VOLUNTARY DISCLOSURE AND CORPORATE INNOVATION: EVIDENCE FROM MANAGEMENT EARNINGS FORECASTS

ZIYAO SAN

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ABSTRACT

This research consists of two parts. In the first part, I examine whether a firm whose chief executive officer (CEO) is more future-oriented (as measured by commitment to voluntary disclosure practices, i.e., issuing more frequent and more disaggregated earnings forecasts) is likely to be more successful in corporate innovation investment. Using a global sample of 26,364 firms from 27 countries and a single-country sample of 8,980 firms (domiciled in the US), I find that firms with more future-oriented CEO are granted more patents and receive more citations per patent. The results of additional cross-sectional analyses indicate that the relationship between commitments to voluntary disclosure and corporate innovation varies with various CEO-, firm-, and country-level factors.

In the second part of this research, I investigate the role of CEOs' personality traits in corporate innovation and in the association between commitment to voluntary disclosure and corporate innovation. I find that firms with more extraverted CEOs tend to be more successful in their innovation investment in the future and that the signaling role of commitment to voluntary disclosure in corporate innovation success is more pronounced in firms with more extraverted CEOs. My findings also indicate that voluntary disclosure by more extraverted CEOs attracts more investor attention.

Collectively, the results of this research support the conjecture that future-oriented CEOs are likely to commit to voluntary disclosure practices to signal their ability to manage uncertainties associated with innovation investment and thereby achieve innovation success. Additionally, such signaling tends to be driven by more extraverted CEOs.

This research should be important for the investors and other stakeholders, as it shows how the likelihood of firms' future innovation success can be inferred from CEOs' observable earnings forecasting behavior. The findings may also be of interest to firms, as they highlight the importance of considering candidates' level of extraversion when hiring a CEO. Finally, the findings of this research should be helpful to policymakers who develop initiatives to enhance firms' voluntary financial disclosure, because this research highlights how the effectiveness of management earnings forecasts in signaling corporate innovation success varies with country-level institutional characteristics.

DEDICATION

This dissertation is dedicated to my parents, Ruixiang San and Yuping Gu. They motivated me to pursue my doctoral degree and encouraged me to go forward at every step.

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"*You were so disappointed with me because I quit Ph.D. program in Economics in 2008. You said that I should not have given up everything in Canada and come back to China. I never told you that I quit because the doctors said you could live no more than six months. I would like to accompany you in your last moments. I am so grateful that you stayed with me for four more years after that. Now, it is a little bit late and much more difficult, but I have done what I promised to you. I never regretted what I did for you. Thanks for being my family. I miss you*."

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CHAPTER ONE:

INTRODUCTION

Corporate innovation occurs when firms implement new ideas, products, or services to boost their revenue. Corporate innovation benefits a firm by making its processes more efficient, reducing its costs, and increasing its profitability. Therefore, corporate innovation is one of the most important drivers of a firm's long-term competitive advantage and success (Romer 1986; Holmstrom 1989; Porter 1992; Hall et al. 2005; Hsu et al. 2014). In recent decades, investing in corporate innovation has become even more important for firms due to the rapid increase in competition in both domestic and global markets (McKinsey and Company 2007; Ernst and Young 2019). As a result, corporate innovation now receives considerable attention from both researchers and corporate executives.[1] Corporate innovation is generally viewed as a long-term, risky, and idiosyncratic process that requires high levels of financial support, patience, and failure tolerance (Holmstrom 1989). Given the highly uncertain nature of corporate innovation outcomes, two key questions asked in the corporate innovation literature of the last decade (e.g., McKinsey and Company 2007; He and Tian 2018; Ernst and Young 2019) are as follows: What are the drivers/determinants of corporate innovation? Are the outcomes of corporate innovation predictable?

Studies suggest that as well as firm-level factors (e.g., analyst coverage, institutional investment, and financial constraints), the personal characteristics of chief executive officers (CEOs) (e.g., overconfidence, sensation seeking, network connections, and managerial skills) play crucial roles in corporate innovation. However, little is known about the role of CEOs' future orientation in corporate innovation activities, and whether such role varies across the CEO-level, firm-level and country-level characteristics. Given the difficulty in measuring future orientation directly, very

[1] According to a survey by He and Tian (2018), the number of papers on corporate innovation published on major journals has increased by more than 10 times in the past couple of decades. Additionally, the results of surveys of corporate executives indicate the growing importance of corporate innovation in driving growth (see, e.g., McKinsey and Company (2007) and Ernst and Young (2019)).

limited empirical studies in finance and accounting actually focus on CEO's future orientation. Filling in this gap in the literature is one of the main motivations for my research.

According to Seijts (1998), future orientation is the ability to anticipate, plan for, and manage future uncertainties. Studies show that CEOs' future orientation is crucial to the success of corporate innovation (Tansuhaj et al. 1991; Kitchell 1995; Yadav et al. 2007; Rohrbeck and Kum 2018). In a 2013 survey of 519 companies across various industry sectors in France, the UK, and the US conducted by Accenture, 93% of the surveyed executives believed that the long-term success of an organization depends on executives' ability to innovate. However, despite the high priority given to innovation by the majority of the companies surveyed (with about 70% of the executives listing innovation among their companies' top five priorities), few of the executives (roughly 18%) believed that their companies' innovation efforts delivered a competitive advantage.[2]

Our current understanding of the determinants of corporate innovation success and the role of CEOs' personal characteristics in innovation is limited. Therefore, in the first part of this research, I explore the role of CEOs' future orientation in corporate innovation. Following the view that committing to forward-looking voluntary disclosure (i.e., more frequent and more disaggregated forecasts) signals managers' ability to manage their firms' innovation investment (e.g., Trueman 1986), I use CEOs' commitment to forward-looking voluntary disclosure (i.e., issuing more

[2] Accenture (NYSE: CAN) is a Fortune Global 500 company that provides multinational professional strategy and consulting services. See "Innovation Efforts Falling Short Despite Increased Investment available at https://newsroom.accenture.com/news/accenture-study-innovation-efforts-falling-short-despite-increased-investment.htm?c=glb_accglbtwt_10000762.

frequent and more disaggregated earnings forecasts), as empirical proxies for CEOs' level of future orientation. Managers' commitment to earnings forecasting (e.g., issuing frequent earnings forecasts and providing supporting forecasts for detailed income statement line items, namely forecast disaggregation) sheds light on how the managers constrain themselves from earnings management (Dutta and Gigler 2002; Hirst et al. 2007). Greater commitment to forward-looking voluntary disclosure signals managers' ability to anticipate, plan for, and manage future uncertainties. That is, a greater commitment to earnings forecasts (i.e., more frequent and more disaggregated forecasts) reflects their effectiveness in managing a firm in an uncertain environment, therefore, a greater commitment to earnings forecast indicates a higher level of future orientation To assess corporate innovation success, I use the number of patents granted to and the number of citations per patent received by a firm in the next three years as proxies for the quantity and quality of the firm's corporate innovation outcomes.

I first take a global perspective to provide a comprehensive understanding of the importance of voluntary disclosure to corporate innovation. This offers the opportunity to examine the differential implications of the decision to provide voluntary disclosure (i.e., earnings forecast propensity) and commitment to forward-looking voluntary disclosure for firms in different countries.[3] I next shift my attention to the US, similar to most studies in this line of literature (see He and Tian 2018 for a comprehensive literature review on corporate innovation). My global sample is based on a unique set of management earnings forecast data hand-collected from the original text of earnings forecasts issued by firms from 27 countries contained in Standard & Poor's Compustat Capital IQ (CIQ) database and global patent and citation data from Bureau van Dijk's Orbis patent database

[3] For example, research suggests that voluntary disclosures issued by firms domiciled in countries with less developed institutions may be perceived as less credible (e.g., Hutton et al. 2003; Cao et al. 2017).

for the period 2004–2016. The global sample consists of 151,456 firm-year observations for 26,364 firms. I then focus on the firms in the global sample that are domiciled in the US, which leads to a US sample comprising 47,914 firm-year observations for 8,980 firms.

After conducting various empirical tests, I find that firms with more future-oriented CEO (i.e. more committed to forward-looking voluntary disclosure) are more likely to have more patents granted and more citations per patent received in both the global and US samples.[4] Specifically, after controlling for an array of determinants documented by prior studies to be associated with corporate innovation (e.g., McKinsey and Company 2007; He and Tian 2018; Ernst and Young 2019), I find that both the number of patents granted to and the number of citations per patent received by a firm in the next three years (i.e., year $t + 1$ to $t + 3$) increase with the frequency and disaggregation of management earnings forecasts in year t. My finding is robust for the global sample, the US sample, and the global sample without US firms. In the additional robust test, I use the propensity score matched (PSM) approach to identify samples with similar characteristics and employing alternative innovation measures, the empirical finding is statistically unchanged in all the sample. Furthermore, according to my empirical evidence, the decision to issue a management earnings forecast alone is not found to be an effective signal of a firm's future innovation success. Taken together, these findings support the conjecture that firms with more future-oriented CEO (i.e., more committed to forward-looking voluntary disclosure) tend to have greater success in

[4] Earnings forecasts vary in multiple dimensions, including forecast frequency (the total number of earnings forecasts provided by a firm in a given year) and forecast disaggregation (the number of performance measures forecasted in addition to earnings). I focus on these two variables because research concludes that more frequent and more disaggregated forecasts more accurately signal managers' beliefs about their future performance and are thus perceived as more credible (e.g., Botosan and Harris 2000; Hirst et al. 2007; Merkely et al. 2013). I use firms' *ex ante* commitment to forward-looking voluntary disclosure practices instead of their actual (or *ex post*) innovation outcomes as a proxy for CEOs' future orientation because CEOs' likelihood of succeeding in future-oriented innovation investment is difficult to observe directly. For example, the literature suggests that as innovation is a long, unpredictable, and risky process, it requires not only effort from a firm's CEO but also luck (Chen et al. 2014).

corporate innovation.

Next, I examine whether and how the effect of CEOs' commitment to providing management earnings forecasts on corporate innovation varies with CEOs' characteristics, firms' characteristics, and country-level institutional characteristics in the global and US samples. Using the number of words in the biographical information on CEOs hand-collected from firms in countries around the world as a proxy for CEOs' work experience, I find that the positive association between commitment to forward-looking voluntary disclosure and corporate innovation is stronger in firms whose CEOs have more work experience. Similarly, using the number of university or college degrees held by a CEO as a proxy for their educational background, I find that management earnings forecasts issued by CEOs with a stronger educational background tend to have a greater association with corporate innovation.[5]

Furthermore, by conducting firm-level cross-sectional analysis, I find that a firm's choice of a Big Four auditor and greater institutional ownership strengthens the positive relationship between management earnings forecasts and corporate innovation in both samples. This finding is consistent with studies that suggest that higher levels of financial statement verification (Ball et al. 2012; Liu et al. 2018) and institutional ownership (Ajinkya et al. 2005) enhance the perceived credibility of a firm's voluntary disclosure.

A growing body of literature analyzes how country-level institutional characteristics affect

[5] I validate these two measures of CEO ability for the firms in global sample using the managerial ability index data for US firms created and provided by Custódio et al. (2013) and Demerjian et al. (2012). I give more details of this validation in Section 5.

corporate innovation. For example, Brown et al. (2013) find that strong shareholder protection in a country can promote corporate innovation investment in that country. Similarly, Levine et al. (2016) find that a legal system that protects outside investors from the expropriation of corporate insiders enhances firm innovation. Following studies that suggest the importance of country-level institutional environments to corporate innovation activities (e.g., McKinsey and Company 2007; He and Tian 2018; Ernst and Young 2019), I examine whether and how the relationship between management earnings forecasts and corporate innovation varies with country-level institutional characteristics—that is, the stringency of shareholder protection and the rule of law. The results indicate that the positive relationship between commitment to forward-looking management earnings forecasts and corporate innovation is strengthened by the country-level institutional development.

Taken together, the findings of the cross-sectional analyses are consistent with the conjecture that observable characteristics of CEOs related to their work experience and educational background, as well as firm-specific and country-specific characteristics, influence the link between management earnings forecasts and corporate innovation. Additionally, consistent with the conjecture that firms with more research and development (R&D) capital are more likely to signal their innovation success through voluntary disclosure, my findings indicate that firms with more R&D capital are likely to exhibit a more positive association between voluntary disclosure and corporate innovation. Finally, I find that future-oriented CEOs in firms with good financial performance are more likely to signal their ability to manage uncertainties associated with innovation investment and thereby achieve innovation success. However, I do not observe any evidence on the role of CEO's compensation in the positive association between commitments to forward-looking voluntary disclosure and corporate innovation.

