013. Specifically, the first research question addresses the relationship between firm workforce diversity and firm R&D Expenditures, R&D/Total Sales and R&D/Total Assets- the study's 3 innovation effort proxies. Based on results of the data analysis for this research question, it is found that more firm workforce diversity is associated with higher firm innovation.

OLS results reveal a significant and positive relationship between firm workforce diversity and R&D expenditures, and between firm workforce diversity and R&D/Total Assets. R&D expenditures increases on average by 40,507,000 USD when firm workforce diversity goes up by 1 score point. R&D/Total Assets increases on average by 0.5 % when firm workforce diversity goes up by 1 score point. Results remain robust when modeling firms with zero R&D expenditures with a Tobit model. Based on Tobit results, R&D expenditures increase on average by 44,726,000 USD when firm workforce diversity goes up by 1 score point. R&D/Total Assets increases by 0.7% when firm workforce diversity goes up by 1 score point.

The results also remain robust when modeling firms with zero R&D expenditures and while controlling for firm CSR performance. Thus, greater firm workforce diversity is associated with higher firm innovation effort. In other words,

the better a firm performs in meeting workforce diversity yardsticks, the more likely it is to have overall higher firm innovation effort.

Overall, the results support a resource-based view of workforce diversity. Results suggest that when firms are able to promote an environment of greater diversity in the work place then the workforce is more motivated to participate in the firm innovation process which is beneficial for firm innovation effort. The findings of the study suggest that in the long term, greater workforce diversity can create sustained competitive advantage for the firm as it is able to encourage more firm innovation effort. Therefore, in the context of the innovating firm, aside from dynamics related to firm governance and managerial behavior, firm workforce diversity can be anticipated to play a key role in influencing firm innovation effort.

Findings of the study are in line and complement other existing studies that observe a positive link between firm workforce diversity and innovation effort outside the U.S context. These include the Østergaard et al. (2011) study that find that more balanced gender composition, higher education and diversity in the types of education positively influences a firm's likelihood to innovate. Also, studies by Cady and Valentine (1999), Niebuhr (2006), Ozgen et al. (2011), Lee and Nathan (2011), Bosetti et al. (2012), and Qian and Stough (2011) that observe that an increase in cultural diversity in the workforce leads to an increase in the contribution of ideas and problem solving owing to differences in knowledge and capabilities of employees from diverse cultural backgrounds. This in turn strongly contributes to the firm innovation process. Findings of the study also complement other more recent studies that observe a positive link between pro diversity policies and firm innovation outputs. Mayer et al (2018) for instance find that pro-diversity corporate policies related to treatment of women and minorities to increase new product announcements, patents and patent citations.

3.6.2 How is Firm Performance Impacted?

The study's second research question further explored the impact of firm innovation effort on firm performance, while holding workforce diversity constant, for the same panel dataset. Specifically, the second research question addresses the relationship between firm innovation effort and firm ROA, ROE and EPSFI (selected

proxies for firm performance), to see if there is a mediation relation: higher diversity spurs more innovation, which in turn leads to higher profitability. Based on results of the data analysis for this research question, it is further noted that, while firm workforce diversity is positively related to firm innovation, the firm's innovation effort has no positive effect on its profitability. On the other hand, a positive association between CSR and firm profitability can be observed.

OLS results reveal a significant but negative relationship between firm innovation effort with ROE and EPSFI. Overall results are not consistent with the proposed mediation hypothesis. While a significant and positive effect of a firm's innovation effort on ROA can be observed, overall results suggest no positive effect of a firm's innovation effort on its performance. The results remain robust when dealing with firms with zero R&D with a Tobit estimation. The relation between firm innovation effort with ROE and EPSFI still remain significant but negative.

Results also remain robust when modeling firms with zero R&D expenditures and while controlling for firm CSR performance. The relationship between firm innovation effort with ROE and EPSFI still remain significant but negative. On the other hand, a significant and positive relationship is found between CSR and two of firm performance measures (i.e., ROA and ROE). In the Tobit estimation, ROA increases on average by 199% when CSR goes up by 1 score point. ROE increases on average by 0.4% when CSR goes up by 1 score point.

This finding is in line with several other studies that also observe a positive association between CSR and firm performance. Harjoto and Jo (2007) and Jiao (2010) find that, contrary to the CSR over-investment hypothesis, CSR engagement positively influences firm value (measured using industry-adjusted Tobin's q). Atkas, Bodt, and Cousin (2011) and Deng, Kang and Low (2013) find that acquisitions where the target firm is more socially responsible is able to bring about more positive stock market reactions offering indication that investors value CSR. Jiraporn et al. (2014) also observe that CSR improves credit ratings significantly. Such evidence suggest that firms do better overall by becoming involved in CSR issues.

Overall, the results of the current study offer differing evidence that lacks support for the notion that a firm's workforce diversity plays a key role in driving the relationship between a firm's innovation efforts (i.e., increase in R&D investment) and

its performance. The findings suggest that while greater firm workforce diversity is associated with higher firm innovation effort, it does not have a positive effect on the relationship between firm innovation effort and firm profitability. Therefore, the expected mediating relationship from higher workforce diversity to more firm innovation effort to enhanced firm performance is not supported in the current study.

The findings of the study fail to offer strong and robust evidence to support the notion that a diverse workforce, that brings together human capital of different skills, judgment and abilities, can be expected to help the firm achieve superior performance and growth through enhanced firm innovation effort. On the other hand, the results highlight enhanced firm profitability through improved corporate social responsibility performance instead. This could be attributed to the fact that the awareness and case for CSR, especially in the West, has been reinforced by corporate scandals as well as the greater international context within which modern firms operate in (Brammer et al., 2007; Tan and Komaran, 2006). Industries, consumers and business philosophies have been brought closer as a result of globalization. CSR may have become an essential element for running a successful and profitable business, due to increased demands for better CSR from customers, suppliers, employees and other stakeholders.

The cost of not practicing CSR now proves to be far greater than the cost of being socially responsible, evidenced by greater consumer boycotts, shareholder activism and general public protests (Ramasamy et al., 2010; Tan and Komaran, 2006). Firms therefore face greater pressure to behave ethically and to develop policies, standards and behaviors that exhibit their sensitivity to not just shareholder concerns but also concerns by broader groups of stakeholders, as well as society at large (Brammer et al. 2007; Jiraporn et al., 2014). This has led to an increase in the number of firms engaging in more diverse CSR activities as awareness on CSR had strengthened over the years (Jiraporn et al., 2014). In such a climate where firms are expected to integrate social and environmental concerns and undertake actions that promote social good beyond the interest of the firm or as required by law, improved CSR performance can therefore be anticipated to enhance firm performance and growth.

3.7 Conclusion and Future Research

Previous studies investigating the relationship between diversity and innovation have mainly tried to explicate the diversity-innovation link through deliberations of elaborate case studies that focus on work team compositions or providing empirical evidence that underscores the necessity of diversity in top management teams. Also, not much is understood pertaining to the diversity-innovation-performance interconnection, especially in the U.S. context. Awareness of the importance of promoting diversity in the workplace has grown in the recent years and majority of firms can be anticipated to be experiencing an increase in the diversity of its labor force as a result. Hence, in light of this trend, the current study adopts a more complete measure of workforce diversity to extend the ongoing debate to better shed light on the diversity-innovation nexus.

Motivated by a resource-based view of the firm, the current study examines whether innovation effort (i.e., investment in R&D and R&D intensity) is greater for firms that have stronger workforce diversity and the overall impact this relationship has on firm performance. Using a panel dataset of US publicly listed companies comprising of 14,250 firm year observations for the 1992-2013 period, the study first addressed the effect of workforce diversity on firm innovation effort and then the mediating effects of innovation on firm performance through both OLS and Tobit estimations.

Results from both estimations offer three key findings, after controlling for several firm, industry and year factors, as well as a firm's CSR. In line with the proposed relationship between workforce diversity and innovation, the study observes an overall significantly positive relationship between workforce diversity and innovation. Secondly, there is no mediation effect of innovation effort on firm performance. Thirdly, an overall significantly positive relationship between CSR and firm performance is found.

Overall, the findings of the current study further complement existing studies that observe a positive relationship between diversity and firm innovation effort which supports the resource-based view of workforce diversity. The study offers strong and robust evidence that suggest that when firms are able to promote an environment of greater diversity in its labor force then employees are more motivated

to be actively involved in the firm innovation process. However, no evidence of the positive diversity-innovation-performance link is offered. This confirms the direct effect of workforce diversity on performance which suggest that diversity directly impacts growth through other channels not related to innovation. Also, overall findings suggest an emphasis on enhancing firm profitability through improved corporate social responsibility performance as a whole that is not exclusively fixated on workforce diversity and innovation.

Theoretically, there is acceptance of the association between CSR and firm performance, especially when the influence of CSR practices on firm performance is concerned. Since in recent years the cost of not practicing CSR has proven to be far greater than the cost of being socially responsible, the findings of the current study could be reflecting such a trend where overall CSR practices is able to create value, competitiveness, and growth for the firm. Future studies considering the diversity-innovation-performance link could address this relationship utilizing more complete measures of innovation effort that go beyond totaling R&D expenditures. Also, future studies can also address the overall mediating effects of innovation effort utilizing firm performance measures that better captures overall firm long-term performance and growth as well as shareholder value creation.

CHAPTER IV
CEO DOMINANCE AND FIRM INNOVATION EFFORT

4.1 Introduction

The role of managerial individualities in relation to firm outcomes has been largely explored. While majority of studies have looked at the influence of CEO behavior on corporate strategies (*see for example* Chikh & Filbien, 2011) as well as corporate outcomes (*see for example* Helft, 2014; Lee, Park, & Park, 2015), very little attention has been given to how powerful CEOs influence firm innovation effort. Even more so, both the corporate governance literature and organizational literature in general have utilized variables as proxies for managerial behaviors that are either noisy, inadequate or imprecise. To address this high-level research gap, the current study explores the role of CEO Dominance in relation to firm innovation effort while similarly also looking at the role of incentives in driving this relationship.

The idea that disparity in senior executives' choices is essential to the understanding of firm behavior is behind the management and organizational behavior literature on managerial discretion. Finkelstein and Hambrick (1996) offer an exhaustive review on this vital topic highlighting the issue to be part of an interesting debate over whether managers matter for corporate decisions and outcomes. Hannan and Freeman (1977) for instance, play down the influence of managerial discretion on firm performance, arguing that organization and environmental constraints limit the scope of managerial actions. On the other hand, Hambrick and Mason (1984) and Tushman and Romanelli (1985) argue that, in terms of the evolution of organizations, executive leadership is the principal driving force.

While in some firms CEOs make all the major decision, in others decisions are more the product of consensus among top executives. When different individuals have different opinions then the distribution of decision-making power within firms will affect which decisions are made. When decisions of managers impacts outcomes of firms then both organizational variables and the characteristics of executives can

indeed influence firm level performance (Adams et al., 2005). Because CEOs and other top executives are typically viewed as key factors in making investment, financing and other strategic decisions therefore their views of the firm should also have a profound effect on corporate practices and outcomes. Rotemberg and Saloner (2000) for instance, explicitly integrates the vision of the CEO in their model of firm policy (*see also* Van den Steen, 2005). Bertrand and Schoar (2003) observe the role of CEOs and top executives to be more important in influencing some corporate decisions than others. When adding manager fixed effects to models of corporate policies that have already incorporated both observable and unobservable time-variant firm characteristics, the study finds that adjusted R2's increases by more than four percentage points. Malmendier and Tate (2005) contend that firms whose CEOs attain superstar status consequently underperform the benchmarks.

Also, Graham et al. (2012) offer evidence that firms and particularly manager fixed effects explain a considerable portion of the variation in executive pay. Furthermore, Coles and Li (2012) observe that manager fixed effects show variation in explanatory powers for several corporate policies. Such studies highlight the importance of managerial attributes in corporate policies and decision making. Additionally, several recent studies have also attempted to address the importance of individual managers in shaping firm performance. Bebchuk et al. (2011) for instance empirically study how the relative significance of CEO in the top management team impacts firm value. They find strong evidence that CEO dominance is related to declining firm value. The empirical evidence overall backs the notion that manager-level characteristics impact firm outcomes.