The recent literature highlights the importance of the psychological biases or traits of managers to firms' decision-making (e.g., Bertrand and Schoar 2003; Hirshleifer et al. 2012; Liao et al. 2021). However, to the best of my knowledge, no empirical evidence is available of the role of CEO's personality traits in corporate innovation. This research gap motivates me to link CEO's personality traits to the commitment to management earnings forecasts and corporate innovation. Specifically, in the second part of this research, I investigate the role of CEOs' personality traits in corporate innovation and in the association between CEOs' commitment to management earnings forecasts and corporate innovation outcomes. Following studies that adopt the so-called "Big Five" framework, which was originally developed in psychological research to measure personality traits (Goldberg 1990), I measure CEOs' personality traits based on their speech patterns during the question-and-answer (Q&A) portions of conference calls. As insufficient textual data on these portions of conference calls are available for non-US firms, this analysis is limited to the US sample. I find that firms with more extraverted CEOs are more likely to be successful in innovation investment in the future and that the signaling role of commitment to forward-looking voluntary disclosure in corporate innovation success is more pronounced in firms with more extraverted CEOs. Furthermore, my findings indicate that the stock market reaction to the issuance of management earnings forecasts is positively associated with CEO extraversion, suggesting that more extraverted CEOs attract more investor attention when they issue voluntary disclosures.

My research contributes to the literature in several ways. First, Trueman (1986) suggests that managers' observable forecasting behavior provides a signal of their unobservable managerial ability. Motivated by this research, later studies examine the association between management earnings forecasts and CEO turnover (Lee et al. 2012) and ability (Baik et al. 2011). Overall, these studies suggest that better earnings forecasts reflect managers' ability to effectively manage a firm in an uncertain environment. However, while studies recognize the important roles of CEOs' personality traits and skill sets in corporate innovation outcomes (e.g., Galasso and Simcoe 2011; Hirshleifer et al. 2012; Faleye et al. 2014; Custodio et al. 2017; Sunder et al. 2017), to the best of my knowledge, no studies examine the role of CEOs' future orientation in corporate innovation activities. This oversight is surprising, as future orientation can directly affect decision-making and other future-oriented activities, such as corporate innovation.[6] Thus, my findings add to the literature by empirically demonstrating the important role of CEOs' future orientation (measured by their commitment to forward-looking voluntary disclosure, i.e., issuing more frequent and more disaggregated management earnings forecasts) in firms' innovation outcomes.[7]

Second, studies identify various determinants and capital-market consequences of firms' voluntary disclosure (see, e.g., Hirst et al. (2008) for a review of the management earnings forecast literature). The important role of management earnings forecasts in capital markets is highlighted in a large

[6] Supporting this view, Chen (2013) and Liang et al. (2018) find that future-oriented behavior can be explained by an individual's level of future orientation. For example, using a sample of firms from 29 countries, Liang et al. (2018) show that corporate social responsibility and R&D investment in a given country increase with the level of future orientation of people living in that country.

[7] Chen et al. (2015) examine whether managerial ability facilitates corporate innovation through analysis of US firms. They use multiple measures of managerial ability, including (1) the managerial ability score developed by Demesrjian et al. (2002), (2) a dichotomous variable indicating whether a CEO is recognized by *Worth* as being among the "Best CEOs" or by the *Financial Times* as among the "World's Most Respected Business Leaders," etc., and (3) the level of media citation. However, these measures tend to capture CEOs' past ability to generate revenue rather than their ability to innovate and/or likelihood of succeeding in future-oriented innovation investments, which is the focus of this research.

number of studies (Patell 1976; Ajinkya and Gift 1984; Waymire 1984; Pownell and Waymire 1989; Baginski and Hassell 1990; Pownall et al. 1993; Frankel et al. 1995; Kasznik and Lev 1995; Coller and Yohn 1997; Hirst et al. 2008; Cao et al. 2017; Li et al. 2018; Chen et al. 2019). Given the high level of uncertainty associated with firms' success in innovation investment, the observation of a positive relationship between forward-looking voluntary disclosure and corporate innovation in this research suggests that the provision and properties of management earnings forecasts are important indicators of the likelihood of firms' future innovation success. Moreover, the findings of this research also extend the finding of a positive relation between financial transparency/information environment and firm innovation (e.g., Brown and Martinsson 2018; Zhong 2018) to firms' voluntary disclosure practices.

Third, this research contributes to the literature related to the role of CEO-personality traits on corporate decisions. Research shows that CEOs have a significant impact on a wide range of corporate financial and accounting policies, such as debt structure (e.g., Chava and Purnanandam 2010), tax avoidance (e.g., Francis et al. 2014), and financial reporting practices (e.g., Aier et al. 2005; Geiger and North 2006; Ge et al. 2011). These studies use demographics as proxies for psychological personality traits. In contrast, I focus directly on CEOs' personality traits. Given the limited understanding of the role of CEOs' personality traits in corporate innovation investment outcomes, my research contributes to the literature on both corporate innovation and executive personality traits by suggesting that CEO extraversion plays a positive role in corporate innovation success.

The Big Five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) are shown to explain financial and environmental performance (Milfont and Sibley 2012; Judge and Zapata 2015; Hrazdil et al. 2019c). I add to this literature by providing additional evidence that the Big Five traits of CEOs, particularly extraversion, influence the association between CEOs' voluntary disclosure behavior and corporate innovation success. I add to the literature on CEO characteristics by demonstrating the importance of considering candidates' level of extraversion when hiring a CEO. Most importantly, although studies suggest that more extraverted CEOs attract considerable social attention (measured by, for example, the number of analysts following a firm and investor recognition of the firm, e.g., He and Tian 2018; Green et al. 2019), there is limited evidence of this phenomenon. My findings contribute to the literature by showing that investors perceive the earnings forecasts issued by more extraverted CEOs as more informative and credible.

Finally, studies provide rich evidence of the importance of country-level institutional characteristics in shaping corporate accounting and disclosure (Alford et al. 1993; Pope and Walker 1999; Ali and Hwang 2000; Ball et al. 2000; Ball 2001; Ball et al. 2003; Bhattacharya et al. 2003; Leuz et al. 2003; Bushman et al. 2004; DeFond et al. 2007; Cao et al. 2017; Li et al. 2018; Guan et al. 2020). For example, Cao et al. (2017) show that because earnings forecasts issued by firms in countries with stronger shareholder protection are perceived as more credible and less opportunistic, earnings forecasts observed in such countries can have a stronger positive effect on the cost of equity capital. Analysis of the relationship between voluntary disclosure and innovation at the international level sheds light on how the effectiveness of management earnings forecasts in signaling corporate innovation success varies with country-level institutional characteristics and thereby contributes to the literature examining the global heterogeneity of voluntary disclosure.

My empirical analysis, as discussed in the above paragraphs, contributes to several lines of the literature and indicates directions for future research. My findings may also help investors and other stakeholders who are not involved in firms' daily business to make investment decisions, as they show how the likelihood of firms' future innovation success can be inferred from CEOs' observable behavior. The findings may also be of interest to firms, as they highlight the importance of considering candidates' level of extraversion when hiring a CEO. Finally, the findings should be of interest to policymakers, as corporate innovation is not only important for a firm's competitive advantage (Porter 1992) but also vital to a country's economic growth (Solow 1957; Romer 1986; Porter 1992; Hall et al. 2005; Hsu et al. 2014).[8] Furthermore, the research highlights how the effectiveness of management earnings forecasts in signaling corporate innovation success varies with country-level institutional characteristics; therefore, the findings should also be helpful to policymakers developing initiatives to enhance firms' voluntary financial disclosure.

The rest of this research is organized as follows: In the first part of Chapter Two, I review the research relevant to this research. In Section 2.1.1, I provide a review of the literature regarding corporate innovation; Section 2.1.2 discusses the literature related to voluntary disclosure; and Section 2.1.3 focuses on the literature regarding the Big Five personality traits. In the second part of Chapter Two, I develop my hypotheses. Chapter Three presents the data, sample, empirical design, and summary statistics. Chapter Four discusses the results of the analyses and robustness

[8] The OECD (2015) reports that corporate innovation (e.g., technological innovation in physical capital, investment in knowledge-based capital, increased productivity, and the creation of new products and services) accounts for about 50% of a country's total GDP growth on average.

checks. Finally, Chapter Five concludes this research.

CHAPTER TWO:

LITERATURE REVIEW, THEORY, AND HYPOTHESES

2.1 Literature Review

In this section, I review the extant research relevant to my research. Specifically, in section 2.1.1, I provide a review of the literature regarding corporate innovation. Section 2.1.2 discusses the literature related to voluntary disclosure. At last, section 2.1.3 focuses on the papers in line of the Big Five personality traits.

2.1.1 Corporate Innovation

Given the important role of corporate innovation in a firm's long-term competitive advantage (Porter 1992) and a country's economic growth (Solow 1957; Romer 1986; Porter 1992; Hall et al. 2005; Hsu et al. 2014), in the last few decades, an increasing number of researchers have started to study CEO-level, firm-level, market-level, and country-level drivers and determinants of corporate innovation. Four survey papers to date address corporate innovation. Ederer and Manso (2011) review theoretical and empirical studies that explore the motivation for corporate innovation. Hall and Lerner (2010) and Kerr and Nanda (2015) focus on the financing of research and development investment and corporate innovation. He and Tian (2018) highlight publications in the top accounting and finance journals and provide a comprehensive perspective on how corporate finance is motivated and financed and the initiation, processes, features, and outcomes of corporate innovation. In this research, I mainly focus on CEO-level, firm-level, and country-level characteristics, drivers, and determinants of corporate innovation.

2.1.1.1 CEO-level Determinants of Corporate Innovation

As the top manager in a firm, a CEO is responsible for resource allocation, business strategies, and financial performance. Consequently, their compensation schemes, incentives, management styles, and personality traits have a substantial influence on the firm's corporate innovation (Galasso and Simcoe 2011; Hirshleifer et al. 2012; Ederer and Manso 2013; Custodio et al. 2017; Sunder et al. 2017; He and Tian 2018). For example, studies show that CEOs with incentive plans that reward long-term success are more likely to engage in innovation activities and perform better in innovation investments relative to CEOs who receive standard pay for performance compensation (Ederer and Manso 2013). Additionally, studies show that incentive plans with longer vesting periods, more incentive compensation, and more stringent antitakeover provisions are more effective in motivating CEOs to invest in innovative projects (Manso 2011; Baranchuk et al. 2014). Moreover, CEOs with more years remaining on their contracts tend to invest more in innovation activities (Gonzalez-Uribe and Xu 2015).

As well as CEOs' compensation and incentives, CEOs' skill sets are shown to be crucial to corporate innovation. For instance, based on a sample of 2,366 CEOs from 1,532 firms between 1997 and 2006, Faleye et al. (2014) find that firms with better-connected CEOs generate more and higher-quality patents. Additionally, they suggest two possible channels through which CEOs' network connections affect corporate innovation, namely (1) the labor market insurance effect of personal network connections on CEOs' risk-taking incentives and (2) greater access to innovation-related information. Custodio et al. (2017) examine the innovation activities of firms with generalist CEOs. Using a sample of 2,005 CEOs from 1,464 firms between 1993 and 2003, they find that firms with such CEOs are granted more patents and receive more citations per patent.[9] They attribute their findings to generalist CEOs' superior ability to manage innovation

[9] As well as the personal characteristics of CEOs, CEOs' incentives, in the form of compensation design or structure, may have a significant effect on corporate innovation (e.g., Ederer and Manso 2013; Gonzalez-Uribe and Xu 2015; Mal and Zhang 2017).

failure.

Furthermore, increasing attention is being paid to the role of CEOs' personal characteristics in corporate innovation. For example, adopting the option-based measure of CEO overconfidence proposed by Malmendier and Tate (2005a, b), Galasso and Simcoe (2011) find that more overconfident CEOs are more likely to pursue innovation activities because of their tendency to underestimate the likelihood of innovation failure. Similarly, using the measure of CEO overconfidence developed by Malmendier and Tate (2005b, 2008) based on the fraction of press releases mentioning his/her name; Hirshleifer et al. (2012) confirm the positive role of CEO confidence in the success of R&D projects and the productivity of corporate innovation in innovative industries.

Additionally, recent studies explore the role of CEOs' personality traits in corporate innovation. For example, Sunder et al. (2017) examine the innovation activities of firms with sensation-seeking CEO. Specifically, based on a sample of 1,200 CEOs in US-listed firms, the authors report that firms with sensation seeking CEO (measured as CEO's hobby in airplanes-flying) generate more patents and citations, exhibit higher innovation efficiency, and pursue more diverse and original innovation activities. However, little is known about the role of CEOs' future orientation in corporate innovation activities.

2.1.1.2 Firm-level Determinants of Corporate Innovation

According to the literature, there are three groups of firm-level determinants of corporate innovation. The first group includes venture capital and the different types of ownership structures.

The positive effect of venture capital on innovation was first documented by Kortum and Lerner (2000). They report that from 1983 to 1992, about 8% of industrial innovation in the US manufacturing sector was driven by venture capital. In a later study, Tian and Wang (2014) suggest that IPO firms with more failure-tolerant venture capital investors are more likely to be successful in innovation activities. In contrast, Mao et al. (2016) examine whether and how the structure of venture capital investment influences corporate innovation. While venture capital staging (the staging of financing) increases corporate innovation because it reduces agency problems, Mao et al. (2016) finds empirical evidence of the negative impact of venture capital staging on corporate innovation output. They conclude that this negative effect may be due to the great pressure on young firms to meet short-term performance goals to receive follow-up funding. Firms with a public ownership structure are better able to exploit existing ideas, while firms with a private ownership structure are more successful in generating new ideas (e.g., Ferreira et al. 2014). The number of citations received for each patent is greater for firms with a private ownership structure (e.g., Aggarwal and Hsu, 2014); it drops after IPOs and increases after acquisitions (e.g., Zhao 2009; Aggarwal and Hsu 2014; Bena and Li 2014; Seru 2014; Liu et al. 2016b).

The second group of firm-level determinants consists of internal factors that are controlled by the firm, such as the characteristics of non-CEO employees, corporate governance, and human capital. Corporate innovation is a long and risky process that requires effort from all employees involved in day-to-day work in the R&D division. Recent studies suggest a positive association between the innovation-related incentives of non-CEO employees and corporate innovation. For example, Chang et al. (2015) find that non-CEO-employee stock options have a positive impact on both the quantity and quality of innovation outcomes. Jia et al. (2016) report a positive influence of synergistic incentives among executives on corporate innovation performance. Sauermann and Cohen (2010) document that motivations such as intellectual challenges, independence, and monetary bonuses are positively associated with corporate innovation outcomes. As well as employees, corporate governance plays an important role in monitoring innovation projects. For example, Balsmeier et al. (2017) find that independent board directors can enhance the productivity of managers who work in the R&D division. Additionally, studies document that human capital may matter more than organizational capital to corporate innovation outcomes (Liu et al. 2016a) and that firms with higher-quality management teams tend to invest more in innovation projects and have superior innovation outcomes (Chemmanur et al. 2016).

The last group covers external factors that cannot be controlled by shareholders, such as analyst coverage, market reaction, and institutional investment (He and Tian 2018). Studies report that firms with a higher level of institutional ownership have more successful innovation outcomes (Aghion et al. 2013). Furthermore, recent studies show that firms backed by activist institutions have higher innovation efficiency (Brav et al. 2018) and firms with foreign institutional ownership engage in more innovation (Guadalupe et al. 2012; Luong et al. 2017). Empirical evidence shows that as well as institutional investors, the presence of short-sellers enhance the quality of firms' innovation. Firms with dual ownership tend to have fewer but more valuable patents (Yang 2017) relative to those firms with signal ownership, which indicates that shareholder–creditor conflict influences firm innovation. As important financial-market intermediaries, financial analysts exert pressure on managers to issue forecasts, and firms followed by more financial analysts tend to have fewer long-term innovation projects (He and Tian 2013).

2.1.1.3 Country-level Determinants of Corporate Innovation

Studies related to corporate innovation highlight the effect of a country's laws related to shareholder protection, investor protection rights, and labor protection, as well as the country's overall financial development, on corporate innovation activities (He and Tian 2018). For example, adopting the theoretical model of Aghion and Tirole (1994), in a study of 60 countries, Lerner (2009) explores how investor protection laws impeded the number of patents generated over the past 150 years. Furthermore, based on a sample of Chinese firms, Fang et al. (2017) find that the positive association between innovation and state-owned enterprises (SOE) privatization is stronger in cities with a higher level of investor protection rights. Moreover, Brown et al. (2019) show that stronger investor protections encourage firms to invest in high-tech R&D.

In addition to laws related to investor protection rights, a growing body of literature focuses on the effect of shareholder protection on firm innovation. For instance, using a comprehensive sample of firms from 32 countries from 1990 to 2007, Brown et al. (2013) find that strong shareholder protection and better access to stock market financing encourage firms' innovation activities. Additionally, Levine et al. (2016) examine industries in 94 countries between 1976 and 2006 and conclude that the enforcement of insider trading laws has a positive effect on innovation. Moreover, using a sample of firms from 41 countries, Tsang et al. (2019) examine the effect of corporate governance reform on firm innovation between 1981 and 2015; the authors find that the negative effect of corporate governance reform on firm innovation is more pronounced in countries with a more stringent legal environment.

Furthermore, a growing line of research explores how a country's overall financial development, social traits, and accounting systems impact corporate investment. For example, Tadesse (2006) shows that market-centered systems enhance corporate innovation; using a sample of 10 manufacturing industries in 34 countries, he finds that between 1980 and 1995, firms in bank-centered countries tended to perform better in innovation activities. Furthermore, Hsu et al. (2014) find that in countries with better financial market development, firms in industries with more external financing are more likely to engage in innovation activities. Other studies explore the implications of financial accounting regulation for corporate innovation. For instance, Li et al. (2016) document a positive association between mandatory International Financial Reporting Standards and corporate innovation outcomes. Additionally, Brown and Martinsson (2017) find that firms in countries with more transparent information environments tend to have greater corporate innovation output. Moreover, research shows that religiosity may negatively impact innovation (Benabou et al. 2013, 2015) and that firms in countries whose inhabitants have a greater propensity for gambling tend to invest more in innovation and have better innovation performance (Chen et al. 2014; Adhikari and Agrawal 2016).

2.1.2 Voluntary Disclosure

Management earnings forecasts represent one of the primary voluntary disclosure mechanisms through which managers provide information about expected earnings to market participants (Waymire 1985; Pownall and Waymire 1989; Lev and Penman 1990; Healy and Palepu 2001; Hirst et al. 2008). Research suggests that voluntary disclosure (e.g., earnings forecasts) reduces agency conflicts by bridging the information asymmetry gap between corporate insiders and outside shareholders (Healy and Palepu 2001). Through earnings forecasts, managers alter the beliefs of market participants regarding firms' expected earnings (Ajinkya and Gift 1984; Merkley et al. 2013). Given the importance of management earnings forecasts, studies related to such forecasts are reviewed in this section. A framework for the analysis of management earnings forecasts is shown in Figure 1. Based on this framework, I discuss the following five aspects of management earnings forecasts: (1) determinants of management earnings forecasts; (2) consequences of management earnings forecasts; (3) commitment to management earnings forecasts; (4) management earnings forecasts in an international setting; and (5) the relationship between management earnings forecasts and corporate innovation.

2.1.2.1 Determinants of Management Earnings Forecasts

In this subsection, I discuss why managers issue earnings forecasts. Management earnings forecasts are financially based and are often bundled with revenue forecasts, earnings announcements, or other announcements. In their survey paper, Graham et al. (2005) note that managers tend to provide voluntary disclosure to reduce information risk in their firms' stocks. When the deterioration of the information environment increases information risk, managers may become more inclined to provide guidance (Fang et al. 2020; Lang et al. 2021). Although management earnings forecasts are voluntary,[10] they are influenced by environmental factors. For example, managers do not have complete control over the forecasts that they convey because the legal and regulatory environments constrain the type of forecast and the channels through which forecasts are disseminated (Johnson et al. 2001; Baginski et al. 2002; Bailey et al. 2003; Heflin et al. 2003; Wang 2007).

The behaviors of analysts and investors are two other environmental factors that influence

[10] Management earnings forecasts in Japan are mandatory (Chen et al. 2019).

managers' decisions to issue earnings forecasts. Management earnings forecasts are forward-looking information that is sought by investors and analysts; therefore, an increase in analyst coverage or institutional investment usually leads to a rise in the number of firms providing earnings guidance11 (Healy et al. 1999; Barber et al. 2001; Gompers and Metrick 2001; Barber et al. 2003; Gillan and Starks 2003; Ajinkya et al. 2005; Anilowski et al. 2007).

In addition to the above external factors, internal factors affect whether a firm issues earnings forecasts. For instance, studies highlight the positive association between a firm's litigation risk and its decision to issue earnings forecasts (e.g., Skinner 1994, 1997; Brown et al. 2005; Cao and Narayanamoorthy 2005; Field et al. 2005; Rogers and Stocken 2005). These studies find that when a firm has bad news,[12] its managers tend to issue earnings forecasts to pre-empt earnings disclosure and thus avoid subsequent litigation (Cao and Narayanamoorthy 2005; Hirst et al. 2008). Additionally, managers may be deterred from providing earnings forecasts when they face higher proprietary costs (Bamber and Cheon 1998; Li 2010), increased litigation risk (Rogers and Van Buskirk 2009), or concern about their reputation or career (Lee et al. 2012).

Managerial incentives have been found to be another important determinant of whether firms issue management earnings forecasts. Managers are motivated to issue earnings forecasts to reduce the information asymmetry between a firm and market participants; however, they may also choose whether to issue earnings forecasts based on self-interest or incentives such as equity-based

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[11] Anilowski et al. (2007) show that 1) institutional investors' share of US stock market capitalization expanded from 30% in 1980 to 50% in 2002; 2) the number of firms followed by analysts increased from 1841 in 1986 to 5786 in 2001; and 3) the number of firms issuing management earnings forecasts increased from 10–15% in 1995 to 50% in 2004.

[12] The positive effect of litigation risk on earnings forecasts is also observed in firms with good news. For a constant level of litigation risk, firms with bad news are more likely to issue earnings forecasts than are firms with good news (Brown et al. 2005).

compensation.[13] Some studies investigate the effect of managerial incentives on managers' forecasting behavior (e.g., Nagar et al. 2003; Hirst et al. 2008). For example, Nagar et al. (2003) show that managers with more equity-based compensation tend to issue more earnings forecasts to avoid stock mispricing and thus protect their wealth. Furthermore, managers who receive a large amount of equity-based compensation may time poor earnings forecasts to temporarily depress stock prices around stock option award periods to obtain lower strike prices on their option grants (Marquardt and Wiedman 1998; Aboody and Kasznik 2000; Rogers and Stocken 2005; Cheng and Lo 2006).

2.1.2.2 Consequences of Management Earnings Forecasts

Voluntary disclosure such as management earnings forecasts can reduce the information asymmetry between firms and investors (Hirst et al. 2008; Fang et al. 2020; Lang et al. 2021). However, management earnings forecasts may not guarantee positive capital market consequences (Brown and Higgins 2005; Stunda 2019). In this subsection, I discuss the consequences of management earnings forecasts.

Studies find that management earnings forecasts are generally considered to be more informative than other types of financial disclosure (e.g., earnings announcements, mandatory filings required by the Securities and Exchange Commission (SEC), and earnings forecasts by financial analysts; Beyer et al. 2010). Management earnings forecasts are influential. For example, studies document the impact of management earnings forecasts on stock prices (Patell 1976; Pennman 1980; Pownall

[13] According to prior studies (e.g., Hall and Liebman 1998; Bebchuk and Grinstein 2005), in 1990s, equity-based compensation accounted for an average of less than 20% of CEO compensation in the US, before jumping to 50% in the mid-1990s and about 60% in the mid-2000s.

et al. 1993; Nagar et al. 2003), the number of analysts following the firm, institutional ownership of the firm (Healy et al. 1999; Ajinkya et al. 2005; Wang 2007; Chen et al. 2019), analysts' earnings forecasts (Waymire 1986; Jennings 1987; Baginski and Hassell 1990; Cotter et al. 2006), and the firm's litigation risk (Skinner 1994; Field et al. 2005). Furthermore, research highlights the importance of voluntary disclosure by showing that voluntary earnings forecasts can increase a firm's value by improving its stock market liquidity and lowering its cost of capital (Diamond and Verrecchia 1991; Frankel et al. 1995; Coller and Yohn 1997; Stocken 2000; Balakrishnan et al. 2014).

Empirical evidence also indicates that managers issue earnings forecasts for their self-interest. For example, to gain more compensation, develop a reputation for accurate and transparent reporting,[14] and signal their management abilities (Skinner 1994; Hall and Liebman 1998; Stocken 2000; Healy and Palepu 2001; Bebchuk and Grinstein 2005; Graham et al. 2005). Managers have incentives to meet their self-imposed earnings targets (Fuller and Jensen 2002). While managers cannot directly influence stock prices via their earnings forecasts, they can revise earnings upward through accounting choices to meet their own forecasts (Kasznik 1999). Managers also have incentives to issue pre-emptive earnings forecasts, particularly when this firm involves bad news. For instance, Skinner (1994) finds that bad-news firms that issue pre-emptive earnings forecasts with earnings warnings are more likely to avoid subsequent litigation. Furthermore, Field et al. (2005) find that pre-emptive earnings forecasts that convey impending bad news are effective in deterring some types of litigation.

[14] More than 90% of managers surveyed by Graham et al. (2005) believed that developing a reputation for high-quality reporting is one of the main reasons for issuing earnings forecasts.

Moreover, management earnings forecasts have an important impact on analyst behavior. Studies show that firms that issue more earnings forecasts tend to be followed by more analysts (Graham et al. 2005; Wang 2007). About 60% of analysts update their forecasts within four weeks of receiving a management earnings forecast (Jennings 1987; Clement et al. 2003; Cotter et al. 2006). While the form of an earnings forecast does not affect analysts' earnings forecasts, the interaction between a manager's earnings forecast accuracy and the form of manager's earnings forecast significantly influences analysts' revisions of their earnings forecasts (Hirst et al. 1999; Libby et al. 2006).