An important dimension of the top management team characteristic is the distribution of decision-making power. When such decision making power is more concentrated in the hands of the CEO then he would have more freedom to influence decisions and simultaneously also have his opinions reflected more directly in corporate outcomes. Therefore this can have both positive and negative implications for stakeholders as CEOs might use their dominant role to better adjust firm policy to advance their own objectives (Liu and Jiraporn, 2010). While the extant literature offers empirical evidence with regards to the role of CEO dominance in shaping corporate outcomes, not much is understood as to the extent to which CEO dominance

influences firm innovation effort. The current study draws on prior research to extend the debate on the empirical chemistry between CEO dominance and corporate outcomes by highlighting its impact on firm innovation effort, a key performance indicator sensitive to CEO decision making. In the context of innovation, powerful CEOs could for instance exercise their influence over investment decisions concerning firm innovation effort, favoring short-term gains over long-term growth thereby hindering growth opportunities and performance of the firm.

The current study contributes to the extant literature that look at the effects of CEO power on corporate outcomes (*see for example* Bebchuk et al., 2011; Adams et al., 2005). The management literature offers extensive debate as to whether or not top executives matter to corporate decisions and outcomes. While early literature argues that managers do not matter (Lieberson and O'Connor, 1972; Finkelstein and Hambrick, 1996; Pfeffer, 1997) more studies are finding contrary evidence suggesting that executives do indeed matter (*see for example* Child, 1972; Hambrick and Mason, 1984; Tushman and Romanelli, 1985; Weiner and Mahoney, 1981). Similar questions have also been addressed in the economics and finance literature (*see for example* Hermalin and Weisbach, 1988; Agrawal and Knoeber, 2001; Denis and Denis, 1995; Parrino, 1997; Bertrand and Schoar, 2003; Huson et al., 2004; Malmendier and Tate, 2008). The current study further extends and adds on to this debate by addressing the influence of CEO dominance on firm innovation effort.

Furthermore, the current study contributes to the emergent literature on the determinants of corporate innovation. Majority of recent studies have focused more on examining firm characteristics to explain variation in innovation productivity. Most of them find firm characteristics to be a better predictor of corporate innovation outcomes. Cho et al. (2016) for example, find that characteristics of managers tend to better explain the heterogeneity in corporate innovation productivity compared to characteristics of firms. The current study contributes to this literature by offering evidence that majority of the variation in firm innovation effort can also be explained by observable managerial characteristics over time.

4.2 Prior Empirical Evidence

4.2.1 Managerial Characteristics and Firm Performance

Several studies highlight the significance of intangible firm factors, for example corporate culture and firm dynamics in innovation output (Cho et al., 2016). Manso (2011) for instance observe that ideal compensation schemes for managers that help encourage innovation should demonstrate tolerance for early failures and reward for long-term success. In turn, Tian and Wang (2014) find that new publicly-listed firms that are invested by more risk tolerant venture capitalists appear to be a lot more innovative. While such studies highlight how latent tangible or intangible firm factors contribute to firm innovation effort, more recent studies identify certain managerial characteristics that matter for firm innovation effort. Some identified characteristics include managers' compensation structures (Lerner and Wulf, 2007; Xue, 2007), CEO overconfidence (Galasso and Simcoe, 2011; Hirshleifer et al., 2012), CEO turnover (Bereskin and Hsu, 2013), managers' motives (Sauermann and Cohen, 2010), and the general abilities of the CEO (Custódio et al., 2014).

Additionally, Bertrand and Schoar's (2003) seminal work has encouraged a number of studies to focus on how latent managerial characteristics/styles impact corporate outcomes. Graham et al. (2012) for instance, observe that latent managerial styles impact managerial compensation. Nonetheless, even though the above studies show that latent managerial characteristics can contribute to firm innovation efforts, there is still not much understanding as to which latent managerial characteristics plays a key role in driving firm innovation effort. Moreover, this debate is further made complex by an additional strand of literature that studies the phenomena of managerial myopia where managers tend to boost short-term stock prices or profitability at the expense of the firm's long-term interests (*see for example* Stein, 1988). The assumption here is that if compensations are awarded to managers for only meeting short-term goals then eventually their incentives to innovate will decrease. This could in turn result in latent managerial characteristics contributing less to a firm's innovation effort.

While the extant literature sheds light on the existence and sources of managerial characteristics affecting firm innovation effort, the relative importance of

such characteristics in driving firm innovation effort still remains to be explored further. A recent study by Cho et al. (2016) find that firm characteristics dominate manager characteristics in explaining the heterogeneity in firm innovation productivity, noting that manager fixed effects, while being significant, are generally less crucial than firm fixed effects in explaining firm innovation productivity. The study findings highlight the importance of investors questioning whether they should bet on management or the business in their investment decisions or in portfolio rebalancing (Kaplan et al., 2009). Because innovation is essential in creating firm competitive advantage, survival, long-term investment as well as growth prospects (Lerner et al.,2011), understanding the relative importance of managerial characteristics (versus firm characteristics) in driving firm innovation effort could assist investors in making sound investment decisions from a long-term perspective.

4.2.2 CEO Dominance and Firm Performance

Haleblian and Finkelstein (1993) define 'dominance' as the ability of an individual to exercise their will. Dominance is different from overconfidence since the latter is an aspect of personality and is therefore intrinsic to the individual. In principle, dominance is an objective fact of behavior as it encompasses demonstrated ability of one person to impose their will on others. Therefore, dominance has meaning only in social or organizational contexts. While dominance may follow from overconfidence not all overconfident individuals will be dominant (Brown and Sarma, 2007). CEO dominance is a term used to define the power of the CEO within corporate ranks as well as his/her influence over the board of directors and occurs when the board allows the CEO to apply too much power and influence over corporate decision making. CEO dominance relinquishes the board's responsibility to rein in on the CEO whose behavior is not in pursuit of the best interests of the firm and its shareholders (Liu and Jiraporn, 2010).

The extant literature offers four sources of power for the CEO that include structural, ownership, expert and prestige (Finkelstein, 1992), with structural power being the most commonly cited in the literature and is derived from the formal organizational structure and hierarchical authority (Perrow, 1970; Hambrick, 1981; Brass, 1984; Tushman and Romanelli,, 1985). In the firm context, the determination of

personal compensation is a decision in which an individual is most likely inclined to exercise his/her dominance (Brown and Sarma, 2007). This is because remuneration is considered one of the most significant validation and form of recognition an individual like the CEO receives, and since high compensation is more salient than other possible measures of a CEO's success and value to the firm (Paredes, 2004).

Additionally, CEO dominance can prove to be a worrisome corporate governance issue since it often emerges after a fraud, illegal activity or mismanagement has already caused damage to the firm and its shareholders (Barclift, 2011). While board of directors specifically seeks to employ CEOs with dynamic and strong-willed personalities, some studies do suggest that such traits can lead to the corruption of the board's corporate governance process. In this sense, CEOs are able to limit the board's effectiveness in rooting out poor behavior before or while it occurs through their sheer personality and control over the governance process (Barclift, 2011). Prior studies have not only found aspects of CEO power and firm financial performance to be interrelated, where performance is both an antecedent condition and outcome of CEO power (Daily and Johnson, 1997). Such studies have also shown strong CEO power to be linked to lower firm value, lower profitability, and higher costs of debt (Bebchuk, Cremers, and Peyer, 2011; Liu and Jiraporn, 2010; Jiraporn et al.,2012). Also, CEO dominance is observed to stimulate managerial entrenchment while exacerbating agency conflicts which consequently jeopardizes value of firms.

Haleblian and Finkelstein (1993) for instance observe that firms with large teams performed better while firms with dominant CEOs performed worse in turbulent environments than in stable ones. Adams et al. (2005) looks at how CEO power impacts performance variability hypothesizing that powerful CEOs are less likely to compromise to other top executives which results in more extreme decisions that prove either beneficial or harmful to the firm. The study finds that stock returns appear more variable for firms run by powerful CEOs corroborating prior studies that argue that variability in firm performance increases with the degree of CEO influence.

Additionally, Liu and Jiraporn (2010) argue that executives can impact corporate outcomes when they have influence over crucial decisions. Exploring the effect of CEO power on bond ratings and yield spreads the study finds that firms

who's CEOs have more decision-making power demonstrate lower credit ratings and higher yield spreads. Bebchuk et al. (2011) also observe CEO centrality to be negatively associated with firm value, lower accounting profitability, lower stock returns accompanying acquisitions announced by the firm, and higher likelihood of a negative stock return accompanying such announcements. The study argues that poor performance could be the result of the agency conflict since strong CEO power is also related to several instances of shareholder-manager agency-related outcomes. The evidence particularly suggests that strong CEO power enables the CEO to act in a manner advantageous to himself/herself but not necessarily to the shareholders which worsens the agency conflict between shareholders and managers.

Jiraporn et al. (2012) also observe a tendency for dominant CEOs to select sub-optimal leverage so as to avoid the discipline imposed by debt financing. The study further finds that powerful CEOs hurt firm value by making more adverse the impact of changes in leverage on firm value. On the other hand, Tang et al. (2011) observe that firms with dominant CEOs tend to have a strategy deviant from the industry central tendency. This leads to extreme performance, i.e., either big wins or big losses. It is further noted that powerful boards weaken the tendency of dominant CEOs towards extremeness while improving the likelihood of dominant CEOs having more big wins than big losses. The study to a certain extent reconciles the pessimistic and heroic views regarding dominant CEOs and contend that the notion of power balance should be considered in a broader context. Prior research therefore offer evidence that CEO dominance may be an important factor in firm innovation effort since the CEO is typically the most powerful member of the corporate elite (Jensen & Zajac, 2004).

4.3 Theoretical Framework and Hypothesis Development

4.3.1 CEO Dominance and Firm Innovation

The current study draws on managerial power theory and agency theory to address the role of CEO dominance in shaping a firm's innovation effort. Managerial power theorists argue that CEO pay contracts are not always negotiated at arm's

length by the CEO and the board. CEOs could Utilize their relations with board members along with their job-related de facto power to initiate their compensation schemes. This could lead to less performance contingent schemes especially in firms where governance is quite weak (Barkema & Pennings, 1998; Bebchuk et al., 2002; Finkelstein & Hambrick, 1989). In line with this assertion, prior research offers evidence that executives with greater power receive more pay (Bebchuk & Fried, 2004; see also Bebchuk & Fried, 2003). Because contracts alone are not sufficient in resolving agency conflicts (Hart, 1995), corporate governance mechanisms have evolved to monitor activities by management and limit undesirable managerial behaviors (Jensen & Meckling, 1976).

Boards of directors act as representatives for stockholders. They are considered the primary internal control mechanisms enabling better alignment of the different interests of shareholders and top management, as well as reduction of executive opportunistic behavior (Gomez-Mejia & Wiseman, 1997; Tosi, Werner, Katz & Gomez-Mejia, 2000). In line with this notion, prior studies have highlighted the positive effects of strong corporate governance in managing CEO power. Zhang et al. (2007) for example note that when audit committees possess less financial expertise then there is greater likelihood that firms experience internal control weakness. Also, when boards and committees are more independent of the CEO, this can alleviate agency problems between shareholders and managers (Howton et al., 2001) and lead to more effective monitoring of management decisions (see for example Klein, 2002; Yermack, 1996). Such boards and committees are also less likely to be part of firms that are GAAP violators (Dechow & Sloan, 1996), and have lesser financial fraud instances (Beasley, 1996; Beasley, Carcello, Hermanson & Lapides, 2000; Jensen, Murphy & Wruck, 2004; Uzen, Szewczyk & Varma, 2004). They can also contribute to firms having more informative earnings (Bryan et al., 2004) and decreasing their normal accruals (Klein, 2002; Peasnell et al., 2005). Some studies also observe that a dual role CEO increases the likelihood of earnings management (Gul & Lai, 2002), decreases the reporting credibility of firms (Dey, 2005) and also negatively impacts the market (Anderson et al., 2003).

These prior studies show that stronger CEO power (i.e., dominance) exacerbates agency costs *(see for example,* Bebchuk et al., 2011). Therefore in the

context of the innovating firm, it can be anticipated that when firm corporate governance is weak, dominant CEOs are able to exercise more decision making power that is not in alignment with shareholder's interests. In this scenario, dominant CEOs could go after short-term gains while neglecting activities that serve the long-term growth of the firm. To test this assumption derived from managerial power theory, the following hypothesis is offered:

Hypothesis 1: There is a negative relation between CEO Dominance and:

1. a R&D Expenditures
1. b R&D/Total Sales
1. c R&D/Total Assets

The above hypothesis assumes that firms with CEOs (rewarded with large pay slices) having more power to influence decisions will show less initiative in risky ventures like innovation since the CEO may favor short-term gains to long-term growth. This is because CEOs are able to use their effective power related to their job and relations with the board of directors to reduce risky investment activities like innovation projects. With more power, CEOs can more effectively pursue their own agenda, since CEOs do not have to compromise with other members of the top management team if they disagree with him or her.