2.1.2.3 Commitment to Management Earnings Forecasts

As noted earlier, managers have considerable discretion in terms of whether to issue an earnings forecast. Once a manager decides to issue an earnings forecast, they have various choices as to the characteristics and attributions of the forecast. For example, the manager can choose to issue earnings forecasts more frequently, issue earnings forecasts in qualitative or quantitative form,[15] issue earnings forecasts with supplementary detailed income statement line items,[16] and issue earnings forecasts at a particular time. In general, studies consider the above forecast properties (attributes) to reflect managers' commitment to voluntary disclosure because they capture their beliefs about the future (King et al. 1990). Therefore, following the prior studies in the literature of management earnings forecasts (e.g., King et al. 1990; Dutta and Gigler 2002; Hirst et al. 2007), I use the term "commitment to voluntary disclosure (management earnings forecast) "to describe and capture the properties of voluntary disclosure (management earnings forecast) in this research.

[15] In general, qualitative forecasts are non-numerical. Any earnings forecast containing point, range, minimum, or maximum estimates is considered a quantitative forecast.
[16] According to Lansford et al. (2007), about 30% of US-based S&P 500 companies that provide annual earnings forecasts along with additional financial information (e.g., revenue, sales, cost of goods sold) in their income statement.

Specifically, managers' commitment to management earnings forecast include: 1) issuing earnings forecasts more frequently (i.e., forecast frequency), 2) issuing earnings forecasts in qualitative or quantitative form (i.e., forecast precision), 3) issuing an earnings forecast at a particular time (i.e., forecast timeliness), 4) issuing an earnings forecast with additional financial information (i.e., forecast disaggregation), and 5) issuing an earnings forecast with additional attributions (i.e., forecast attributions) and so on.

Research suggests that commitment to forward-looking voluntary disclosure (i.e., providing more frequent, more precise, timelier, and/or more disaggregated earnings forecasts) enhances the effectiveness of earnings forecasts in reducing information asymmetry (e.g., Ajinkya et al. 2005; Hirst et al. 2007; Merkely et al. 2013; Li et al. 2018). For example, Hirst et al. (2007) find that investors believe that disaggregated forecasts are more credible, while Choi et al. (2010) find that good news is associated with more precise forecasts than is bad news. Studies also find that precise forecasts are associated with greater managerial certainty (Hughes and Pae 2004) and better corporate governance (Ajinkya et al. 2005; Karamanou and Vafeas 2005). Investors believe that the more managers commit to issuing better earnings forecasts, the less room there is for them to manipulate earnings through accounting choices (Dutta and Gigler 2002). Therefore, investors generally consider management earnings forecasts from managers who commit to better earnings forecasts to be more informative.

Commitment to better forward-looking voluntary disclosure indicates managers' confidence and signals their ability to achieve their expected performance (Dutta and Gigler 2002; Hirst et al. 2007). The ability to manage future uncertainties and thereby achieve the anticipated future performance outcomes, or in other words the level of future orientation, represents one of the most outstanding traits of managers (Seijts 1998). However, it is unclear whether and how Commitment to forward-looking voluntary disclosure is associated with future corporate innovation.

2.1.2.4 Management Earnings Forecasts in an International Setting

Adding to research on the determinants and consequences of management earnings forecasts in the US,[17] a growing body of the literature extends such investigations to international settings.[18] These studies show that country-specific factors can significantly influence firms' voluntary disclosure, and the issuance of earnings forecasts in particular (Radhakrishnan et al. 2012). Using a sample from 27 countries, Li et al. (2019) document that the issuance and characteristics of management earnings forecasts vary with various country-level institutional factors related to the business and accounting environment. Using a sample of firms domiciled in 31 countries, Cao et al. (2017) find that the issuance of management earnings forecasts is associated with a lower cost of equity capital and that the relationship between these two factors depends on a country's investor protection, information dissemination, and mandatory disclosure requirements. Moreover, based on a sample of firms domiciled in 61 countries, Chen et al. (2019) show that firms that choose to cross-list in foreign countries whose accounting standards are extremely different from those of the firm's home country tend to provide more earnings forecasts. Moreover, treating corporate governance reform (CGR) as a quasi-shock, Liao et al. (2021a) study whether and how the country-wide implementation of CGR influences management earnings forecasts. Using a

[17] See Hirst et al. (2008) for a detailed discussion of the antecedents, characteristics, and consequences of management earnings forecasts.

[18] Several other studies examine the management forecast practices of firms in a single non-US country. For example, Baginski et al. (2002) examine earnings forecasts issued by firms in Canada, Kato et al. (2009) examine earnings forecasts issued by firms in Japan, and Huang et al. (2014) examine earnings forecasts issued by firms in China.

sample from 23 countries, the authors find that forecast propensity increases significantly after CGR and that this increase is more pronounced for firms that incur losses in the current period or anticipate future losses.

2.1.3 The Big Five Personality Traits

Hambrick and Mason (1984) define organizational outcomes as "reflections of the values and cognitive biases of powerful actors" (i.e., the 'upper echelons") in organizations. They argue that corporate strategic choices and decision outcomes can be predicted based on the characteristics and idiosyncrasies of individual managers. Upper echelons theory stimulates numerous empirical studies to investigate whether the personal characteristics of executives are related to corporate policy choices and firm performance. Given that managers' idiosyncrasies are inherently difficult to measure, researchers take several approaches to explore the influence of the characteristics of executives on corporation decisions. Bertrand and Schoar (2003) use managerial fixed effects to capture the characteristics of individual executives and find that manager style affects core strategic operation and financing decisions.[19] Although the findings of these studies suggest the managerial style affects firm decision/performance, this "black box" approach provides limited insight because managerial fixed effects cannot be used to identify the specific personality traits that are related to corporate outcomes. Moreover, tracking individual executives across multiple firms over time imposes greater data restrictions, which significantly reduce the sample size.

Another way to explore the influence of managers' characteristics on corporate decisions involves

[19] Subsequent studies taking the same approach generally find that top managers, particularly CEOs and CFOs, exert a significant influence on firms' voluntary disclosure behavior and accounting choices (Bamber et al. 2010; Dyreng et al. 2010; Ge et al. 2011; Davis et al. 2015).

inferring personality traits from observable demographic characteristics such as gender, age, education, and experience. However, studies using this approach do not always find consistent results, probably because such demographic characteristics cannot effectively capture personality attributes (Ge et al. 2011). Some studies infer psychological characteristics from managerial behavior, such as using the timing of the exercising of stock options to measure CEO overconfidence. Hribar and Yang (2016) find that overconfident CEOs are more likely to issue earnings forecasts but are also more likely to miss these forecasts.[20]

Furthermore, a growing literature stream adopts the so-called "Big Five" framework to investigate individual's personality traits (Goldberg 1990). The Big Five model is the most widely used taxonomy of personality traits in personality psychology (Almlund et al. 2011). The first trait, openness to experience, describes an individual's attraction to novelty. Individuals with greater openness to experience are more creative and curious (Robbins et al. 2008). The second trait is conscientiousness. Conscientious individuals are persistent and dependable (Rothman and Contzer 2003; Robbins et al. 2008;). The third trait is extraversion. Extraverted people are assertive, outgoing, and sociable (Robbins et al. 2008). The fourth trait is agreeableness. An agreeable individual is trusting and willing to cooperate and empathize with others. Neuroticism reflects emotional stability; individuals who are less neurotic are more self-confident and secure (Robbins et al. 2008).

Most importantly, a growing stream of research examines how different psychological traits affect

[20] Subsequent studies taking the same approach generally find that top managers, particularly CEOs and CFOs, exert a significant influence on firms' voluntary disclosure behavior and accounting choices (Bamber et al. 2010; Dyreng et al. 2010; Ge et al. 2011; Davis et al. 2015).

accounting choices. For example, Ahmed and Duellman (2013) show that overconfident CEOs use conservative accounting practices significantly less often relative to non-overconfident CEO, while Hribar and Yang (2016) find that such CEOs issue more frequent, optimistic, and precise earnings forecasts. To test these findings, given the difficulty of measuring personality traits across large samples, Plöckinger et al. (2016) call for researchers in accounting to collect psychographic profiles of executives using established frameworks, such as the Big Five personality traits.

Psychologists propose that the Big Five personality traits are the basic underlying personality traits (Goldberg, 1990). These traits are recognized to be genetically based and relatively stable and generalizable across cultures (Barrick and Mount 1991; Costa and McCrae 1997; Gupta 2008; Cobb-Clark and Scherer 2012; Anglim and O'Connor 2018; Hrazdil et al. 2018). Psychological research confirms the benefits of using the Big Five personality traits to predict individual's job performance (Barrick and Mount 1991; Anglim and O'Connor 2018). Furthermore, studies find that the personalities of group members may be useful for predicting group output (Hackman and Morris 1975; Kichuk and Wiesner 1997; Kramer and Johnson 2014; Anglim and O'Connor 2018). However, research on the significance of the Big Five personality traits in the fields of accounting and finance is limited.

Given that executives are often unwilling to undergo psychometric testing or respond to surveys about their personality, a few accounting studies use recent developments in machine learning to measure the Big Five personality traits of CEOs and chief financial officers (CFOs) based on their responses to questions raised by analysts during conference calls (Green et al. 2019; Hrazdil et al. 2019a). The use of machine learning algorithms to measure personality traits has the advantage of allowing individual personality traits to be assessed across large samples. Many studies indicate that estimates of the Big Five personality traits obtained using linguistic analytics are highly valid and objective and are stable over time (e.g., Cobb-Clark and Schurer 2012).

In the field of accounting and finance, there are limited studies linking Big Five personality traits of CEOs to firm outcomes/performance. For example, Gow et al. (2016) find that the Big Five personality traits of CEOs are associated with firms' financing policies, investment choices, and operating performance. Hrazdil et al. (2019a, b, c) measure an executive's appetite for risk based on the Big Five traits and document a positive association between an executive's risk tolerance and audit fees and the executive's compensation structure. Green et al. (2019) find that more extraverted CEOs and CFOs have higher compensation, longer tenure, and a lower likelihood of job turnover.

Among the five Big Five personality traits, extraversion is shown to be the most closely associated with leadership (Judge et al. 2002) and the most predictive of performance in jobs requiring social skills (Judge and Zapata 2015). Describing leaders in terms of the Big Five personality traits, Toegel and Barsoux (2012) show that extraversion is associated with high energy, positive emotions, assertiveness, sociability, talkativeness, and the tendency to seek stimulation from the company of others. Moreover, Green et al. (2019) find that more extraverted CEOs enjoy greater career benefits, including higher compensation, a lower likelihood of job turnover, and more outside directorships. They also show that CEO extraversion is positively related to firm performance. Furthermore, studies show that openness to experience has a positive effect on job performance because individuals who are more open to experience foster innovation by obtaining information (e.g., Sung and Choi 2009; Hsieh et al. 2011). Furthermore, Lee and Lin (2008) propose that more conscientious individuals are more responsible and achievement oriented; however, they also find that such individuals may have a negative impact on organizational performance.

To the best of my knowledge, only a few studies have investigated the link between Big Five personality traits and corporate innovation and management earnings forecasts. For example, to investigate the effect of political connections on corporate innovation, Cheng et al. (2019) employ openness to experience to construct an index to measure the innovative spirit of a firm's CEO; using the China Employer–Employee Survey, the authors find that political connections contribute to corporate innovation investments in firms whose CEO have a strong innovative spirit. Furthermore, Hsieh et al. (2011) develop a survey instrument to investigate the personality traits of employees in the biotechnology industry in Taiwan; their analysis is based on 506 valid questionnaires and indicates that employees with personality traits such as high level of conscientiousness, openness to experience, extraversion, and emotional stability are more innovative and creative.[21] However, little is known about the role of CEOs' personality traits, such as conscientiousness, extraversion, and emotional stability, in corporate innovation success.

2.1.4 Corporate Innovation, Management Earnings Forecasts, and the Big Five Personality Traits

Although researchers in accounting and finance have extensively studied corporate innovation,

[21] Additionally, Hsieh et al. (2011) explore the effect of personality traits on technological innovation. They find that employees in the biotechnology industry in Taiwan with personality traits such as conscientiousness, agreeableness, and extraversion are more likely to be successful in technological innovation.

management earnings forecasts, and the implications of the Big Five personality traits, only a few papers have studied the association between these three factors. In this section, I review these papers and discuss the differences between them and my research.

Based on a sample of 24,895 firm-year observations in the US from 1994 to 2004, Huang et al. (2021) examine whether more successful innovation can induce more disclosure if innovation success creates information asymmetry between firms and investors. The authors show that successful firm innovation leads investors to demand more information about the firm and that firms with successful innovation thereby disclose more in response to the increased information demand. Moreover, the authors show that the positive association between successful innovation and management guidance is stronger for firms with a greater level of institutional investor ownership and weaker for firms that experience more competition. While both Huang et al. (2021) and my research document a positive association between innovation and management guidance, Huang et al. (2021) examine whether and how innovative firms respond to information demand when information asymmetry between the firm and its investors is high, whereas I investigate whether firms with more future-oriented CEOs tend to be more successful in corporate innovation. I do this by using the provision and properties of management earnings forecasts, which reflect CEOs' commitment to forward-looking voluntary disclosure, as empirical proxies for CEOs' level of future orientation.