4.3.2 CEO Incentive and Firm Innovation

Agency theory argues that agency conflicts can arise from the separation of ownership and control, divergent management and shareholder objectives, as well as information asymmetry between managers and shareholders (Fama& Jensen, 1983; Jensen & Meckling, 1976). Agency theorists contend that because of these conflicts, managers would have motivation and ability to maximize their own utility at the expense of shareholders, including when such actions don't maximize wealth of shareholders (Watts & Zimmerman, 1986).

In line with arm's length contracting, board of directors that operate at arm's length from executives endeavor to serve shareholder interests by adopting compensation schemes that are designed to offer managers efficient incentives to maximize shareholder value. As such, compensation contracts can therefore be considered a partial remedy to the agency problem, reducing potential costs from self-

serving decisions by managers (Cianci et al., 2011). In the context of the innovating firm therefore, dominant CEOs can be incentivized to serve the long-term growth needs of the firm with performance contingent compensation schemes that serve shareholder interests. To test this assumption derived from agency theory, the following hypothesis is proposed:

Hypothesis 2: There is a positive relation between CEO Incentives and:

2. a R&D Expenditures

2. b R&D/Total Sales

2. c R&D/Total Assets

The above hypothesis assumes that the board of directors is able to design compensation schemes that offer appropriate equity-based incentives (i.e., those that demonstrate tolerance for early failures and reward for long-term success) which motivate CEOs to pursue innovation effort that favor firm long-term growth while maximizing shareholder value. Both hypotheses assume the CEO as being critically important to the success of the firm. This is because CEOs as organizational leaders make key decisions related to strategy, overall mission as well as the culture of the organization and can therefore be anticipated to have a direct impact on firm performance (Barclift, 2011).

4.4 Sample, Data and Empirical Approach

4.4.1 Sample Size

The current study utilizes secondary data of U.S. publicly listed companies from 1993 to 2013. The study's panel data is constructed from the Executive Compensation database (EXECUCOMP) for CEO compensation and incentives data, and then matched with data from COMPUSTAT as well as data from MSCI's ESG KLD STATS database. Data on firm R&D expenditures, firm characteristics as well as financial and accounting data are obtained from the merged CRSP/COMPUSTAT database. Firm corporate governance scores are obtained from the MSCI ESG KLD STATS database. Firms reporting zero R&D expenses are included in the final sample so as to obtain more sample observations (*see for example* Galasso and Simcoe, 2010;

Aghion et al., 2009; O'Connor and Rafferty, 2012; Sapra et al., 2013; Cho et al., 2016). The final matched dataset consists of two samples based on availability of CEO Pay Slice and CEO Incentives data. The first one includes 11,416 firm year observations from 1993 to 2013, excluding firms belonging to the finance and utilities sectors, based on CEO Pay Slice data availability. The second sample includes 6,998 firm year observations from 2007 to 2013, excluding firms belong to the finance and utilities sectors, based on CEO Incentives data availability.

4.4.2 Measurement of CEO Dominance

To measure CEO dominance, the study utilizes CEO pay slice (CPS) which reflects a CEO's relative compensation among top executives while capturing the relative significance of the CEO with regard to abilities, contribution or power (Jiraporn et al., 2012; Bebchuk et al. 2011; Finkelstein, 1992). The study follows Jiraporn et al. (2012) and Bebchuk et al. (2011) by defining CEO pay slice as the CEO's total compensation as a fraction of the combined total compensation of the top five executives (including the CEO) in a given firm. Included in total compensation are salary, bonus, other annual pay, long-term incentive payouts, total value of restricted stock granted that year, Black-Scholes value of stock options granted that year, and all other total compensation (EXECUCOMP item TDC1).

4.4.3 Measurement of CEO Incentive

The study uses CEO equity compensation (i.e., value of stock ownership and executive stock options for a given year) as a proxy for CEO Incentive. Equity based compensation (i.e., from stock ownership and stock options) directly ties CEO wealth to shareholder value. It is considered a major component of total CEO incentives (Jensen and Murphy 1990; Hall and Liebman 1998; Conyon and Murphy 2000; Core et al. 2003). Stock options provide value-increasing incentives for CEOs where year-to-year stock options grants offer incentives if the size of the grant is based on performance. Stock ownership also add to the incentives generated by the compensation package. It is another way that a CEO's welfare varies directly with the performance of his/her firm while being independent of any link between compensation and performance (Jensen and Murphy, 1990). To compute CEO equity

compensation, the current study utilizes the sum of the EXECUCOMP items value of stock awards - FAS 123R ($) and value of options awards - FAS 123R ($)[12].

4.4.4 Measurement of Firm Innovation Effort

R&D activities serve as a key component of the innovation effort of firms, as well as the most important intangible innovation expenditure (Evangelista et al., 1997). R&D investment can therefore be used as a proxy for innovation effort (*see for example* Balkin, Markman, & Gomez-Mejia, 2000; Hoskisson, Hitt, Johnson, & Grossman, 2002; Miller & Del Carmen Triana, 2009). The study employs 3 proxies for innovation effort: R&D expenditure, R&D/total sales and R&D/total assets, the latter two representing firm R&D intensity. R&D measures the effort with which firms pursue new and modified products, or new knowledge. R&D expenditures are also empirically more appealing as efforts in R&D can be carried out rather quickly and hence are more easily linked to specific events and must be immediately expensed (Honoré et al., 2015). Therefore R&D is more observable and has greater potential of providing clear evidence of the interplay between CEO dominance and firm innovation efforts.

4.4.5 Control Variables

The study follows the innovation literature and controls for potential observable firm characteristics to account for other factors that can influence firm innovation effort and consequently firm performance. Control variables included are a firm's size, earnings intensity, advertising intensity leverage, and investment intensity (*see for example* Acs and Audretsch, 1988; Opler and Titman, 1994; Crepon et al., 1998; Srinivasan et al., 2008; Souitaris, 2002; Timmer, 2003; Hosono et al., 2004;

[12] Both values are reported based on the 2006 financial accounting standard introduced by the Financial Accounting Standards Board (FASB). Under this standard, firms are required to subtract the share-based (equity) payment amount awarded to their employees on an annual basis. Equity compensation is provided to employees as a supplement to their salaries. This form of compensation usually comprises of stock option grants which can later be traded in for shares of a firm's stock. With the FAS 123R, costs related to equity payment for the services of an employee are to be expensed on financial statements. This would enable reflecting the economic transaction occurring between a firm and its employees. In the past, equity compensation was not expensed this way as to the firm it wasn't considered a real monetary expense. However, equity compensation should be recognized as a direct expense to a company's shareholders. This is because shareholders are the owners of publicly traded firms and therefore the ones who eventually end up paying for the issue of extra shares through the dilution process (i.e., when convertible securities are converted or when a firm issues additional shares).

Cho, 2016). The current study utilizes the following proxies for firm characteristics: Total Assets (firm size), EBITDA/Total Assets (earnings intensity), Advertising/ Total Assets (advertising intensity), Total Debt/Total Assets (firm leverage), and Capital Expenditures/ Total Assets (firm investment intensity).

The current study also controls for firm corporate governance which has been found to influence not only CEO power but also firm innovation activity and firm performance. Corporate governance scores for the current study represents the composite corporate governance score for a firm in a given year, which includes the total number of strengths minus total number of concerns across eleven corporate governance dimensions (compensation, ownership, accounting, reporting quality, political accountability, public policy, governance structure, investments, business ethics, corruption and political instability, and financial systems instability). Additionally, to account for variations across industries and across time, the study includes industry (based on the first two digits of SIC) and year dummies.

4.4.6. Empirical Approach

The current study uses both Ordinary Least Squares (OLS) regression and Tobit analysis (with panel-level random effects) to address the study's main hypothesis that addresses the relationship between CEO Dominance and innovation effort. OLS regression is utilized to test the association between CEO Dominance and the study's innovation proxies for the full sample, while controlling for corporate governance and firm characteristics. A follow up OLS regression analysis is also conducted for the full sample to address an alternative view to the CEO Dominance-Innovation argument, which is the CEO Incentive -Innovation argument.

An OLS regression allows for variation in the study variables, across time and across firms, with the clustering of standard errors at the firm level. However, while an OLS regression treats the reported research and development expenses as actual values (including those at the 0 threshold) and not as the upper limit of firms investing in research and development, a drawback of such an approach is that when there is a censoring of the variable, an OLS is unable to provide consistent estimates of the parameters. Hence, coefficients generated from the analysis may not always move closer to the true population parameters as the sample size expands (see Long, 1997).

Therefore, as a robustness check, further analysis is conducted utilizing Tobit analysis (with panel-level random effects) as it allows for estimating linear relationships between variables where the dependent variable is observed to have either left or right censoring (i.e., below and above censoring).In the current study's case, censoring from below takes place when firms reporting research and development expenses, for example, fall at or below the 0 threshold (*see* McDonald and Moffitt, 1980). Tobit analysis is utilized to test the association between CEO Dominance and the study's innovation effort proxies (i.e., R&D expenditures, R&D/Total Sales and R&D/Total Assets) for the full sample, while controlling for corporate governance and firm characteristics. A follow up Tobit analysis is also conducted for the full sample as a robustness check for the CEO Incentive - Innovation hypothesis. Additionally, the two-stage least squares (2SLS) technique is also employed to address possible endogeneity. This process requires instrumental variables that are related to the study's proxies of CEO dominance and incentive but that should not affect innovation effort except through CEO dominance and incentive. To address outliers where applicable, 0% / 1% - 99% winsorization is undertaken (refer to Appendix D1).

4. 5 Findings and Analysis

The current chapter addresses two key research questions. The first research question aims to investigate the influence of CEO Dominance on firm innovation effort. The second research question considers the effects of CEO Incentive on firm innovation effort. Both these questions are reflected in the study's two main hypotheses and six sub-hypotheses. The following section presents the empirical findings for the chapter while addressing the study's hypotheses utilizing two models. Model 1 provides empirical findings and addresses the study's hypotheses utilizing OLS regression analysis. A robustness check is then conducted utilizing Model 2 (where Tobit analysis is adopted to address the same hypotheses). Model 3 addresses reverse causality using instrumental variable analysis.

Table 4.1 Summary Statistics for Full Sample

This table presents descriptive statistics of the sample which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 11,416 firm year observations of U.S. firms from 1993 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. CEO Pay Slice is the CEO's total compensation as a fraction of the combined total compensation of the top five executives (including the CEO) in a given firm. CEO Incentive is the sum value of share ownership and executive stock options for a given year (in $000's). Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm characteristics utilized as control variables include Firm CG, Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

CEO Dominance/ Incentive	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
CEO Pay Slice	0.364	0.373	0.134	4.35E-05	0.987	0.088	3.663
CEO Incentive	2973	1750	3544.24	0	19015	2.185	8.541
Innovation Effort	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
R&D Expense	232.61	30.2	696.131	0	5000	5.175	32.100
R&D/ Sales	0.066	0.023	0.104	0	0.675	3.117	15.829
R&D/ Assets	0.043	0.022	0.054	0	0.260	1.721	5.924
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**
GovScore	-0.345	0	0.703	-4	2	-0.310	3.686
Total Assets *(log)*	7.605	7.524	1.590	2.772	13.590	0.403	3.042
EBITDA/Assets	0.136	0.134	0.093	-0.158	0.394	-0.037	3.879
Advertise/Assets	0.012	0	0.027	0	0.148	3.052	12.719
Cap.Exp./Assets	0.042	0.032	0.037	0	0.193	1.669	6.216
Debt/ Assets	0.178	0.139	0.190	0	1.705	1.253	5.267

Table 4.2 Summary Statistics by CEO Dominance

This table presents descriptive statistics (mean, median, standard deviation, minimum and maximum values) of the sample by weak to strong CEO Dominance performing firms, based on firm year observations. This study's full sample consists of 11,416 firm year observations of U.S. firms from 1993 to 2013, excluding firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Weak (strong) CEO Dominance performing firms consists of firms with CEO Dominance levels of below 0.5 (above 0.5), between 1993 and 2013. Weak CEO Dominance firms comprise of 9,986 firm year observations. Stronger CEO Dominance firms comprise of 1,430 firm year observations.