To explore whether firms that frequently issue earnings forecasts behave myopically, Cheng et al. (2005) study the association between earnings guidance and corporate R&D investment. Using a sample consisting of 11,868 firm-quarters in 10 industries in the US from 2001 to 2003, they find that firms that issue fewer regular forecasts tend to invest more in R&D projects. There are two major differences between Cheng et al. (2005) and my research. First, the former aims to examine managers' myopic R&D investment behavior, where myopic behavior is defined as sacrificing long-term earnings growth to meet short-term earnings targets (Porter 1992); therefore, it studies differences in R&D spending across dedicated and occasional guiders. In contrast, my research investigates whether firms with more future-oriented CEOs tend to be more successful in corporate innovation. Additionally, Cheng et al. (2005) use R&D expenditure as a proxy for corporate innovation. I choose not to use this measure due to its lack of theoretical support and its high measurement error (Aghion et al. 2013; Chen et al. 2015; Koh and Reeb 2015; Huang et al. 2021). Following Huang et al. (2021), I measure innovation success using two innovation output measures: the number of patents granted and the number of citations per patent.

Another notable working paper is Chen et al. (2015). Based on a sample of 6235 firm-year observations in the US between 1998 and 2005, the authors use a PSM design and a pair-matching design to examine whether earnings guidance fosters managerial myopia by impeding firm innovation. Via regression, they find that earnings guiders are likely to be granted more patents and receive more future citations-per-patent relative to matched non-guiders. The same study highlights the negative role of management earnings guidance on managerial myopia and shows the positive effect of the decision in issuing management earnings guidance on corporate innovation. Unlike Chen et al. (2015), my research focuses on CEOs' commitment to forward-looking voluntary disclosure (i.e., issuing more frequent, and more disaggregated disclosures) and emphasizes the signaling role of CEOs' level of future orientation in their firm's future innovation success.

While a few studies investigate the association between management earnings forecasts and corporate innovation (e.g., Cheng et al. 2005; Chen et al. 2015; Huang et al. 2016), there is still room to further examine this topic. In this research, I do not only explore the association between the provision of management earnings forecasts and corporate innovation in both US and Global setting, but also study the association between the properties of management earnings forecasts and corporate innovation.[22] Additionally, I investigate whether the association between managers' commitment to management earnings forecasts and corporate innovation varies with CEO-level, firm-level and country-level characteristics. This offers the opportunity to examine the differential implications of the decision to provide voluntary disclosure (i.e., the likelihood of issuing an earnings forecast) and commitment to forward-looking voluntary disclosure (i.e., providing more frequent and more disaggregated forecasts) by firms in different countries.[23] Moreover, in the second part of this research, I examine the effect of the Big Five personality traits of CEO on corporate innovation, as well as study the role of the Big Five personality traits of CEO on the association between managers' commitment to management earnings forecasts and corporate innovation.

2.2 Hypothesis Development

In this section, I develop the research's hypotheses.

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[22] Once managers choose to issue an earnings forecast, they have various choices as to the characteristics and attributions of the forecast. According to prior studies related to management earnings forecast (e.g., Dutta and Gigler, 2002; Hirst, 2007), providing more frequent, more precise, timelier, and/or more disaggregated earnings forecasts is managers' commitment to management earnings forecast. The frequency, precision, timeliness, and disaggregation are the property of management earnings forecast.

[23] For example, research suggests that voluntary disclosure issued by firms, especially those domiciled in countries with less-developed institutions, is less credible (e.g., Hutton et al. 2003; Cao et al. 2017).

2.2.1 The Relationship between Commitment to Forward-looking Voluntary Disclosure and Corporate Innovation

Generally, corporate innovation is viewed as a long-term, and risky activity because it requires a lot of time, high levels of financial support and is always associated with high uncertainties (Holmstrom 1989). Hirshleifer et al. (2013) find that greater effort to innovate does not necessarily translate into greater innovation output (e.g., patents or citations). In line with this view, studies suggest that the unpredictable outcomes, high level of information asymmetry, and potentially severe proprietary costs associated with corporate innovation investment may increase investors' doubts over managers' abilities to achieve innovation success (Qi 2016; Brown and Martinsson 2018). In turn, this may increase managers' concerns about shareholder intervention and/or the difficulty of gaining support from shareholders regarding their future-oriented investment decisions. Supporting this argument, Faleye et al. (2011) suggest that intense monitoring by the board may increase managerial myopia by weakening the CEO's perception of board support for risky but value-enhancing corporate innovation.

According to the literature, voluntary disclosure, and in particular management earnings forecasts, plays an important role in reducing information asymmetry between firms and capital market participants in countries around the world (e.g., Cao et al. 2017; Chen et al. 2019; Li et al. 2019; Tsang et al. 2019) and in signaling managers' ability to manage future-oriented investment with a high level of uncertainty (Trueman 1986; Baik et al. 2011; Lee et al. 2012).[24] Thus, to the extent that capital-market participants (such as investors, competitors, financial analysts etc.) cannot accurately value managers' innovation efforts, one possible prediction is that managers are more

[24] For instance, Trueman (1986) suggests that management earnings forecasts provide a public signal of a manager's ability to anticipate changes in the firm's business environment and respond to uncertainties.

likely to provide earnings forecasts to signal their future-orientation and ability to achieve innovative success. This suggests the possibility of a positive relationship between management earnings forecasts and corporate innovation.

Additionally, some studies explore how firms' access to external capital and/or firms' financial constraints affect corporate innovation (e.g., Brown et al. 2009; Brown et al. 2012; Hsu et al. 2014). Other studies establish a link between corporate transparency and corporate innovation by showing that higher-quality disclosure fosters corporate innovation by increasing firms' access to cheaper external capital (Biddle et al. 2009). Zhong (2018) shows that providing verifiable financial information on firm value and managerial actions not only facilitates the better allocation of capital to innovation investment but also reduces the sensitivity of management turnover to poor innovation output. These findings also suggest a positive relationship between management earnings forecasts and corporate innovation. Therefore, I formally state my first hypotheses as follows:

Hypothesis 1: The propensity to issue management earnings forecasts is positively associated with corporate innovation.

As discussed above, the highly uncertain nature of corporate innovation outcomes may increase investors' doubts about managers; abilities to achieve innovation success (Qi 2016; Brown and Martinsson 2018). This increase managers' concerns about the difficulty of gaining support from shareholders regarding their innovation investment decisions. Therefore, there is information asymmetry between the investors and managers regarding manager's true ability to manage uncertainties associated with investment. Obviously, the managers have strong incentives to reduce such information asymmetry. Manager's true ability to achieve innovation success is unobservable, then how to reduce their information asymmetry is a question.

One possible way is through their observable forecasting behavior. Voluntary disclosure is one of the important tools managers use to communicate with investors. Prior studies further suggest managers' commitment to earnings forecasts (such as issuing more frequent and more disaggregated forecasts) enhances the effectiveness of these forecasts in reducing information asymmetry (e.g., Ajinkya et al. 2005; Hirst et al. 2007; Merkely et al. 2013; Li et al. 2018). However, issuing earnings forecasts or committing to earnings forecasts do not come without a cost.

For example, prior studies suggest that a reputation for accurate and credible earnings forecasts is important to the forecasting firms (e.g., Williams 1996; Kasznik 1999; Atiase et al. 2005). A survey conducted by Graham et al. (2005) indicate that managers have an incentive to develop and maintain a reputation for accurate and transparent reporting through the issuance of voluntary disclosure, such as management earnings forecasts (see also Stocken 2000; Healy and Palepu 2001). Although a firm's reputation for issuing credible earnings forecasts is normally built over an extended period, such a reputation is likely to be impaired in a relatively short period if a firm's earnings performance tends to deviate from its own forecasts. Research provides consistent evidence of the link between management earnings forecasts and earnings management, suggesting that managers have incentives to manage earnings to meet their own forecasts, presumably to maintain their reputation for providing credible voluntary disclosure (Jaggi and Sannella 1995; Kasznik 1999; Krishnan et al. 2012).

In short, the failure of a firm to meet its earnings forecast can be costly to the firm and the manager (Kasznik 1999; Hribar and Yang 2016). Generally, once a manager decides to issue an earnings forecast, they have considerable discretion in terms of their commitment to management earnings forecasts (e.g., in terms of frequency, precision, timeliness, and/or disaggregation). The more managers commit to issuing earnings forecasts, the less room they have to manipulate earnings through accounting choices. That is, the more managers commit to forward-looking voluntary disclosure, the more managers constrain themselves for subsequent earnings management (Dutta and Gigler 2002).

Given the risk of failure to meet their forecasts, one possible explanation on the reason for the managers choose to commit to earnings forecasts is that the managers know their true level of future-orientation (true ability) to anticipate, plan for and manage their business in an uncertain environment, such as the uncertainties that hinder them from meeting their own forecasts, or the uncertainties associated with innovation investment. Therefore, it is plausible that more managers commit to issuing earnings forecasts, the more confidence they have in their level of future orientation and their ability to achieve innovation success.

However, the issuance of management earnings forecasts can exert pressure on managers due to the high career risk associated with the failure to meet their earnings forecasts (e.g., Baik et al. 2011; Lee et al. 2012); in turn, this may lead them to refrain from providing management earnings forecasts. In this case, given the general uncertainty in the long-term return on corporate innovation investment, managers may choose to sacrifice investment in innovation projects to meet their earnings forecasts. In other words, in order to meet their own earnings forecast, the managers may choose to stop innovation investment because innovation investment may incur more uncertain expenses. In this case, the more managers commit to issuing earnings forecasts, the less room they have to meet their forecasted earnings targets through earnings management, and that therefore, they are more likely to cease corporate innovation investment that incurs more uncertain expenses in the near term.

While committing more to management earnings forecast might hinder corporate innovation success in short run, it is possible for the managers who have greater level of future orientation manage such difficulties and achieve innovation success in long run. Therefore, based on the discussion above, I predict that there is a positive association between managers' commitment to voluntary disclosure and corporate innovation. Formally, I state my second hypothesis as follows:

Hypothesis 2: The commitment to management earnings forecast is positively associated with corporate innovation.

2.2.2 The Effect of CEOs' Personality Traits on the Relationship between Commitment to Forward-looking Voluntary Disclosure and Corporate Innovation

There is considerable disagreement in the literature regarding the effects of CEOs' personality traits on corporate behavior. Upper echelons theory posits that personal characteristics have a particularly large influence on decisions in which managers can exercise considerable discretion (Hambrick 2007). Prior studies provide vast empirical evidence supporting upper echelons theory in a variety of corporate settings (e.g., Bamber et al. 2010; Dyreng et al. 2010; Ge et al. 2011;

Davis et al. 2015). Moreover, one of the most important assumptions of economic theory is that firms' top executives vary in talent (e.g., Gabaix and Landier 2008; Edmans et al. 2009). Studies indicate that particular characteristics of top managers can significantly impact corporate performance (e.g., Malmendier and Tate 2005a; Malmendier et al. 2011; Hirshleifer et al. 2012; Custodio and Metzger 2013; Graham et al. 2014; Benmelech and Frydman 2015). The CEO, as the top manager in a firm, often makes decisions on R&D budget, engagement, and project prioritization. The investment decision making behavior of CEOs may be affected by their personality traits (Mailtal 1986; Hsieh et al. 2011).

However, upper echelons theory may not always empirically hold in corporate settings (Hrazdil et al. 2019a). First, CEOs are hired by shareholders to make strategic and operational decisions for their firms. They are expected to act in their firms' best interests rather than making decisions based on their own preferences (Kruger 2015). Second, corporate behavior is affected by many factors. The personality traits of CEOs may be too weak to have a discernible influence on corporate behavior in firm-level settings (Hrazdil et al. 2019a).[25] Given competing views in the literature regarding the validity of upper echelons theory in corporate settings, I conjecture that the CEOs personality traits (such as openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) tend to affect corporate innovation.

As stated in Section 2.2.1, commitment to earnings forecasts may be positively or negatively associated with corporate innovation. If CEOs personality traits are positively associated with corporate innovation, given that the investment decision-making behavior of CEOs is affected by

[25] For instance, Trueman (1986) suggests that management earnings forecasts provide a public signal of a manager's ability to anticipate changes in the firm's business environment and respond to uncertainties.

their personality traits (Mailtal 1986; Hsieh et al. 2011), it is plausible that the association between commitment to earnings forecasts and corporate innovation varies with CEOs' personality traits. Thus, I predict that the CEOs personality traits (such as openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) positively moderate the association between commitment to forward-looking voluntary disclosure and corporate innovation.

CHAPTER THREE:

RESEARCH DESIGN, DATA, SAMPLE, AND SUMMARY STATISTICS

3.1 Research Design

In this section, I present the data, sample, empirical design, and summary statistics of this research.

3.1.1 Model

In this subsection, I introduce the regression models I use in this research.

3.1.1.1 The Association between Voluntary Disclosure and Corporate Innovation

I use Model (1) to examine the association between the propensity to issue management earnings forecast and corporate innovation (Hypotheses 1):

$$LnPatent_{i,t+x}\left(LnCitation_{i,t+x}\right) = \beta_0 + \beta_1 MfIssuance_{i,t} + All\ Controls$$
$$+ YearFE + IndustyFE + CountryFE + \varepsilon_{i,t} \qquad (1)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

As discussed in the previous chapter, following the prior studies in the literature of management earnings forecasts (e.g., King et al. 1990; Dutta and Gigler 2002; Hirst et al. 2007), I use the term “commitment to voluntary disclosure (management earnings forecast)” to describe and capture the likelihood of voluntary disclosure (management earnings forecast) in this research. There are three measures of commitment to voluntary disclosure in this research: *MfFrequency, MfItems and CMF*. More details on these three measures will be discussed in section 3.1.3.

Therefore, to examine whether and to what extent commitment to issuing management earnings forecasts can be used to predict firms’ future innovation success (Hypotheses 2), I develop Model (2a) - (2c) as follows:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfFrequency_{i,t} + All\ Controls + YearFE + IndustyFE + CountryFE + \varepsilon_{i,t} \qquad (2a)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfItems_{i,t} + All\ Controls + YearFE + IndustyFE + CountryFE + \varepsilon_{i,t} \qquad (2b)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 CMF_{i,t} + All\ Controls + YearFE + IndustyFE + CountryFE + \varepsilon_{i,t} \qquad (2c)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

Following prior studies (He and Tian 2013; Chen et al. 2015; Cho et al. 2016; Balsmeier et al. 2017; Tsang et al. 2019), I measure firm innovation using two dimensions in both Model (1) and Model (2a-2c): $LnPatent_{i,t+x}$, which is the natural logarithm of the total number of patents granted to firm *i* in year *t+x* plus one; and $LnCitation_{i,t+x}$, which is the natural logarithm of the average number of citations-per-patent received by a given firm in year *t+x* plus one.[26] Starting in year *t*, I advance my dependent variables by between one and three years (i.e., *x* =1, 2, or 3) because the innovation process generally takes more than one year. More importantly, advancing the

[26] Recent studies on corporate innovation tend to use citations-per-patent as an alternative measure of corporate innovation (e.g., He and Tian 2013; Chen et al. 2015; Balsmeier et al. 2017) to avoid patents with relatively few citations being equally weighted in the innovation measure based on the total number of patents. However, both measures suffer from a truncation bias. To address this issue, in an additional analysis, I test the robustness of my findings using adjusted patent and citation measures.

dependent variables allows me to explore the length of time that it takes to observe the predicted effect of commitment to management earnings forecasts on a firm's innovation.

The independent variables of Model (1) $MfIssuance_{i,t}$ is the propensity to issue management earnings forecast. It is an indicator variable that is equal to one if an earnings forecast is provided by a firm in a given year and is equal to zero otherwise. I use ordinary least squares (OLS) regression to test Model (1). Therefore, for Hypothesis 1, a significantly positive (negative) coefficient (β_1) of $MfIssuance_{i,t}$ indicates a positive (negative) association between the propensity of management earnings forecast and corporate innovation.

The independent variables of Model (2a), (2b) and (2c) are $MfFrequency_{i,t}$, $MfItems_{i,t}$ and $CMF_{i,t}$ respectively, which I will discuss in detail in Subsection 3.1.3. A significantly positive (negative) coefficient (β_1) of $MfFrequency_{i,t}$, $MfItems_{i,t}$ and $CMF_{i,t}$ in Model (2a), (2b) and (2c) indicates that corporate innovation success in year *t+x* is positively (negatively) associated with commitment to issuing management earnings forecasts in year *t*.

Furthermore, in both Model (1) and Model (2a-2c), I include an array of control variables that have been identified by prior studies to have the potential to affect firm innovation output (e.g., Acs and Audretsch 1987; Kleinknecht 1989; Bhagat and Welch 1995; Balasubramanian and Lee 2008; Cheng and Lei, 2015; Kim et al., 2016; Zhang et al., 2016; He and Tian, 2018). Specifically, I include three categories of variables as controls. The first category is the firm's main characteristics, because prior research demonstrates that these factors are associated with firm innovation. These factors including 1) firm size (*Size*), which is measured by the natural logarithm of the firm's total assets at the beginning of the fiscal year. 2) the firm leverage (*Leverage*), which is defined as the ratio of the firm's total liability to its total assets; 3) the market-to-book ratio (*MB*), which is the firm's market value divided by the book value of the firm's common equity; 4) the firm performance (*ROA*), which is measured by the return on assets ratio; 5) the firm age (*Age*), which is defined as the natural logarithm of the number of years since the firm's IPO year; and 6) the level of cash holdings (*Cash*), which is measured as the firm's cash holdings in a given year scaled by its total assets; Among these factors, the firm size (*Size*), the market-to-book ratio (*MB*) and the level of cash holding (*Cash*) is expected to be positively associated with corporate innovation (e.g., Cheng and Lei 2015; Cho et al. 2016; Sunder et al. 2017; Cheng et al. 2019; Tsang et al. 2019); The firm leverage (*Leverage*) is expected to be negatively related to corporate innovation (e.g., Cho et al. 2016; Tsang et al. 2019). The effect of the firm age (*Age*) on corporate innovation could be either positive (e.g., Cho et al. 2016; Cheng et al. 2019) or negative (e.g., Balasubramanian and Lee 2008).

The second category of control variables in Model (1) and Model (2a-2c) is regarding firms' innovation investment input. I control for two factors. The first is R&D capital (*R&D*). Following prior studies (e.g., Cheng et al. 2015; Cho et al. 2016; Tsang et al. 2019), *R&D* is calculated as the research and development expenditure scaled by total assets. I first assign a zero to the any observation with missing R&D expenditure (*RDEXP*) when computing *R&D,* then replace any observation with a value of zero *R&D* with the country-industry-year average; While prior studies argues greater innovation input does not necessarily translate into greater innovation output (Hirshleifer et al. 2013), most researches in this line of literature suggest that firms with higher level of R&D capital tend to have greater innovative output. Therefore, a significantly positive effect of R&D capital (*R&D*) on corporate innovation is expected. Additionally, because research suggests firms with higher capital intensity are more likely to have greater patenting propensity (e.g., Hall and Ziedonis 2001; Cho et al. 2016), the second factor in this category that I control for is capital assets (*CapExp*), which are the capital expenditure scaled by the total assets in a given year. A significantly positive impact of capital assets (*CapExp*) on corporate innovation is expected as well.

The third category of control variables includes all the other factors that may influence corporate innovation. Firstly, Aghion et al. (2005) show that product market competition can have a significant impact on firms' innovation. Therefore, I use the Herfindahl–Hirschman Index (*Competition*) multiplied by minus one to control for the level of market competition, where the index is calculated as the sum of the squares of the fractional market shares of firms within each two-digit SIC industry for each country in a given year. Secondly, I include the firm-level financial opacity (*Accural*) as control variables, which is the country-industry-year-adjusted total scaled accruals defined after Bhattacharya et al. (2003). It is unclear how firm-level financial opacity influence corporate innovation drawn on the literature, thus, it is interesting to study the association between these two factors based on the sample in this research. Thirdly, prior studies suggest the positive impact of the percentage of closely held shares on corporate innovation (e.g., Tsang, et al., 2019), therefore, I include closely held shareholding (*Insider*) as one of the control variables in the models. Specifically, it is defined as the percentage of the firm's shares held by corporate insiders. A positive sign on closely held shareholding (*Insider*) is expected. Fourthly, since studies (e.g., Aghion et al. 2013) find a positive relationship between a firm's institutional holdings and its innovation, I also control for institutional ownership (*IO*) in Model (1) and Model (2a-2c). Fifthly, I control for analyst coverage (*Analyst*) in the model because of the significant association between financial analyst followings and firm innovation documented by prior studies (He and Tian 2013; Goldman and Peress 2016). Finally, I include the year-, industry-, and country- fixed effects in the models to control for possible variation in firm innovation driven by unobservable factors across years, industries, and countries.

3.1.1.2 The Role of CEO Personality Traits

To examine whether and to what extent CEOs' personality traits influence firms' future innovation success, I develop the following regression model:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta BigFive_{i,t} + CEOChar_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (3)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

Additionally, to examine whether the association between commitment to voluntary disclosure and corporate innovation varies with CEOs' personality traits, I develop the following regression model:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 BigFive_{i,t} + \beta_2 CMF_{i,t} + \beta_3 BigFive_{i,t} \times CMF_{i,t} + CEOChar_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (4)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

The dependent variable and control variables in models (3) and (4) are the same as in Model (1) and Model (2a-2c). The independent variable in Model (3) is a vector composed of variables related to each of the Big Five personality traits (*Extraversion*, *Emotion*, *Conscientious*, *Openness*, and *Agreeableness*, referring to extraversion, neuroticism, conscientiousness, openness to experience, and agreeableness, respectively); I will discuss these variables in detail in Subsection 3.1.4. A significant positive (negative) coefficient (*β*) of $BigFive_{i,t}$ in Model (3) indicates a positive (negative) effect of CEOs' personality traits on corporate innovation. The variable of interest in Model (4) is $BigFive_{i,t} \times CMF_{i,t}$. A significant positive (negative) coefficient (β_3) of $BigFive_{i,t} \times CMF_{i,t}$ indicates a positive (negative) moderating role of CEOs' personality traits in the association between commitment to voluntary disclosure and corporate innovation.

Following prior studies in this line of literature (e.g., Cho et al. 2016; Gao and Zhang 2017; Green et al. 2019), I control for CEO-specific characteristics. Specifically, *CEOChar* is a vector of CEO age (measured as the natural logarithm of the age of the CEO) and gender (measured by an indicator that is equal to one if the CEO is male and equal to zero otherwise). Finally, to capture unobserved factors that may drive the results, I include both year- and industry- fixed effect in the models.

3.1.2 Measures of Corporate Innovation

There are two notable points regarding my use of patents and citations to capture firm innovation. First, some studies use innovation input (e.g., a firm's R&D capital or yearly R&D expenditure) to measure a firm's innovation effort/input. However, there are concerns over whether innovation input can adequately capture firms' innovation output (Luong et al. 2017). Additionally, R&D expenditure data are sparsely available for firms in some countries because of differences in accounting standards. However, firms that do not report R&D expenditure do not necessarily lack innovation activities (Koh and Reeb 2015). Therefore, I adopt innovation output variables (patents granted and citations per patent) to measure a firm's innovation success. Additionally, following prior studies (He and Tian 2013; Cho et al. 2016; Luong et al. 2017; Zhong 2018; Tsang et al. 2019), to calculate the number of patents granted, I use the application year of a successful patent instead of the patent's grant year because this enables the timing of firm innovation to be better captured (Griliches et al. 1986).

3.1.3 Measures of Commitment to Voluntary Disclosure

Seijts (1998) formally defines future-orientation as the ability to anticipate, plan for and manage future uncertainties. Although researchers view CEO's future orientation is important to corporate outcomes, very limited empirical studies in finance and accounting actually focus on CEO's future orientation because it is difficult to measure directly. In this research, I use CEOs' commitment to forward-looking voluntary disclosure, as empirical proxies for CEOs' level of future orientation. This idea is motivated by Trueman (1986). Trueman (1986) suggests that managers' observable forecasting behavior provides a signal of their unobservable managerial ability. Specifically, he argues committing to voluntary disclosure signals managers' ability to anticipate and manage the uncertainties in their business. That is, a greater commitment to earnings forecast indicates a higher level of CEO's future orientation.

According to the prior studies in management forecasts (see the discussion in section 2.1.2.3), managers' commitment to management earnings forecast include: 1) issuing earnings forecasts more frequently (i.e., forecast frequency), 2) issuing earnings forecasts in qualitative or quantitative form (i.e., forecast precision), 3) issuing an earnings forecast at a particular time (i.e., forecast timeliness), 4) issuing an earnings forecast with additional financial information (i.e., forecast disaggregation), and issuing an earnings forecast with additional attribution (i.e., forecast attribution) etc. Among these observable forecasting behaviours (properties), more frequent and more disaggregated earnings forecasts are generally perceived as more desirable and indicative of forward-looking voluntary disclosure by investors (Hirst et al. 2008). More importantly, prior studies measure managers' *ex ante* commitment to better earnings forecast practices using the level of earnings forecast disaggregation, because earnings forecast disaggregation satisfies the theoretical requirement that signaling be costly (Evans and Sridhar 2002). For example, earnings forecasts that are more disaggregated may reveal projections that would otherwise be proprietary, which may help rivals to compete with the forecasting firm (Merkely et al. 2013). The issuance of more disaggregated earnings forecasts can also constrain managers' ability to take action to achieve their forecasted earnings (Dutta and Gigler 2002). Moreover, issuing more disaggregated earnings forecasts may exacerbate the negative stock market reaction to the earnings surprises of the forecasting firm if detailed earnings forecasts turn out to be inaccurate (Dong et al. 2017).