	CEO Dominance < 0.5 = 9,986			**CEO Dominance > 0.5 = 1,430**		
	Mean	**Median**	**Sd**	**Mean**	**Median**	**Sd**
CEO Pay Slice	0.333	0.354	0.109	0.581	0.552	0.083
R&D Expense	238.004	30.361	707.581	194.931	29.523	609.108
R&D/ Sales	0.067	0.024	0.105	0.064	0.021	0.102
R&D/ Assets	0.045	0.023	0.055	0.040	0.019	0.052
GovScore	-0.339	0	0.706	-0.385	0	0.681
Total Assets (log)	7.599	7.507	1.612	7.652	7.635	1.422
EBITDA/Assets	0.137	0.136	0.094	0.133	0.131	0.090
Advertise/Assets	0.013	0	0.027	0.012	0	0.026
Cap.Exp./Assets	0.043	0.0325	0.038	0.038	0.029	0.033
Debt/ Assets	0.176	0.135	0.190	0.197	0.164	0.190

4.5.1 Descriptive Statistics

Table 4.1 displays overall summary statistics for the study's independent, dependent and control variables. Summary statistics include the mean, median, standard deviation, minimum, maximum, as well as the skewness and kurtosis values, for 11,416 firm year observations across 1993 to 2013 and excludes firms from the finance and utilities SIC industry groups. The average CEO Pay Slice is 0.364. The average CEO Incentive is 2972.953. Table 4.2 displays overall summary statistics by a firm's CEO Dominance (i.e. firms with CEO Dominance of below 0.5 or otherwise),

based on firm year observations. Between 1993 and 2013, based on the number of firm year observations, over fifty percent of the sample had CEO Dominance values of below 0.5. Majority of CEOs of firms in the sample had weak dominance owing to lower CEO Pay Slice values. Overall statistics show that firms who's CEOs have a pay slice of below 0.5 have slightly higher mean values in terms of research development expenditures, R&D/ Total Sales and R&D/ Total Assets.

4.5.2 OLS Regression- Model 1

In Model 1, the study's two main hypotheses and six sub-hypotheses are addressed utilizing OLS regression analysis.

4.5.2.1 Model 1a: OLS Regression- CEO Dominance and Firm Innovation Effort

Model 1a addresses Hypothesis 1 which states that there is a negative relation between CEO Dominance and innovation effort while holding corporate governance constant. Specifically that this relationship is negative between CEO Dominance and R&D expenditures, CEO Dominance and R&D/Total Sales, and CEO Dominance and R&D/Total Assets. Table 4.3 reports the OLS regression results for CEO Dominance and innovation effort for the full sample.

Hypothesis 1a states that there is a negative relation between CEO Dominance and R&D expenditures. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is negative. Thus, Hypothesis 1a is supported. A follow up analysis by firm market capitalization, which is the total dollar market value of a firm's outstanding shares and more commonly used by the investment community to determine a firm's size, further reveals that this result is only significant and negative for large cap firms (refer to Appendix D2). Hypothesis 1b states that there is a negative relation between CEO Dominance and R&D/Total Sales. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Sales is negative. Thus, Hypothesis 1b is supported. Furthermore, this result if only significant and negative for large cap firms (refer to Appendix D3).

Hypothesis 1c states that there is a negative relation between CEO Dominance and R&D/Total Assets. Based on OLS regression results from Model 1a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is negative. Thus, Hypothesis 1c is supported. Additionally, this result if only significant and negative for mid cap firms (refer to Appendix D4).

Table 4.3 OLS Regression: CEO Dominance and Innovation Effort

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 1 using a sample of 11,416 firm year observations of U.S. firms from 1993 to 2013. The independent variable is CEO Pay Slice. The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-1762.575	0.000	0.221	0.000	0.132	0.000
CEO Pay Slice	-239.126	0.010	-0.017	0.043	-0.014	0.003
GovScore	65.207	0.004	-0.010	0.000	-0.005	0.000
Total Assets *(log)*	276.522	0.000	-0.009	0.000	-0.006	0.000
EBITDA/ Assets	161.500	0.388	-0.369	0.000	-0.075	0.000
Advertise/Assets	1322.088	0.061	-0.116	0.095	0.042	0.304
Cap.Exp./ Assets	501.094	0.345	0.057	0.328	0.053	0.097
Debt/ Assets	-563.88	0.000	-0.043	0.045	-0.031	0.001
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
R2	*0.401*	-	*0.371*	-	*0.401*	-
No. of Observations	*11,416*	-	*11,416*	-	*11,416*	-

4.5.2.2 Model 1b: OLS Regression- CEO Incentive and Firm Innovation Effort

Model 1b addresses Hypothesis 2 which states that there is a positive relation between CEO Incentive and Firm Innovation effort. Specifically that this relationship is positive between CEO Incentive and innovation effort, CEO Incentive and R&D Total Sales, and CEO Incentive and R&D Total Assets. Table 4.4 reports the OLS regression results for CEO Incentive and Innovation effort for the full sample.

Hypothesis 2a states that there is a positive relation between CEO Incentive and R&D expenditures. Based on OLS regression results from Model 1b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, Hypothesis 2a is supported.

Hypothesis 2b states that there is a positive relation between CEO Incentive and R&D/Total Sales. Based on OLS regression results from Model 1b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Sales is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, Hypothesis 2b is supported.

Hypothesis 2c states that there is a positive relation between CEO Incentive and R&D/Total Assets. Based on OLS regression results from Model 1b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, Hypothesis 2c is supported.

Table 4.4 OLS Regression: CEO Incentive and Innovation Effort

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 2 using a sample of 6,998 firm year observations of U.S. firms from 2007 to 2013. The independent variable is CEO Incentive[13] (in $000's). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the coloumn "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-760.236	0.003	0.342	0.000	0.192	0.000
CEO Pay Slice	-491.773	0.000	-0.067	0.000	-0.042	0.000
CEO Incentive	0.018	0.022	6.07E-06	0.000	3.14E-06	0.000
GovScore	76.382	0.004	-0.006	0.011	-0.003	0.021
Total Assets *(log)*	236.616	0.000	-0.017	0.000	-0.011	0.000
EBITDA/ Assets	79.225	0.621	-0.387	0.000	-0.101	0.000
Advertise/Assets	1377.597	0.059	-0.206	0.008	0.007	0.874
Cap.Exp./ Assets	61.734	0.898	-0.022	0.742	0.009	0.797
Debt/ Assets	-535.158	0.000	-0.034	0.176	-0.025	0.021
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
R2	*0.399*	-	*0.409*	-	*0.433*	-
No. of Observations	*6,998*	-	*6,998*	-	*6,998*	-

[13] Prior studies utilize the Black-Scholes method to calculate the dollar value of restricted stocks and stock options granted to the CEO during the year *(see for example* Jensen and Murphy, 1990; Mehran, 1995; Deckop et al., 2006; Sanders and Hambrick, 2007; Sun et al., 2009). Appendix D5 reports OLS results utilizing the Black-Scholes method. Results are robust to this method.

4.5.3 Tobit Analysis- Model 2

In Model 2, to check for the robustness of the results, the study's two main hypotheses and six sub-hypotheses are addressed again utilizing Tobit analysis.

4.5.3.1 Model 2a: Tobit Analysis- CEO Dominance and Firm Innovation Effort

Model 2a addresses Hypothesis 1 which states that there is a negative relation between CEO Dominance and innovation effort. Specifically that this relationship is negative between CEO Domiannce and R&D expenditures, CEO Dominance and R&D/Total Sales, and CEO Dominance and R&D/Total Assets. Table 4.5 reports the Tobit results for CEO Dominance and Innovation effort for the full sample.

Hypothesis 1a states that there is a negative relation between CEO Dominance and R&D expenditures. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is negative. Thus, results remain robust where Hypothesis 1a is still supported.

Hypothesis 1b states that there is a negative relation between CEO Dominance and R&D/Total Sales. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is negative. Thus, results remain robust where Hypothesis 1b is still supported.

Hypothesis 1c states that there is a negative relation between CEO Dominance and R&D/Total Assets. Based on Tobit results from Model 2a, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is negative. Thus, results remain robust where Hypothesis 1c is still supported.

Table 4.5 Tobit Analysis: CEO Dominance and Innovation Effort

This table presents the Tobit estimation results as a robustness check for Hypothesis 1 using a a sample of 11,416 firm year observations of U.S. firms from 1993 to 2013. The independent variable is CEO Pay Slice. The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm CG, Firm Size , Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-2163.085	0.000	0.233	0.000	0.139	0.000
CEO Pay Slice	-303.677	0.000	-0.022	0.004	-0.017	0.000
GovScore	60.257	0.000	-0.012	0.000	-0.006	0.000
Total Assets *(log)*	315.475	0.000	-0.009	0.000	-0.007	0.000
EBITDA/Assets	118.442	0.128	-0.414	0.000	-0.083	0.000
Advertise/ Assets	1565.666	0.000	-0.063	0.161	0.082	0.000
Cap.Exp./Assets	818.533	0.000	0.048	0.165	0.062	0.000
Debt/ Assets	-737.195	0.000	-0.069	0.000	-0.047	0.000
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
Pseudo R2	*0.060*	-	*-1.264*	-	*-0.537*	-
No. of Observations	*11,416*	-	*11,416*	-	*11,416*	-

4.5.3.2 Model 2b: Tobit Analysis- CEO Incentive and Firm Innovation Effort

Model 2b addresses Hypothesis 2 which states that there is a positive relation between CEO Incentive and innovation effort. Specifically that this relationship is positive between CEO Incentive and innovation effort, CEO Incentive and R&D/ Total Sales, and CEO Incentive and R&D /Total Assets. Table 4.6 reports the Tobit results for CEO Incentive and firm innovation effort for the full sample.

Hypothesis 2a states that there is a positive relation between CEO Incentive and R&D expenditures. Based on Tobit results from Model 2b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D expenditures is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, results remain robust where Hypothesis 2a is still supported.

Hypothesis 2b states that there is a positive relation between CEO Incentive and R&D/Total Sales. Based on Tobit results from Model 2b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Sales is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, results remain robust where Hypothesis 2b is still supported.

Hypothesis 2c states that there is a positive relation between CEO Incentive and R&D/Total Assets. Based on Tobit results from Model 2b, this relationship is statistically significant (P value < 0.05), while the coefficient of R&D/Total Assets is positive. Also CEO Dominance remains statistically significant (P value < 0.05) with a negative coefficient. Thus, results remain robust where Hypothesis 2c is still supported.

Table 4.6 Tobit Analysis: CEO Incentive and Firm Innovation Effort

This table presents the Tobit estimation results for Hypothesis 2 as a robustness check using a sample of 6,998 firm year observations of U.S. firms from 2007 to 2013. The independent variable is CEO Incentive (in $000's). The dependent variables include firm R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-1004.14	0.000	0.385	0.000	0.217	0.000
CEO Pay Slice	-675.191	0.000	-0.085	0.000	-0.053	0.000
CEO Incentive	0.027	0.000	7.90e-06	0.000	4.17e-06	0.000
GovScore	75.709	0.000	-0.007	0.000	-0.003	0.001
Total Assets *(log)*	265.791	0.000	-0.021	0.000	-0.013	0.000
EBITDA/ Assets	61.150	0.54	-0.437	0.000	-0.111	0.000
Advertise/ Assets	1458.297	0.000	-0.169	0.009	0.053	0.113
Cap.Exp./ Assets	334.260	0.258	-0.048	0.313	0.012	0.618
Debt/ Assets	-763.957	0.000	-0.067	0.000	-0.045	0.000
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
Pseudo R2	*0.063*	-	*-2.009*	-	*-0.694*	-
No. of Observations	*6,998*	-	*6,998*	-	*6,998*	-

4.5.4 Instrumental Variable Analysis- Model 3

Model 3 addresses the possibility of endogeneity or a reverse causal relationship between CEO Dominance and firm innovation effort, and between CEO Incentive and firm innovation effort. First of all, it is not plausible that increased firm innovation effort leads to weaker CEO dominance (CPS) and greater CEO equity based incentives. In other words, it is not likely that higher firm innovation effort 1) imposes less discipline on the CEO allowing him/her to consolidate his/her power and thus play a more dominant role 2) incentivizes the CEO through the creation of higher equity based incentives. Although reverse causality is unlikely, we cannot rule out that a more general endogeneity problem affects the reported results, when some unobserved and unknown factor is simultaneously driving innovation effort, CEO dominance and CEO equity incentives. Instrumental variables are thus selected to help address possible endogeneity problems.

The first variable selected as an instrument is the age of the CEO. Older CEOs can be anticipated to bring with them more years of experience in his/her field and in turn can therefore utilize such experience to exert more dominant roles as well as negotiate better compensation and incentive packages. Proponents of the behavioral view, including human resource specialists and industrial psychologists identify age as an individual factor key for the design and administration of top management compensation (Foster, 1980; Cummings, 1984; Fisher 1989) and can explain variations in the amount, mix, and type of compensation systems (O'Reilly, Main, and Crystal, 1988; Finkelstein and Hambrick, 1989). A positive relationship has also been found between the two (*see for example* Andrews and Henry, 1963). The age of the CEO will therefore likely affect the level of CEO dominance and incentive while not likely to have any direct effect on firm innovation effort. CEO age is measured using age in years of the incumbent CEO.

The second variable selected as an instrument is career ascension of the incumbent CEO as a result of greater propensity to negotiate. The motivation for the use of this instrument is simple: the higher the propensity to negotiate then the more rewarding the career advancement in the corporate world. Propensity to negotiate can be reflected in the speed of career ascension where faster career ascension (*see for example* Greig, 2008) reflects greater propensity to negotiate. Moreover, the

propensity to negotiate of the incumbent CEO should be a fairly exogenous event, which will impact the level of dominance of the current CEO, but at the same time does not have a reasonable effect on firm innovation effort. The study therefore utilizes period of career ascension as a proxy for propensity to negotiate which is measured using the length of years between joining a company and advancing to the CEO position (the value is zero for newly hired CEOs).

The third variable selected as an instrument is length of CEO tenure. A CEO's power likely grows more potent after he/she has already occupied the position for a number of years. Numerous studies hypothesized that board control over management decreases as CEO tenure increases (*see for example* Finkelstein and Hambrick, 1989; Singh and Harianto, 1989). According to Finkelstein and Hambrick (1989), a CEO can develop a "personal mystique or patriarchy" as his/her tenure increases which results in sanctions against questioning his/her authority. Therefore, given the growth in power associated with the length of CEO tenure, this in turn will likely impact level of CEO incentives, but is unlikely to have any direct effect on firm innovation effort. CEO tenure is measured using the length of years served in the CEO position.

Finally, the current study follows the Jiraporn et al., (2012) study, which relied on Bebchuk et al's finding that CPS exhibit variation across industries, and utilize industry-level median CPS as a fourth instrumental variable. A CEO in each given firm can be anticipated to influence his/her own firm's policies related to executive compensation and R&D expenditures, but is not likely to have any influence on other firm's policies in the industry (see also John an Knyazeva, 2006; John and Kadyrzhanova (2008); and Knyazeva, 2009).

Table 4.7 Instrumental Variable Analysis: CPS and CEO Incentive

CEO Pay Slice is the CEO's total compensation as a fraction of the combined total compensation of the top five executives (including the CEO) in a given firm. CEO Incentive is the sum value of share ownership and executive stock options for a given year (in $000's). Firm characteristics included as control variables include Firm CG, Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), and Firm Investment Intensity (Capital Expenditures/Total Assets).

	Model 3.1 First Stage CEO Pay Slice (CPS)	**Model 3.2 Second Stage R&D Expenditures**	**Model 3.3 First Stage CEO Incentive**	**Model 3.4 Second Stage R&D Expenditures**
Dependent Variable	**Coefficient** *t-value* *(p-value)*	**Coefficient** *t-value* *(p-value)*	**Coefficient** *t-value* *(p-value)*	**Coefficient** ***t-value*** ***(p-value)***
Constant	0.025 *1.18* *(0.237)*	-1089 *-10.01* *(0.000)*	-7388 *-24.23* *(0.000)*	-537.446 *-1.57* *(0.116)*
Predicted CEO Pay Slice	-	-2026 *-6.91* *(0.000)*	-	-
Predicted CEO Incentive	-	-	-	0.125 *2.62* *(0.009)*
CEO Age	0.0007 *2.87* *(0.004)*	-	2.273 *0.47* *(0.640)*	-
Career Ascension	-0.001 *-7.25* *(0.000)*	-	-	-
CEO Tenure	-	-	22.103 *4.36* *(0.000)*	-
Industry-Median CPS	0.745 *17.10* *(0.000)*	-	-	-
GovScore	-0.001 *-0.43* *(0.670)*	66.203 *4.96* *(0.000)*	-116.957 *-2.46* *(0.014)*	71.935 *5.88* *(0.000)*
Total Assets *(log)*	0.006 *4.83* *(0.000)*	291.614 *45.34* *(0.000)*	1373.343 *59.18* *(0.000)*	68.572 *1.05* *(0.296)*
EBITDA/ Assets	0.036 *1.75* *(0.081)*	337.136 *2.95* *(0.003)*	1311.323 *3.19* *(0.001)*	-9.839 *-0.09* *(0.931)*
Advertise/ Assets	0.123 *1.83* *(0.067)*	-520.543 *-1.42* *(0.156)*	7081.533 *5.27* *(0.000)*	-841.152 *-1.86* *(0.062)*
Cap. Exp. / Assets	-0.084 *-1.69* *(0.091)*	-1011.431 *-3.67* *(0.000)*	-316.9373 *-0.30* *(0.764)*	-606.872 *-2.52* *(0.012)*
Debt/ Assets	0.009 *0.94* *(0.350)*	-607.246 *-10.81* *(0.000)*	-2268.067 *-11.79* *(0.000)*	-408.650 *-3.46* *(0.001)*
F-Statistics	*118.48* *(0.000)*	*308.10* *(0.000)*	*11.45* *(0.000)*	*308.74* *(0.000)*
Centered R2	-	0.2424	-	0.0812
Sargan's (1958) Statistics	-	0.2536	-	0.5153

Table 4.7 reports the results of the two-stage regressions. Model 3.1 shows the first-stage regression for CEO Pay Slice. CEO age produces a significant and positive coefficient, in line with the argument that older CEOs are able to exert more dominance. Career ascension also produces a significant and negative coefficient, in line with the argument that greater propensity to negotiate is reflected in faster career advancement and greater dominance among CEOs. Industry-Median CPS also produces a significant and positive coefficient, in line with results from the Jiraporn et al. (2012) study. In Model 3.2, CPS is replaced with predicted CPS from the first-stage regression. The coefficient of predicted CPS is negative and significant, corroborating prior results (in both the OLS and Tobit estimations the relationship between CPS and R&D expenditures is significant and negative). To ensure appropriateness of the instruments the Sargan's (1958) test of over-identifying restrictions is conducted. The Sargan statistic is not significant and fails to reject the null hypotheses that the instrumental variables are uncorrelated with the residuals in the second-stage regression. Hence, the instruments are acceptable.

Model 3.3 shows the first-stage regression for CEO Incentive. CEO Tenure produces a significant and positive coefficient, in line with the argument that CEOs who have occupied his/her position for a while already experiences increases in incentives over the years as a result of increases in incentives awarded to him/her. In Model 3.4, CEO Incentive is replaced with predicted CEO Incentive from the first-stage regression. The coefficient of predicted CEO Incentive is significant and positive, corroborating prior results (in both the OLS and Tobit estimations the relationship between CEO Incentive and R&D expenditures is significant and positive). To ensure appropriateness of the instruments the Sargan's (1958) test of over-identifying restrictions is conducted. The Sargan statistic is not significant and fails to reject the null hypotheses that the instrumental variables are uncorrelated with the residuals in the second-stage regression. Hence, the instruments are acceptable. To sum up, while it is often difficult to eliminate endogeneity entirely, these additional results to a certain extent help lessen concerns about endogeneitty and offer some level of assurance that weaker CEO Dominance and better CEO Incentives more likely cause an increase in firm innovation effort, as opposed to the other way round.

4.6 Discussion of the Empirical Findings

This following section focuses on the interpretation of the empirical results based on the chapter's two key research questions and their corresponding hypotheses. The first research question addresses the influence of CEO Dominance on firm innovation effort. The second research question considers the effects of CEO Incentive on firm innovation effort. The discussion first focuses on whether the empirical findings and analysis offer evidence supporting the notion that stronger CEO Dominance deters firm innovation effort before moving on to discuss the evidence of the impact of CEO Incentive.

4.6.1 Does stronger CEO Dominance mean weaker Firm Innovation Effort?

The study's first research question explored the impact of CEO Dominance on firm innovation effort in the U.S. context, drawing on data from 11,416 firm year observations from 1993 to 2013. Specifically, the first research question addresses the relationship between level of CEO Dominance and firm R&D Expenditures, R&D/Total Sales and R&D/Total Assets- the study's three innovation effort proxies. Based on results of the data analysis for this research question, it is observed that stronger CEO dominance is associated with lower investments in R&D and overall lower R&D intensity.

OLS results reveal a significant and negative relationship between CEO Dominance and R&D expenditures. R&D expenditures decreases on average by 239,126,000 USD when CEO Pay Slice goes up by 1%. R&D/Total Sales decreases on average by -1.7% when CEO Pay Slice goes up by 1%. R&D/Total Assets decreases on average by -1.4% when CEO Pay Slice goes up by 1%. The results remain robust when modelling firms with zero R&D expenditures in the Tobit estimation.

A significant and negative relationship between CEO Dominance and the study's three innovation effort proxies can still be observed in the Tobit estimations. R&D expenditures decreases, on average by 303,677,000 USD, when CEO Pay Slice goes up by 1 %. R&D/Total Sales decreases, on average by -2.2%, when CEO Pay Slice goes up by 1 %. R&D/Total Assets decreases, on average by -1.7%, when CEO Pay Slice goes up by 1 %. This result shows that stronger CEO Dominance is

associated with overall lower investments in R&D and weaker R&D intensity of firms. In other words, the more dominant a CEO, then the more likely the firm is to have overall lower R&D investments and R&D intensity.

The results of the current study complement other studies that observe a negative impact of strong CEO power on overall firm performance. Such studies have found dominant CEOs to be bad for firm performance in turbulent environments (Haleblian and Finkelstein, 1993), to be negatively associated with accounting profitability, lower stock returns accompanying acquisitions announced by the firm and higher likelihood of a negative stock return accompanying such announcements (Bebchuk et al., 2011), and to hurt firm value (Bebchuk et al., 2011; Jiraporn et al., 2012). Indirectly related, Kashmiri et al. (2017) find that firms having a CEO with a narcissistic personality (i.e., a strong need for praise, overconfidence, and having a strong dominance orientation) tend to have greater firm innovation output, but also a higher likelihood of encountering a product-harm crisis (Kashmiri et al., 2017).

Overall the findings of the current study support the notion that CEOs rewarded with large pay slices have power to influence decisions that may not be in alignment with shareholder's interests. In a situation where a CEO favors short-term gains over long-term growth, then he/she will utilize such power to deviate from risky ventures like innovation, especially in a weak corporate governance setting. Moreover, the results suggest that powerful CEOs are able to negotiate compensation schemes that are not as provisional to their performance and hence do not feel obligated to compromise with other top managements members. Hence, in the context of the innovating firm, the presence of strong CEO dominance/power can hinder rather than promote efficient firm innovation effort since self-serving CEOs would rather focus on short-term gains while viewing innovation effort as risky.

4.6.2 Does CEO Incentive have any impact?

The study's second research question further explored the impact of CEO Incentive pay on Firm Innovation effort for the 2007-2013 panel dataset. Specifically, the second research question addresses the relationship between level of CEO Incentive pay (linked to the firm's stock price) and firm R&D Expenditures, R&D/Total Sales and R&D/Total Assets- the study's three innovation effort proxies.

Based on results of the data analysis for this research question, it is found that higher CEO Incentive pay is associated with higher investments in R&D and overall higher R&D intensity.

The OLS results reveal a significant and positive relationship between CEO Incentive and R&D expenditures. R&D expenditures increases on average by 18,000,000 USD when CEO Incentive goes up by 1,000,000 USD. R&D/Total Sales increases on average by 0.61% when CEO Incentive goes up by 1,000,000 USD. R&D/Total Assets increases on average by 0.314 % when CEO Incentive goes up by 1,000,000 USD. The results remain robust when modelling firms with zero R&D expenditures separately in the Tobit estimation.

A significant and positive relationship between CEO Incentive and the study's three innovation effort proxies can still be observed. In the Tobit estimation, R&D expenditures increases, on average by 27,000,000 USD when CEO Incentive goes up by 1,000,000 USD. R&D/Total Sales increases, on average by 0.79%, when CEO Incentive goes up by 1,000,000 USD. R&D/Total Assets increases, on average by 0.417%, when CEO Incentive goes up by 1,000,000 USD. Thus, higher CEO Incentive pay is associated with overall higher investments in R&D and higher R&D intensity of firms. In other words, the more incentivized a CEO, then the more likely the firm is to have overall higher R&D investments and R&D intensity.