Thus, I use three measures of managers' commitment to voluntary disclosure to test Hypothesis 2 in this research. The first two measures are the frequency of management earnings forecasts and the disaggregation of management earnings forecasts. Specifically, in Model (2a) and Model (2b), the key variables of interest are *MfFrequency* and *MfItems*, reprehensively. The definitions of these two variables are as follows:

(1) *MfFrequency*: the total number of earnings forecasts provided by a firm in a given year.

(2) *MfItems:* the total number of supplementary forecasted performance items contained in a management earnings forecast in addition to the earnings themselves. For firms issuing multiple earnings forecasts in a given year, I use the average of all forecasts to measure the level of forecast disaggregation.

Additionally, to better measure managers' commitment to forward-looking voluntary disclosure, I further construct an aggregated measures of management earnings forecast properties as the third measure of managers' commitment to management earnings forecast. The formal definition of this variable is as follows:

(3) $CMF=b+c$, where b is equal to one if the total number of earnings forecasts provided by a firm in a given year is more than one, zero otherwise; and c is equal to one if the total number of forecasted performance measures contained in an earnings forecast in addition to the earnings themselves is more than one, and is equal to zero otherwise.

3.1.4 Measures of CEO Personality Traits

Following Green et al. (2019), I measure the personality traits of CEOs based on his/her speech patterns during the Q&A portion of a conference call. Green and his co-authors first downloaded the original conference call transcripts from the Thomson Reuters and Seeking Alpha databases, then constructed Big Five personality trait variables following three steps:

Taking the variable *CEO_Extraversion* as an example. In the first step, they calculate the extraversion score using the average of four linguistic algorithms. They refer to the extraversion score of an executive, determined based on his/her speech during the Q&A portion of a conference call, as *Call Extraversion.* In the second step, they first build a regression model as follows:

$$Call\ Extraversion = \beta_0 + \beta_1 Ret_{it-63,t-2} + \beta_2 Ret_{it-1,t+1} + \beta_3 Ret_{it+2,t+63}$$

$$+\beta_4 Earnings\ Call + \beta_5 MBE + \beta_6 Surprise\ + \beta_7 Loss + Qtr + \ \varepsilon_{i,t} \quad . \qquad (5)$$

The trait score is regressed on a set of determinants including managerial characteristics and firm fundamentals. The detailed definitions of the related variables in Model (4) will be described in Appendix A.

Next, they estimate the residuals from each conference call. In the last step, they weight the residuals from each conference call based on the number of words spoken by the CEO during the Q&A portion of the call. The weighted average residuals (*CEO_Extraversion*) are taken as the measure of the CEO's extraversion. To be short, the variable CEO*_Extraversion* is defined as the weighted average residual extraversion across all conference calls, where each call is weighted by the number of words spoken by the CEO in the Q&A portion of the call. For each conference call, following the same steps, the CEO personality trait variables *CEO_Emotion, CEO_Conscientious, CEO_Openness,* and *CEO_Agreeableness* are also constructed.[27]

[27] Given the inherent difficulty in measuring CEO's personality traits directly, very few studies adopt empirical measures of the Big Five personality traits. Prior studies in this line of literature (e.g., Mairesse et al., 2007; Green et al., 2019; Brown et al., 2021) measure the Big Five personality traits through computerized textual analysis. The Big Five framework are viewed as a highly personality trait (Costa and McCrae 1988; Mairesse et al., 2007). Green et al. (2007)'s Big Five personality measures are calculated by applying linguistic algorithm to the language spoken by CEOs in the question-and-answer portion of conference calls. The authors examine the variation is extraversion at the conference call level and provide evidence on the stability of their Big Five personality measures. Such call-based measures are preferable to one that changes with firm fundamentals, because the Big Five personality measures change with firm fundamentals, it may raise the concern that the personality measures are capturing some unobservable omitted fundamental variable.

3.2 Data and Sample

I construct corporate innovation variables using data from Bureau Van Dijk's Orbis patent database. This database contains information on around 400 million companies across the world and sources patent application information from more than 40 authorities. Studies (e.g., Hall et al. 2001, 2005; He and Tian 2013) commonly use the National Bureau of Economic Research (NBER) Patent Citation Database or the Harvard Business School (HBS) Patent Database, both of which only focus on the US. Meanwhile, Bureau Van Dijk's Orbis covers international firms and has a longer sample period than these two databases, enabling me to explore the variation in firm innovation across countries. I first exclude all patents filed in more than one country to avoid overestimating patent counts. Then, I obtain the total number of patents granted and the total number of citations per patent for each firm in each application year. I assign a value of zero to firm-years with missing values for patents granted and citations per patent.

Management earnings forecast data are hand-collected from the original text of management earnings forecasts issued by publicly listed firms worldwide covered by the Standard & Poor's Compustat Capital IQ database during the period 2004–2010. Following studies that examine management earnings forecasts in a global setting (e.g., Cao et al. 2017; Chen et al. 2019; Li et al. 2019; Tsang et al. 2019), to reduce the effect of possible confounding events, I include only "standalone" management earnings forecasts in my sample—that is, I exclude earnings forecasts that are issued together with earnings announcements, customer announcements, or any other non-earnings-forecast-related corporate announcements. I further exclude all management earnings forecasts from firms domiciled in Japan, as such forecasts are mandatory for these firms (Kato et al., 2009).

To obtain the frequency of management earnings forecasts, I count the total number of standalone earnings forecasts issued by each firm in a given year. I then read each standalone earnings forecast and manually identify projected performance measures in each one. Following Barton et al. (2010), I identify the following performance measures: (1) sales; (2) income before income taxes; (3) income before extraordinary items and discontinued operations; (4) operating earnings before interest, income taxes, depreciation, and amortization; and (5) operating income before income taxes. An earnings forecast containing at least one of these five performance measures in addition to earnings is considered as a disaggregated management earnings forecast. I then use the total number of additional performance measures contained in each disaggregated earnings forecast to measure the level of disaggregation of the forecast. For firms issuing multiple earnings forecasts in a given year, I take the average value for all earnings forecasts issued in that year as the value for that year. For firm-years when no earnings forecasts were issued, I assign a value of zero to each of the three measures of earnings forecasts (*MfIssuance, MfFrequency*, and *MfItems*). Data for the control variables are obtained from the Standard & Poor's Compustat Capital IQ database, except for institutional ownership data, which are obtained from FactSet database, and financial analyst following data, which are obtained from Institutional Brokers Estimate System (IBES) database.

Data on the Big Five personality traits are obtained from Green et al. (2019).[28] The original conference call transcripts come from the Thomson Reuters and Seeking Alpha databases. Green

[28] Green et al. (2019) draw these data from corporate conference call transcripts collected during 2006–2013.

et al. (2019) analyze corporate conference call transcripts collected between 2006 and 2013. Data on other executive variables, such as age and gender, and data on all other firm-level characteristics variables are collected from the Standard & Poor’s Compustat Capital IQ (CIQ) database.

In my empirical examination, I require patent and citation data to be available for the five years after a firm’s issuance of an earnings forecast. Given the substantial financial and time cost associated with hand-collecting data on management earnings forecast disaggregation with global coverage, my earnings forecast (patent and citation) data span 2004–2010 (2004–2016). After deleting data with missing values for the control variables, my final global sample consists of 151,456 firm-year observations associated with 26,364 firms domiciled in 27 countries. The US sample comprises 47,914 firm-year observations from 8,980 firms.

To construct the sample for the tests in examining the role of CEO personality traits in the relationship between the commitment to forward-looking voluntary disclosure and corporate innovation outcomes, I first match Green et al. (2019)’s CEO Big Five personality traits data with the CEO characteristic data (e.g., CEO age and CEO gender) and then merge the matched data with my US sample. I call this new sample “the US Big5 sample”. Given the sample period of Green et al. (2019) CEO Big Five personality traits data is from 2006 to 2013, after matching and merging, my US Big5 sample consists of 4,875 observations from 1,359 firms, and the sample period spans 2006 to 2010.

3.3 Sample Distribution

In this section, I discuss the sample distribution and descriptive statistics of the key variables for both the global and US samples.

3.3.1 Statistics of the Global Sample

Panel A of Table 1A provides the sample distribution and descriptive statistics of the key variables (i.e., the variables for earnings forecasts and innovation output) by country/region. I report descriptive statistics for both full samples and the patent and citation samples.[29] There is substantial inter-country variation in the number of observations. US firms contribute the most observations in my final sample (31.60%), while Austrian firms contribute the fewest (0.01%). Additionally, there is substantial inter-country variation in the average number of patents granted and citations per patent received; for example, while firms in the Netherlands contribute the highest average number of patents granted (26.55), firms in Indonesia contribute the lowest (1.00). In the full sample, the mean likelihood of a firm's issuing earnings forecasts is 19.50%, with firms in Finland (Taiwan) exhibiting the highest (lowest) likelihood.

Unlike the earnings forecast issuance variable, which is applicable to the full sample, the earnings forecast property variables (i.e., earnings forecast frequency and disaggregation) are conditional on firms issuing earnings forecasts. Thus, I report the mean of these variables for the full sample and for a subsample of firms that issued at least one earnings forecast during the sample period. Thus, the descriptive statistics of the subsample reflect the average frequency and level of

[29] The patent (citation) sample is the sample containing firms granted at least one patent (citation) during the sample period.

disaggregation of earnings forecasts issued by the forecasting firms in each country. Across all countries in the global sample, forecasting firms issued an average of 2.49 earnings forecasts each year, with an average of around one additional performance measure issued in each earnings forecast. The obtained statistics are close to those documented in prior studies (e.g., Li et al. 2019; Tsang et al. 2019) despite the substantially different sample sizes.

[Panel A of Table 1A Here]

Panel B of Table 1A reports the sample distribution by year for the global sample. The results reveal a steadily increasing trend in the number of observations during the study period, with 17,927 observations (11.84% of the total) in 2004 and 22,674 observations (14.97%) in 2010. While there is no substantial variation in the number of patents granted over the sample period (Column 3), I find that the number of citations per patent steadily drops (Column 4). The results in columns 8 and 9 are based on the patent sample and the citation sample, respectively; these results confirm those in columns 3 and 4. This observation is consistent with studies of corporate innovation that describe a lag between the grant year and the citation year of a patent (e.g., Tsang et al. 2019). Additionally, there is an increase in the propensity of firms to issue earnings forecasts across the study period. I find no large variation in forecast disaggregation across the study period, although I find a slight increase in the forecast frequency. Furthermore, to investigate the yearly distribution of forecast characteristics, I narrow my full US sample by keeping only firms that issue earnings forecasts in a given year. While I find a slight increase in forecast frequency over the study period for this limited sample, there is a steady decrease in forecast disaggregation.

[Panel B of Table 1A Here]

Panel C of Table 1A reports the sample distribution by industry in the global sample based on the industry classifications suggested by Barth et al. (1998). There is notable variation in the number of observations across industries. Consistent with the findings of the majority of studies in this line of literature, firms in the transportation equipment, chemicals, and computing industries contribute most to the level of innovation output. Firms in the transport equipment industry tend to have the highest level of innovation output (as measured by the total number of patents granted and the total number of citations-per-patent received), and firms in the restaurant industry tend to have the lowest level of innovation output (as measured by the total number of patents granted and the total number of citations-per-patent received). There is also notable variation across industries in terms of the issuance propensity and properties of earnings forecasts. For example, firms in the utilities industry have the highest propensity to issue earnings forecasts, while firms in the insurance/real estate industry have the lowest propensity.

[Panel C of Table 1A Here]

3.3.2 Statistics of the US Sample

Panel A of Table 1B reports the sample distribution by year for the US sample. Columns 2 to 7 are based on the full sample; they reveal a steadily increasing trend in the number of observations during the study period, with 6,092 observations (12.71%) in 2004 and 7,339 observations (15.32%) in 2008. However, the number of observations drops slightly in the final two years. There is no substantial variation in the number of patents granted over the study period; however, there is a gradual decrease in the number of citations per patent in the period of 2004 to 2010. There is no substantial variation in the propensity of firms to issue earnings forecasts across the study period. Across the whole period, the US firms were granted an average of 4.685 more patents than the non-US firms, which indicates that US firms tended to be more successful in corporate innovation between 2004 and 2010.

[Panel A of Table 1B Here]

Panel B of Table 1B reports the distribution of the US sample by industry type. Firms in the computing, transportation equipment, and chemicals industries have higher levels of innovation output (as measured by the total number of patents granted; see Column 8). Meanwhile, firms in the utilities, wholesale, and services industries have lower levels of innovation output (as measured by the total number of patents granted; see Column 8). Firms in the insurance/real estate industry have the lowest likelihood of providing earnings forecasts, while firms in the misc. manufacturing industries have the highest likelihood.

[Panel B of Table 1B Here]

3.4 Summary Statistics

Panel A of Table 2 reports the descriptive statistics of the variables used in my main empirical analyses of the global sample. To reduce the influence of outliers, I winsorize all of the continuous variables at the 1st and 99th percentiles. On average, a firm was granted 1.572 patents per year and each patent received an average of 0.219 non-self-citations per year. A total of 19.5% of the firms issued at least one earnings forecast in the sample period. The firms issued an average of 4,564 earnings forecasts per year, with an average of 0.191 supplementary performance items forecasted in each earnings forecast in addition to earnings themselves.