The results of the current study complement other studies that find a positive impact of greater CEO incentives (that promote long term performance) on overall firm performance. Such studies have observed incentive schemes to not only impact firm productivity, firm value and profitability (Masson, 1971; Murphy 1985; Abowd, 1990; Jensen and Murphy, 1990; Mehran, 1995; Conyon and Freeman, 2002; Hanlon at al. 2003; Sun, Cahan, and Emanuel, 2009), but also corporate social performance (Johnson and Greening, 1999; Deckop, Merriman, and Gupta, 2014). Results also complement more recent studies that observe CEO risk-taking incentives to encourage risky investments (Chen, 2017) as well as enhance innovation output quantity and quality (Mao and Zhang, 2018),

Overall, the findings of the current study are in favor of the notion that board of directors operate at arm's length (from the endeavors of executives) to serve interests of shareholders by designing compensation schemes that incentivize

managers to maximize shareholder value. Such equity-based compensation contracts are intended to partially help address the agency problem that increases potential costs from a manager's self-serving decisions. Hence, in the context of the innovating firm, powerful CEOs can be incentivized to serve shareholder interests (that are in line with the long term growth of the firm) utilizing incentives like equity-based compensation that reward long-term performance of the CEO, which in turn helps promote firm innovation effort.

4.7 Conclusion and Future Research

Motivated by both agency theory and managerial power theory, the current study investigates whether innovation effort (i.e., investment in R&D and R&D intensity) is lower for firms exhibiting signs of higher CEO dominance and whether such CEOs can be incentivized to pursue risky ventures such as innovation projects in line with shareholder's interests that are geared towards the long-term growth of the firm. Utilizing two panel datasets of U.S. publicly listed companies comprising of 11,416 firm year observations for the 1993 to 2013 period for CEO pay slice, and 6,998 firm year observations for the 2007 to 2013 period for CEO Incentive, the study first addressed the influence of CEO dominance on firm innovation effort before moving on to address the effects of incentives in this relationship through both OLS and Tobit estimations.

Results from both estimations offer two key findings, after controlling for several firm, industry and year factors, as well as firm level corporate governance. Firstly, in line with the proposed relationship between CEO dominance and innovation effort, the study observes an overall significantly negative relationship between CEO pay slice and firm innovation effort. Secondly, in line with the proposed relationship between CEO incentives and innovation effort, the study observes an overall significantly positive relationship between equity-based incentives and firm innovation effort.

The findings of the study converge with other studies that observe a negative relationship between CEO power and firm performance as well as the positive effects of incentives in enhancing firm performance. Overall, the results of the

study help confirm that, other than firm, industry or market factors, managerial specific characteristics such as CEO dominance can be anticipated to have a profound impact on crucial corporate outcomes such as its level of innovation. Also, while high CPS can be an indicator of agency problems in a firm in which the CEO extracts unjustified rents that eventually hurt corporate performance, the study also finds that when provided with the right incentives, such as those that reward long-term performance, dominant CEOs can be incentivized to go after risky ventures like innovation projects that are crucial to promoting the long-term growth of the firm.

Nonetheless, the empirical evidence offered in the current study has some limitations and leaves scope for further research. Future studies considering the relation between CEO dominance and innovation effort could further consider the mediating effects of innovation effort on long-term growth, using different proxies for innovation effort, and different time lags for the effect of innovation effort to influence firm growth. This will enable better insight as to the overall impact of CEO dominance on corporate outcomes in the context of the innovating firm. Additionally, equity-based incentive is just one among several other incentives available to firms for incentivizing CEOs, therefore another avenue for future research is to consider which form of incentive matters more to the innovating firm.

Finally, recent studies have observed some potential benefits of powerful CEOs for firm innovation activity. Sariol and Abebe (2017), for instance, find that powerful CEOS show greater likelihood of pursuing higher risk (exploratory) innovations. Sheikh (2018) also documents the positive impact of powerful CEOs on a firm's ability to generate more patents and citations, especially in high competition markets. Such studies suggest that certain types of firms could also gain from the presence of powerful CEOs in the firm innovation context, providing another area of interest that calls for further research.

CHAPTER V
CONCLUSION, IMPLICATIONS AND LIMITATIONS

5.1 Conclusions

In the existing literature on firm level innovation growing interest in the role of firm governance, diversity and managerial characteristics in driving firm innovation effort can be observed (*see for example* Østergaard et al., 2011; Parrotta et al., 2012; Honore et al., 2015; Cho et al., 2016). However, the current empirical evidence and debate remains divided as a result of incomplete measures/proxies, use of cross-sectional data that fails to account for changes in trends, or an overall lack of understanding of other fundamental organizational dynamics that can better help explicate the innovation-performance link. Motivated by such research gaps, prior chapters of this thesis provided empirical evidence that addressed the role of underlying organizational factors like corporate governance, workforce diversity and managerial characteristics in relation to a firm's innovation effort and performance in the U.S. context.

In line with agency theory, Chapter II hypothesized that better firm level corporate governance (as promoted by shareholders), which prevents managerial efficiency-seeking strategies that focus on short-term gains, lead to greater firm innovation effort. Chapter II further hypothesized that firm innovation effort mediates the relationship between corporate governance and firm performance. Overall, the results are contrary to the proposed relationships. It is found that better corporate governance performance is associated with higher investments in R&D but weaker R&D intensity of firms, while a firm's innovation effort has no positive effect on its profitability. These results suggest that it is not always the case that effective corporate governance practices promote more efficient firm innovation effort.

Furthermore, motivated by a resource-based view of diversity, Chapter III hypothesized that greater workforce diversity, where a diverse human capital brings skills, experience and knowledge that provide economic value to firms, helps to

unlock firm innovation effort. Chapter III further hypothesized that firm innovation effort mediates the relationship between firm level workforce diversity and its performance. Overall results are contrary to the proposed relationship. While greater workforce diversity is shown to help promote firm innovation effort, a firm's innovation effort has no positive effect on its profitability, while holding workforce diversity constant, especially after controlling for CSR. Overall, the results suggest that while greater firm workforce diversity is associated with higher firm innovation effort, there is an emphasis on enhancing firm profitability through improved corporate social responsibility performance as a whole that deviates from a focus solely on workforce diversity and innovation effort.

Finally, in line with managerial power theory, Chapter IV hypothesized that greater dominance among CEOs, who utilize their power to make decisions that are not in alignment with shareholders' interests, would result in decreased firm innovation effort owing to a focus on short-term gains. Alternatively, Chapter IV further hypothesized a counter argument in line with agency theory that, the greater the CEO equity compensation incentives then the higher firm innovation effort, since CEOs can be incentivized to serve the long-term growth needs of the firm with performance contingent compensation schemes that serve shareholder interests.

Overall results are in line with the proposed relationships. Stronger CEO dominance is found to be associated with overall lower firm innovation effort. Additionally, greater CEO equity-based compensation incentives are shown to be associated with overall higher firm innovation effort. These findings suggest that dominant CEOs tend to favour short-term gains over long-term growth and will utilize their power to deviate from risky ventures like investments in innovation. On the other hand, CEOs can also be better incentivised to serve shareholder interests with increased equity compensation, which may enhance the long term growth of the firm, through greater firm innovation effort.

In conclusion, findings from these three studies highlighted the distinctive roles of corporate governance, workforce diversity and CEO dominance in relation to promoting firm level innovation effort. Chapter II notes how an environment where effective corporate governance practices is strictly adhered to can discourage firm level innovation effort. Chapter III highlights the benefits of strong diversity in the

workforce for the promotion of firm level innovation effort. Finally, Chapter IV emphasizes how equity-based compensation incentives help encourage CEOs to pursue risky ventures like firm innovation projects in line with a firm's long-term growth strategy, while reducing CEO power is also beneficial for increased innovation effort.

5.2 Implications for Theories and Practice

For researchers, empirical evidence from the three studies offer a number of implications. The three studies draw on theories from both the finance and management literature to extend the current understanding of the influence of not just corporate governance systems but also the impact of workforce diversity and powerful CEOs on firm level innovation effort and performance. The study utilizes the agency model to argue the importance of corporate governance in an innovation setting. Contrary to the principle belief of the value and benefits of good corporate governance practices on overall firm performance that is argued by the agency model, the results suggest otherwise. Better corporate governance performance appears to hinder rather than promote firm innovation effort.

On the other hand, the results also offer support for the management power theory which argues that in a weak corporate governance setting, dominant CEOs are able to exercise more decision making power that is not in alignment with shareholder's interests. Hence, he/she can pursue short-term gains while neglecting activities that serve the long-term growth of the firm. However, it is also observed that powerful CEOs can be incentivized to serve the long-term growth needs of the firm with performance contingent compensation schemes that serve shareholder interests. This is in line with the agency model that argues that compensation contracts (designed to offer managers efficient incentives to maximize shareholder value when board of directors operate at arm's length from executives) can be considered a partial remedy to the agency problem by reducing potential costs from self-serving decisions by managers. Moving beyond governance settings, the empirical evidence also offer support for a resource-based view of diversity at the level of the firm. Overall, based on the results of the study, diversity in the workforce could indeed affect the way

knowledge is generated and applied in the innovation process and that this effect is beneficial to overall firm innovation effort.

For practitioners, such as policy makers, firms and decision makers, the three studies offer several implications. In the context of the innovating firm, regulatory frameworks that enforces uniform corporate governance requirements on all types of firms could also lead to negative consequences, especially where firm innovation effort is concerned. Different governance mechanisms might be called for when considering firms that operate in sectors having high growth opportunities and requiring high levels of R&D investments compared to firms that operate in more predictable and stable environments. Also, the findings underscore the significance of human capital as a strategic asset and mirrors the value of employees and their role in helping firms achieve competitive advantage. Thus, in the interest of firm innovation effort, firms can add value through implementation of diversity-promoting human resource management practices as well as work environments. Finally, the results highlight the importance of board monitoring in ensuring that the level of CEO power is not excessive, as that could lessen the firm's drive for innovation, which in turn could affect the firm's long-term growth and sustainability in the market. In addition, it is also necessary for firms to incentivize CEOs to pursue long-term growth such as through innovation projects and avoid taking decisions at the expense of the firm's shareholders.

5.3 Limitations

While the prior chapters of this thesis offer key insight into the role of corporate governance, workforce diversity and CEO dominance in relation to firm innovation effort and overall performance, it nonetheless has some limitations. First, the empirical results are based on a sample of U.S. publicly listed companies, therefore the results may not directly apply to firms in developing economies. While the level of economic development of a country (i.e., developed vs. developing) needs to also be taken into account of when studying the impact of factors like governance, diversity and managerial behavior on the innovation effort of firms, majority of studies thus far only offer theoretical implications from the context of developed countries only. It is

not essentially the case that all three influences explored in the current thesis will impact innovation effort the same way in emerging economies where the general financial and institutional environments are less developed, and firm ownership tends to be concentrated rather than dispersed. Chen et al., (2011) for example find that corporate governance mechanisms (as recommended by the OECD) do not enhance financial returns of Chinese firms since firms in China have very different governance structures compared to those in the U.S. and function in quite different environments compared to the U.S. Hence, contextually, exploring differences between the innovation paradigm vs the catch-up paradigm as well as among industry sectors are left for future research.

Second, the current thesis utilizes regression models that measure relationships between the proposed variables in the same year. The models do not take into account the potential long lag between investments in R&D and new products, and the eventual outcome in terms of firm growth and profitability. Hence, overall results do not reflect the lag between firm level R&D investments and impacts on profitability, and therefore may underestimate the true long-term relation. Third, as with the majority of studies, this thesis looks at R&D (expenditure/intensity) as an antecedent of firm innovation output while leaving out understanding of other innovation sources in relation to how fast new innovations emerge in the market place. R&D is only one among many other measures of innovation discussed in the extant literature. For instance, Shapiro et al.'s (2013) study on Chinese SME's looks at both innovation inputs and output. Finally, along with majority of studies, the current thesis portrays firm level innovation effort (or innovation generation) as a means to enhance firm performance. However, it is noted that the emergence of innovations does not always occur to the market as intended and will likely depend on the success of diffusion rates of any given innovation at any given time. This would require further understanding of how firm performance at a given period is actually an accurate reflection of the innovation catch-up process of a firm to enable understanding of the rate of competitiveness among different industry types. There exist very few studies that look at new the development of new products and services (see Kraft and Czarnitzki, 2002; Shapiro et al., 2013), as well as new marketing and organizational processes, an indicator for firm level innovative success.

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APPENDICES

Appendix A

Description of Variables used in the Estimations

Variable Name	Definition	Data Source
Innovation effort Indicators		
R&D Expenditures	Total R&D Expenditures by *firm i in year t*, reported in $000,000's	CRSP/COMPUSTAT
R&D Expenditures/ Total Sales	Total R&D Expenditures by *firm i in year t* divided by Total Sales by *firm i in year t*	CRSP/COMPUSTAT
R&D Expenditures/ Total Assets	Total R&D Expenditures by *firm i in year t* divided by Total Assets by *firm i in year t*	CRSP/COMPUSTAT
Governance Indicators		
GovScore	Total CG strengths of *firm i in year t* minus Total CG concerns of *firm i in year t*	MSCI's ESG STAT
Workforce Diversity Indicators		
Diversity	Total Diversity strengths of *firm i in year t* minus Total Diversity concerns of *firm i in year t*	MSCI's ESG STAT
CSR	Total CSR strengths of *firm i in year t* minus Total CSR concerns of *firm i in year t*	MSCI's ESG STAT
CEO Dominance Indicators		
CEO Pay Slice	The ratio of CEO total compensation to the sum of all top-five executives' total compensation for *firm i in year t*	EXECUCOMP
CEO Incentive	Total value of CEO Stock Awards plus Total value of CEO Options Awards for *firm i in year t*, reported in $000's	EXECUCOMP
Firm Performance Indicators		
ROA	Net Income by firm i in year t divided by Total Assets by *firm i in year t*	CRSP/COMPUSTAT
ROE	Net Income *by firm i in year t* divided by Total Shareholder's equity by *firm i in year t*	CRSP/COMPUSTAT
EPSFI	Portion of earnings, net of taxes and preferred stock dividends allocated to each share of common stock by *firm i in year t*	CRSP/COMPUSTAT
Firm Characteristics		
Firm Size: Total Assets *(log)*	Log of Total Assets of *firm i in year t*	CRSP/COMPUSTAT
Firm Earnings Intensity: EBITDA/ Total Assets	Earnings before interest depreciation taxes and amortization of firm i in year t divided by Total Assets of *firm i in year t*	CRSP/COMPUSTAT
Firm Advertising Intensity: Advertising/Total Assets	Total Advertising Expenditures *by firm i in year t* divided by Total Assets of *firm i in year t*	CRSP/COMPUSTAT
Firm Leverage: Capital Expenditures/ Total Assets	Total Capital Expenditures by *firm i in year t* divided by Total Assets of *firm i in year t*	CRSP/COMPUSTAT
Firm Investment Intensity: Total Debt/ Total Assets	Total Debt of *firm i in year t* divided by Total Assets of *firm i in year t*	CRSP/COMPUSTAT
Instrumental Variables		
CEO Tenure	Number of years for which the incumbent CEO served as the CEO (in years)	EXECUCOMP
CEO Age	Age of the CEO (in years)	EXECUCOMP
Career Ascension	Year in which the incumbent CEO joined the company minus Year the incumbent CEO was made the CEO of the company	EXECUCOMP
Industry Median CPS	Industry Median CPS of *firm i* in *year t*	EXECUCOMP

Appendix B1

Summary Statistics for Full Sample- Original

This table presents descriptive statistics of the sample (pre-winsorzing) which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 15,761 firm year observations of U.S. firms from 1993 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Firm level CG is measured utilizing the composite corporate governance score for a firm in a given year, which includes the total number of CG strengths minus total number of CG concerns. Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm performance is measured utilizing ROA (net income as a fraction of total assets), ROE (net income as fraction of shareholder's equity), and EPSFI (portion of a firm's earnings, net of taxes and preferred stock dividends allocated to each share of common strock). Firm characteristics included as control variables include Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

CG	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**	**Winsor**
GovScore	-0.331	0	0.710	-4	2	-0.270	3.685	-
Innovation Effort	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**	**Winsor**
R&D Expense	185.4	6.962	745	0	12183	7.736	74.593	99%
R&D/ Sales	0.070	0.005	0.936	0	85.07	70.763	5700.862	99%
R&D/ Assets	0.033	0.005	0.058	0	0.887	3.980	32.793	99%
Firm Performance	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**	**Winsor**
ROA	0.050	0.058	0.124	-4.753	2.170	-7.483	205.113	1%-99%
ROE	0.068	0.120	6.218	-622	70.385	-92.142	9257.046	1%-99%
EPFSI	1.506	1.36	3.501	-68.45	97.9	3.179	147.051	1%-99%
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skewness**	**Kurtosis**	**Winsor**
Total Assets *(log)*	7.627	7.520	1.553	2.772	13.590	0.404	2.991	-
EBITDA/ Assets	0.148	0.141	0.102	-1.068	1.389	0.005	16.619	1%-99%
Advertise/ Assets	0.015	0	0.040	0	0.963	6.561	78.025	99%
Cap. Exp./ Assets	0.053	0.037	0.054	-0.033	0.804	3.080	19.278	1%-99%
Debt/ Assets	0.197	0.175	0.197	0	3.676	3.320	40.350	99%

Appendix B2

OLS Regression: Corporate Governance and R&D Expenditures (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 14, 542 firm year observations of U.S. firms from 1998 to 2013. The independent variable is Corporate Governance. The dependent variable include firm R&D expenditures (in $000,000's). Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D Expenditures	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	-125.402	-3.06	0.002	-53.108	-0.50	0.615	-5725.798	-7.52	0.000
GovScore	-4.109	-2.36	0.018	-4.641	-0.71	0.475	33.039	0.85	0.396
Total Assets *(log)*	18.187	3.59	0.000	61.199	5.83	0.000	684.203	9.40	0.000
EBITDA/Assets	-77.901	-4.86	0.000	-112.319	-1.74	0.082	2438.797	3.91	0.000
Advertise/Assets	118.042	1.72	0.085	249.047	1.52	0.130	928.766	0.41	0.678
Cap. Exp./Assets	77.362	2.15	0.032	323.822	2.26	0.024	604.130	0.53	0.596
Debt/Assets	-14.844	-1.27	0.205	-70.704	-1.95	0.052	-512.259	-1.33	0.186
Mean dependent var			23.026			81.606			705.694
R-squared			0.149			0.303			0.596
F-test			.			.			.
Akaike crit. (AIC)			81989.314			57141.973			39381.675
SD dependent var			73.389			172.980			1145.958
Number of obs			7263.000			4459.000			2451.000
Prob > F			.			.			.
Bayesian crit. (BIC)			82499.215			57602.966			39724.126

Appendix B3

OLS Regression: Corporate Governance and R&D/Total Sales (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 14, 542 firm year observations of U.S. firms from 1998 to 2013. The independent variable is Corporate Governance. The dependent variable include firm R&D/Total Sales. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			**Markcapdum = 1**			**Markcapdum = 2**		
R&D/ Total Sales	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	0.238	7.79	0.000	0.420	10.03	0.000	0.182	4.46	0.000
GovScore	-0.011	-4.66	0.000	-0.008	-4.35	0.000	-0.006	-2.16	0.031
Total Assets *(log)*	-0.026	-9.21	0.000	-0.030	-7.57	0.000	-0.007	-1.91	0.057
EBITDA/Assets	-0.344	-11.07	0.000	-0.337	-6.90	0.000	-0.049	-0.88	0.378
Advertise/Assets	-0.103	-1.93	0.054	-0.006	-0.09	0.931	-0.303	-2.27	0.024
Cap. Exp./Assets	0.017	0.48	0.633	-0.014	-0.34	0.734	-0.099	-1.44	0.151
Debt/Assets	-0.001	-0.07	0.942	-0.014	-0.84	0.400	-0.089	-4.22	0.000
Mean dependent var			0.051			0.039			0.050
R-squared			0.434			0.419			0.468
F-test			.			.			.
Akaike crit. (AIC)			-17957.254			-12478.896			-7104.250
SD dependent var			0.092			0.077			0.076
Number of obs			7263.000			4459.000			2451.000
Prob > F			.			.			.
Bayesian crit. (BIC)			-17447.354			-12017.903			-6761.799

Appendix B4

OLS Regression: Corporate Governance and R&D/Total Assets (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 14, 542 firm year observations of U.S. firms from 1998 to 2013. The independent variable is Corporate Governance. The dependent variable include firm R&D/Total Assets. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D/ Total Assets	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	0.151	7.95	0.000	0.198	9.15	0.000	0.101	4.40	0.000
GovScore	-0.007	-5.10	0.000	-0.005	-3.73	0.000	-0.003	-1.72	0.086
Total Assets *(log)*	-0.017	-10.13	0.000	-0.014	-6.84	0.000	-0.004	-1.80	0.073
EBITDA/Assets	-0.134	-8.00	0.000	-0.103	-4.27	0.000	0.063	1.80	0.072
Advertise/Assets	-0.012	-0.31	0.759	0.041	0.91	0.363	-0.115	-1.32	0.186
Cap. Exp./Assets	0.014	0.63	0.527	0.020	0.77	0.444	-0.042	-0.98	0.328
Debt/Assets	-0.008	-1.06	0.290	-0.019	-1.90	0.057	-0.051	-4.46	0.000
Mean dependent var			0.036			0.026			0.032
R-squared			0.431			0.411			0.473
F-test			.			.			.
Akaike crit. (AIC)			-25311.067			-17420.538			-9742.794
SD dependent var			0.056			0.044			0.045
Number of obs			7263.000			4459.000			2451.000
Prob > F			.			.			.
Bayesian crit. (BIC)			-24801.166			-16959.545			-9400.344

Appendix C1

Summary Statistics for Full Sample-Original

This table presents descriptive statistics of the sample (pre-winsorzing) which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 14,250 firm year observations of U.S. firms from 1992 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. Firm level workforce diversity is measured utilizing the composite diversity score for a firm in a given year, which includes the total number of diversity strengths minus total number of diversity concerns. Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm performance is measured utilizing ROA (net income as a fraction of total assets), ROE (net income as fraction of shareholder's equity), and EPSFI (portion of a firm's earnings, net of taxes and preferred stock dividends allocated to each share of common strock). Firm characteristics included as control variables include Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

Diversity and CSR	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
Diversity	0.023	0	1.385	-3	7	1.140	5.160	-
CSR	-0.223	-1	2.664	-11	19	1.456	8.253	-
Innovation Effort	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
R&D Expense	197.457	26.3	755.740	0	12183	7.737	74.242	99%
R&D/ Sales	4.187	0.037	242.323	-2.263	25684	93.415	9354.395	1%-99%
R&D/Assets	0.076	0.033	0.144	0	7.791	16.261	691.657	99%
Firm Performance	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
ROA	36.159	5.533	181.582	-3252	8084	11.955	372.352	1%-99%
ROE	-0.001	0.029	5.778	-622.4	142.8	-86.819	9493.537	1%-99%
EPFSI	0.979	0.85	2.985	-78.55	97.9	-1.300	192.544	1%-99%
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
Total Assets *(log)*	6.953	6.770	1.758	-0.021	13.59	0.462	3.082	-
EBITDA/ Assets	89.378	16.448	306.793	-551	6377	8.603	103.079	1%-99%
Advertise/ Assets	7.511	0	36.013	0	821.4	10.098	143.759	99%
Debt/Assets	0.162	0.105	0.201	0	3.232	2.450	17.026	99%
Cap.Exp /Assets	29.421	4.543	131.681	-0.942	3557	12.356	199.192	1%-99%

Appendix C2

OLS Regression: Diversity and R&D Expenditures (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 13, 335 firm year observations of U.S. firms from 2000 to 2013. The independent variable is Diversity. The dependent variable include firm R&D expenditures (in $000,000's). Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D Expenditures	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	-60.115	-1.67	0.096	73.848	0.47	0.638	-1925.405	-2.58	0.010
Diversity	4.364	3.07	0.002	26.691	3.56	0.000	83.018	3.04	0.003
Total Assets *(log)*	14.774	3.29	0.001	29.949	1.09	0.274	278.090	3.25	0.001
EBITDA/Assets	-1.235	-2.69	0.007	0.607	0.95	0.343	1.300	4.00	0.000
Advertise/Assets	3.214	1.53	0.127	-0.370	-0.64	0.522	1.673	0.80	0.426
Debt/Assets	-5.040	-0.59	0.554	-69.150	-1.47	0.141	-545.246	-1.35	0.180
Cap. Exp./Assets	3.786	2.25	0.025	1.587	2.89	0.004	-0.558	-0.59	0.558
Mean dependent var			31.457			120.620			951.067
R-squared			0.426			0.367			0.661
F-test			.			.			.
Akaike crit. (AIC)			91618.233			41152.988			27676.470
SD dependent var			71.845			197.731			1263.528
Number of obs			8447			3168			1720
Prob > F			.			.			.
Bayesian crit. (BIC)			92061.851			41492.396			27921.724

Appendix C3

OLS Regression: Diversity and R&D/Total Sales (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 13, 335 firm year observations of U.S. firms from 2000 to 2013. The independent variable is Diversity. The dependent variable include firm R&D/Total Sales. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D/Total Sales	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	1.313	3.42	0.001	0.949	3.44	0.001	0.290	3.85	0.000
Diversity	0.016	0.54	0.590	0.015	3.07	0.002	-0.002	-0.71	0.481
Total Assets *(log)*	-0.151	-1.84	0.066	-0.090	-2.79	0.005	-0.018	-2.13	0.034
EBITDA/Assets	-0.019	-2.28	0.023	-0.001	-2.47	0.014	0.000	1.88	0.061
Advertise/Assets	-0.009	-1.30	0.194	0.000	0.01	0.992	0.000	-0.53	0.599
Debt/Assets	0.625	3.17	0.002	0.035	0.51	0.614	-0.111	-3.61	0.000
Cap. Exp./Assets	0.011	2.59	0.010	0.001	3.39	0.001	0.000	-0.81	0.419
Mean dependent var			0.443			0.093			0.103
R-squared			0.234			0.095			1720.000
F-test			.			.			.
Akaike crit. (AIC)			29527.206			3379.247			-3301.298
SD dependent var			1.576			0.426			0.103
Number of obs			8447			3168			1720
Prob > F			.			.			.
Bayesian crit. (BIC)			29970.824			3718.655			-3301.298

Appendix C4

OLS Regression: Diversity and R&D/Total Assets (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 13, 335 firm year observations of U.S. firms from 2000 to 2013. The independent variable is Diversity. The dependent variable include firm R&D/Total Assets. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			**Markcapdum = 1**			**Markcapdum = 2**		
R&D/Total Assets	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	0.364	12.06	0.000	0.290	9.22	0.000	0.252	6.34	0.000
Diversity	0.004	2.11	0.035	0.007	4.64	0.000	0.002	1.00	0.319
Total Assets *(log)*	-0.043	-8.15	0.000	-0.026	-6.94	0.000	-0.019	-4.26	0.000
EBITDA/Assets	-0.001	-2.08	0.038	0.000	-1.96	0.050	0.000	2.92	0.004
Advertise/Assets	0.000	-0.11	0.910	0.000	0.24	0.807	0.000	-0.08	0.938
Debt/Assets	0.061	4.39	0.000	0.007	0.38	0.702	-0.064	-4.42	0.000
Cap. Exp./Assets	0.001	3.25	0.001	0.000	3.47	0.001	0.000	-0.23	0.822
Mean dependent var			0.091			0.093			0.043
R-squared			0.452			0.095			0.404
F-test			.			.			.
Akaike crit. (AIC)			-15844.407			3379.247			-6071.332
SD dependent var			0.127			0.426			0.052
Number of obs			8447			3168			1720
Prob > F			.			.			.
Bayesian crit. (BIC)			-15400.788			3718.655			-5826.078

Appendix D1

Summary Statistics for Full Sample-Original

This table presents descriptive statistics of the sample which include means, median, standard deviations, minimum and maximum values, as well as skewness and kurtosis values. This sample consists of 11,416 firm year observations of U.S. firms from 1993 to 2013. The sample excludes firms belonging to the (1) financial industrial sector and (2) utilities industrial sector. CEO Pay Slice is the CEO's total compensation as a fraction of the combined total compensation of the top five executives (including the CEO) in a given firm. CEO Incentive is the sum value of share ownership and executive stock options for a given year. Firm innovation effort is measured utilizing R&D expenditures (in $000,000's), R&D/Total Sales, and R&D/Total Assets. Firm characteristics utilized as control variables include Firm Size (Total Assets), Earnings Intensity (EBITDA/Total Assets), Advertising Intensity (Advertising/Total Assets), Firm Leverage (Total Debt/Total Assets), Firm Investment Intensity (Capital Expenditures/Total Assets).

CEO Dominance	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
CEO Pay Slice	0.364	0.373	0.134	4.35E-05	0.987	0.088	3.663	-
CEO Incentive	3150.17	1749.936	6452.72	-1373.442	376180	30.515	1632.947	1%-99%
Innovation	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
R&D Expense	252.515	30.2	858.246	0	12183	6.638	55.430	99%
R&D/Sales	0.0976	0.023	1.099	0	85.07	60.323	4139.085	99%
R&D/ Assets	0.0454	0.022	0.064	0	0.887	3.537	27.255	99%
Firm Characteristics	**Mean**	**Median**	**Sd**	**Min**	**Max**	**Skew**	**Kurtosis**	**Winsor**
GovScore	-0.345	0	0.703	-4	2	-0.310	3.686	-
Total Assets *(log)*	7.606	7.524	1.590	2.772	13.590	0.403	3.042	-
EBITDA/ Assets	0.136	0.135	0.104	-1.068	1.183	-0.591	12.417	1%-99%
Advertise/ Assets	0.013	0	0.035	0	0.519	5.606	50.550	99%
Cap.Exp/ Assets	0.043	0.032	0.039	0	0.414	2.145	10.342	99%
Debt/ Assets	0.178	0.139	0.190	0	1.705	1.253	5.267	-

Appendix D2

OLS Regression: CPS and R&D Expenditures (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 9,984 firm year observations of U.S. firms from 1998 to 2013. The independent variable is CEO Pay Slice. The dependent variable include firm R&D expenditures (in $000,000's). Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0 (Small)			**Markcapdum = 1 (Mid)**			**Markcapdum = 2 (Large)**		
R&D Expenditures	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	-131.802	-2.80	0.005	-351.463	-2.36	0.018	-7476.215	-7.70	0.000
CEO Pay Slice	-7.302	-0.86	0.388	-17.008	-0.57	0.569	-522.636	-2.45	0.015
GovScore	-5.315	-2.19	0.029	-6.361	-0.72	0.473	60.481	1.22	0.223
Total Assets *(log)*	29.124	3.78	0.000	93.445	6.36	0.000	879.475	9.68	0.000
EBITDA/Assets	-113.672	-4.24	0.000	-181.223	-1.96	0.051	3063.822	3.68	0.000
Advertise/Assets	219.489	1.49	0.136	180.664	0.71	0.476	829.514	0.26	0.792
Cap.Exp./Assets	179.153	2.27	0.023	748.466	2.74	0.006	1119.666	0.54	0.592
Debt/Assets	-21.583	-1.32	0.188	-60.273	-1.24	0.214	-832.550	-1.69	0.092
Mean dependent var			33.826			116.771			984.703
R-squared			0.153			0.320			0.614
F-test			.			.			.
Akaike crit. (AIC)			59519.505			40656.441			30164.058
SD dependent var			94.673			202.347			1387.335
Number of obs			5045			3101			1838
Prob > F			.			.			.
Bayesian crit. (BIC)			59937.178			41018.809			30439.880

Appendix D3

OLS Regression: CPS and R&D/Total Sales (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 9,984 firm year observations of U.S. firms from 1998 to 2013. The independent variable is CEO Pay Slice. The dependent variable include firm R&D/Total Sales. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D/Total Sales	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	0.375	10.72	0.000	0.598	8.57	0.000	0.259	4.58	0.000
CEO Pay Slice	0.003	0.23	0.817	-0.017	-1.42	0.156	-0.041	-2.44	0.015
GovScore	-0.014	-3.76	0.000	-0.010	-3.35	0.001	-0.004	-1.45	0.148
Total Assets *(log)*	-0.034	-7.76	0.000	-0.046	-7.14	0.000	-0.012	-2.53	0.012
EBITDA/Assets	-0.544	-10.38	0.000	-0.546	-5.89	0.000	-0.098	-1.27	0.207
Advertise/Assets	-0.292	-3.07	0.002	-0.073	-0.70	0.483	-0.333	-1.85	0.065
Cap.Exp./Assets	0.077	1.04	0.296	0.041	0.44	0.657	-0.176	-1.23	0.220
Debt/Assets	0.002	0.06	0.950	0.012	0.43	0.668	-0.094	-3.75	0.000
Mean dependent var			0.081			0.058			0.067
R-squared			0.437			0.441			0.423
F-test			.			.			.
Akaike crit. (AIC)			-9749.955			-7220.265			-4655.435
SD dependent var			0.121			0.099			0.087
Number of obs			5045			3101			1838
Prob > F			.			.			.
Bayesian crit. (BIC)			-9332.281			-6857.896			-4379.614

Appendix D4

OLS Regression: CPS and R&D/Total Assets (by Market Cap)

This table presents the ordinary least squares (OLS) estimation results by Market Cap as a robustness check for Hypothesis 1 using a sample of 9,984 firm year observations of U.S. firms from 1998 to 2013. The independent variable is CEO Pay Slice. The dependent variable include firm R&D/Total Assets. Based on Standard & Poor's classification of small-mid-large cap stocks, Small Cap Firms (i.e., Markcapdum = 0) consist of firms having a market cap of between 300 million USD to 2 billion USD, Mid Cap Firms (i.e., Markcapdum = 1) consists of firms having a market cap of between 2 billion USD to 10 billion USD, and Large Cap Firms (i.e., Markcapdum = 2) consists of firms having a market cap of more than 10 billion USD. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled for. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	Markcapdum = 0			Markcapdum = 1			Markcapdum = 2		
R&D/Total Assets	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
Constant	0.216	13.83	0.000	0.245	8.61	0.000	0.122	4.27	0.000
CEO Pay Slice	-0.009	-1.18	0.239	-0.016	-2.10	0.036	-0.008	-1.12	0.263
GovScore	-0.008	-4.15	0.000	-0.005	-3.27	0.001	-0.002	-1.34	0.182
Total Assets *(log)*	-0.019	-9.14	0.000	-0.019	-7.01	0.000	-0.006	-2.34	0.020
EBITDA/Assets	-0.166	-7.98	0.000	-0.104	-3.06	0.002	0.081	1.89	0.060
Advertise/Assets	-0.005	-0.10	0.920	0.068	1.07	0.285	-0.126	-1.12	0.265
Cap.Exp./Assets	0.051	1.26	0.208	0.046	0.85	0.394	-0.059	-0.72	0.470
Debt/Assets	-0.012	-1.05	0.294	-0.003	-0.23	0.817	-0.058	-4.52	0.000
Mean dependent var			0.053			0.037			0.042
R-squared			0.448			0.438			0.450
F-test			.			.			.
Akaike crit. (AIC)			-16589.426			-11554.296			-6974.583
SD dependent var			0.062			0.049			0.048
Number of obs			5045			3101			1838
Prob > F			.			.			.
Bayesian crit. (BIC)			-16171.752			-11191.927			-6698.761

Appendix D5

OLS Regression: CEO Incentive and Innovation Effort

This table presents the ordinary least squares (OLS) estimation results for Hypothesis 2 using a sample of 4,418 firm year observations of U.S. firms from 1993 to 2006. The independent variable is CEO Incentive (utilizing the Black-Scholes method). The dependent variables include firm R&D expenditures (in $000,000's) , R&D/Total Sales, and R&D/Total Assets. Firm CG, Firm Size, Earnings Intensity, Advertising Intensity, Firm Leverage, and Firm Investment Intensity are controlled. P-values are shown in the column "Sig.". Coefficients are shown in the column "Coef.". A 5% significance level is applied.

	R&D Expenditures		***R&D /Total Sales***		***R&D/Total Assets***	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
Constant	-2008.528	0.000	0.274	0.000	0.151	0.000
CEO Pay Slice	-406.244	0.002	-0.089	0.000	-0.046	0.000
CEOIncentive2	0.016	0.003	3.77E-06	0.000	1.79E-06	0.000
GovScore	80.093	0.026	-0.0115	0.000	-0.007	0.000
Total Assets *(log)*	284.645	0.000	-0.0135	0.000	-0.008	0.000
EBITDA/ Assets	385.406	0.137	-0.343	0.000	-0.035	0.117
Advertise/ Assets	884.980	0.266	-0.104	0.222	0.043	0.427
Cap.Exp./ Assets	1116.421	0.134	0.136	0.076	0.102	0.012
Debt/ Assets	-467.091	0.000	-0.024	0.332	-0.022	0.052
Industry Dummy	Yes	-	Yes	-	Yes	-
Year Dummy	Yes	-	Yes	-	Yes	-
R2	*0.4454*	-	*0.3797*	-	*0.4297*	-
No. of Observations	*4,418*	-	*4,418*	-	*4,418*	-