[Panel A of Table 2 Here]

Panel B of Table 2 reports the descriptive statistics of the main variables, which used in the regression analyses in the US sample in Section 3.2. I winsorize all of the continuous variables at the 1st and 99th percentiles to reduce the influence of outliers. Compared with the firms in the global sample, the firms in the US sample were granted an average of 1.071 more patents per year, and each patent granted to a firm in the US sample received 0.088 more non-self-citations. This indicates that US firms were more successful in corporate innovation than non-US firms in the sample period. A total of 29.2% of the firms issued at least one earnings forecast during the sample period. Additionally, the firms tended to issue more frequent and more disaggregated earnings forecasts.[30]

Moreover, in the US sample, the mean (median) call-level CEO extraversion is 4.218 (4.207), which is close to the values documented by Green et al. (2019). Additionally, the descriptive statistics of the other Big Five personality traits are comparable to those found by Green et al. (2019). In the US sample, the average CEO age is about 59 years and 97.5% of the CEOs are male.

[Panel B of Table 2 Here]

[30] Research conducted in the US finds that about one third of S&P 500 companies that provide earnings forecasts also provide disaggregated forecasts. I obtain similar results for both the global and US samples.

CHAPTER FOUR:

EMPIRICAL ANALYSIS AND RESULTS

4.1 The Relationship between the Commitment to Voluntary Disclosure and Corporate Innovation in the Global Sample

In this section, I first study whether and how commitment to voluntary disclosure is associated with corporate innovation. I then examine whether different characteristics of country-level institutions play a role in the association between commitment to voluntary disclosure and corporate innovation.

4.1.1 Main Results

To attempt to find empirical evidence to support my competing Hypotheses 1 and 2 in a global setting, I use both univariate and multivariate analysis. In this subsection, I analyze the empirical results.

4.1.1.1 Univariate Analysis

Table 3A presents the Pearson correlation matrix. All the continuous variables are winsorized at the 1% level. Bold values indicate that the correlation is significant at the 10% level or below. All of the variables are defined in Appendix A. The significant positive correlation between the innovation output measures (*LnPatent* or *LnCitation*) and management earnings forecast variables (*MfFrequency, MfItems*) supports my prediction of a positive relationship between commitment to forward-looking voluntary disclosure and firms' innovation success in Hypothesis 2.

[Table 3 Here]

4.1.1.2 Multivariate Analysis and Empirical Results

To examine my first two hypotheses, I use Model (1) and Model (2a-2c) in this subsection. The empirical analysis and results in subsection 4.1.1.2.1 refer to Hypothesis 1, and those in subsection 4.1.1.2.2 refer to Hypothesis 2.

4.1.1.2.1 The Relationship between Voluntary Disclosure and Corporate Innovation

Table 4 presents the results of an OLS regression conducted to estimate whether and how the issuance of management earnings forecasts is related to firms' innovation success. Model (1) is used. Columns 1–4 show the regression results for the relationship between *LnPatent* measured in years *t, t+1*, *t+2*, and *t+3*, respectively, and *MfIssuance in year t*. In all of the columns, there is a significant positive relationship between the issuance of management earnings forecasts and the firm's innovation output (as measured by the number of patents granted).[31] Columns 5–8 show the same as columns 1–4, respectively, except that the dependent variable is replaced by *LnCitation.* In all columns, there is a significant positive relationship between the issuance of management earnings forecasts and the firm's innovation output (as measured by the total number of patents granted and the total number of citations-per-patent received). The findings shown in Table 4 indicate that there is a positive relationship between the issuance of management earnings forecasts and corporate innovation, which supports Hypothesis 1.

To briefly explain the economic implications of the control variables, I take Column 2 of Table 4 as an example. The results show that firms are more successful in corporate innovation if they are

[31] I obtain similar results when *LnPatent* is measured in years *t+4* and *t+5*; however, for simplicity, I report only the results for when the dependent variable is measured in years *t* to *t+3*.

larger enterprises with more revenue, more R&D capital; and if they have operated for a longer period, have a high level of institutional ownership and a large number of analysts following them, and hold a large amount of cash. These findings are consistent with prior studies (e.g., Galasso and Simcoe 2011; Hirshleifer et al. 2012; Ederer and Manso 2013; Custodio et al. 2017; He and Tian 2018; Cheng et al. 2019; Huang et al. 2021).

[Table 4 Here]

4.1.1.2.2 The Relationship between the Commitment to Voluntary Disclosure and Corporate Innovation

In this section, I examine the association between the commitment to voluntary disclosure and corporate innovation by using three different measures of commitment to management earnings forecast.

4.1.1.2.2.1 Frequency of Management Earnings Forecasts

In this subsection, I examine the relationship between the frequency of management earnings forecasts and corporate innovation using Model (2a). I measure firms' innovation success using *LnPatent* and *LnCitation*. The results are reported in Table 5. The dependent variable in Panel A and Panel C is *LnPatent*; the dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B of Table 5 report the results of the OLS regression for estimating whether and how the frequency of management earnings forecasts is associated with corporate innovation using the global full sample. I assign a value of zero to all firm-year observations with no earnings forecasts. Panel C and Panel D of Table 5 report the results of the subsample consisting of firm-year observations with at least one earnings forecast, namely the global MF sample. The results in all panels suggest that firms that issue more frequent earnings forecasts tend to have a higher level of subsequent innovation success, thus supporting Hypothesis 2.

[Table 5 Here]

4.1.1.2.2.2 Disaggregation of Management Earnings Forecasts

The regression results for the relationship between management earnings forecast disaggregation and corporate innovation are reported in Table 6. Model (2b) is used. The dependent variable in Panel A and Panel C is *LnPatent*; the dependent variable in Panel B and Panel D is *LnCitation*. The results for the global full sample are presented in Panel A and Panel B; and the results for the global MF sample are shown in Panel C and Panel D. The results in both panels are robust and indicate that firms issuing more disaggregated management earnings forecasts tend to have greater innovation success in the current year and in the following three year, thus supporting Hypothesis 2.

[Table 6 Here]

4.1.1.2.2.3 Aggregated Management Earnings Forecasts Measure

The results shown in Table 4, Table 5 and Table 6 suggest that both the provision and the properties of management earnings forecasts are related to corporate innovation outcomes. In this subsection, I first investigate which earnings forecast variable plays the most significant role in this relationship. To answer this question, I include all three management earnings forecast variables (*MfIssuance, MfFrequency,* and *MfItems*) in one model. Specifically, I develop this model as follows:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfIssuance_{i,t} + \beta_2 MfFrequency_{i,t}$$

$$+\beta_3 MfItems_{i,t} + All\ Controls + \ YearFE + \ IndustyFE + \ \varepsilon_{i,t} \qquad (6)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

The regression results of Model (6) are reported in Table 7. Although I find a consistent positive relationship between corporate innovation and both management earnings forecast frequency and management earnings forecast disaggregation in all columns of all panels, the estimated coefficients of *MfIssuance* in all columns become significantly negative after controlling for both management earnings forecast frequency and management earnings forecast disaggregation in the same regression. This finding suggests that the positive relationship between management earnings forecast issuance and corporate innovation is likely driven by both management earnings forecast frequency and management earnings forecast disaggregation. The significant negative coefficient for *MfIssuance* after controlling for both management earnings forecast properties is consistent with previous studies (e.g., Hirst et al. 2008) that suggest that the issuance of management earnings forecasts alone can be perceived as self-serving, opportunistic, and lacking credibility. Therefore, the results suggest that the decision to issue a management earnings forecast alone is not found to be an effective signal of a firm's future innovation success.

[Table 7 Here]

Given that more frequent and more disaggregated earnings forecasts are generally perceived as more desirable and indicative of forward-looking voluntary disclosure by investors (Hirst et al. 2008), and inspired by the findings shown in Table 7, I then construct an aggregated measure of management earnings forecasts—namely *CMF*—to better capture managers' commitment to forward-looking voluntary disclosure. I define *CMF* as the sum of two indicator variables:

MfFrequency, which is equal to one if a firm issues more than one earnings forecast in a given year and equal to zero otherwise; and *MfItems*, which is equal to one if a firm issues a management earnings forecast with at least one additional performance measure in a given year and is equal to zero otherwise. Thus, *CMF* ranges from zero to two, with a higher score indicating that a firm issues better earnings forecasts. In short, *CMF* is my key interest variable in this section, as it measures managers' commitment to forward-looking voluntary disclosure. One benefit of creating *CMF* as the aggregated management earnings forecast property variable is that it simplifies the robustness analysis and cross-sectional analysis discussed in later sections.

The regression results are presented in Table 8. Model (2c) is used. In all of the columns, there is a significant positive estimated coefficient on *CMF*; this is consistent with the findings presented in Table 5, Table 6 and Table 7. Moreover, the magnitude of the estimated coefficient of *CMF* is generally higher than the magnitudes of the estimated coefficients of *MfFrequency* and *MFItems* reported in Table 7 (i.e., when *MfFrequency* and *MFItems* are estimated separately). This finding indicates the importance of taking various earnings forecast variables into consideration when measuring a firm's commitment to forward-looking voluntary disclosure. Overall, the regression findings of Table 8 lend further support to Hypothesis 2 that firms with more future-oriented CEO (i.e., more committed to forward-looking voluntary disclosure) are granted more patents and receive more citations per patent.

[Table 8 Here]

4.1.2 The Role of Country-level Institutional Characteristics

Because country-level institutions can have an important effect on the quality of corporate disclosure (e.g., Ball et al. 2003; Bhattacharya et al. 2003; Leuz et al. 2003; Bushman et al. 2004; DeFond et al. 2007), in this subsection, I conduct additional cross-sectional analyses to examine whether and to what extent the role of commitment to forward-looking voluntary disclosure in signaling firms' innovation success varies with country-level institutional characteristics related to the stringency of investor protection and the rule of law. To do this, I develop the following two regression models:

$$\begin{aligned} LnPatent_{i,t+x}\left(LnCitation_{i,t+x}\right) = {} & \beta_0 + \beta_1 ShareProtect_{i,t} + \beta_2 CMF_{i,t} \\ & + \beta_3 ShareProtect_{i,t} \times CMF_{i,t} + All\ Controls \\ & + YearFE + \ IndustyFE \ + \ CountryFE + \ \varepsilon_{i,t} \qquad (7a) \end{aligned}$$

$$\begin{aligned} LnPatent_{i,t+x}\left(LnCitation_{i,t+x}\right) = {} & \beta_0 + \beta_1 RegQuality_{i,t} + \beta_2 CMF_{i,t} \\ & + \beta_3 Regquality_{i,t} \times CMF_{i,t} + All\ Controls \\ & + YearFE + \ IndustyFE \ + \ CountryFE + \ \varepsilon_{i,t} \quad . \quad (7b) \end{aligned}$$

$$\begin{aligned} LnPatent_{i,t+x}\left(LnCitation_{i,t+x}\right) = {} & \beta_0 + \beta_1 RuleLaw_{i,t} + \beta_2 CMF_{i,t} \\ & + \beta_3 RuleLaw_{i,t} \times CMF_{i,t} + All\ Controls \\ & + YearFE + \ IndustyFE \ + \ CountryFE + \ \varepsilon_{i,t} \quad . \quad (7c) \end{aligned}$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3.

In Model (7a), the country-level stringency of investor protection is proxied by the shareholder protection index (*ShareProtect*), which is calculated based on the strength of minority shareholders' protection. This index is obtained from the World Economic Forum's Global Competitiveness Index. $ShareProtect_{i,t} \times CMF_{i,t}$ is the variable of interest. A positive (negative) coefficient (β_3)

of $ShareProtect_{i,t} \times CMF_{i,t}$ indicates that the positive role of commitment to forward-looking voluntary disclosure in corporate innovation success is more (less) pronounced in countries with more (less) stringent investor protection.

In Model (7b), the country-level regulation quality (*RegQuality*) is one of the worldwide governance indicators, which is created by World Bank. It captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. $RegQuality_{i,t} \times CMF_{i,t}$ is the variable of interest. A positive (negative) coefficient (β_3) of $RegQuality_{i,t} \times CMF_{i,t}$ indicates that the positive role of commitment to forward-looking voluntary disclosure in corporate innovation success is more (less) pronounced in countries with a more(less) stringent legal and regulatory environment for the protection of investor interests.

In Model (7c), the country-level rule of law (*RuleLaw*) is obtained from the Index of Economic Freedom, which is created by the Heritage Foundation and the *Wall Street Journal*. $RuleLaw_{i,t} \times CMF_{i,t}$ is the variable of interest. A positive (negative) coefficient (β_3) of $RuleLaw_{i,t} \times CMF_{i,t}$ indicates that the positive role of commitment to forward-looking voluntary disclosure in corporate innovation success is more (less) pronounced in countries with a higher (lower) level of the rule of law for the investor protection.

I observe a positive coefficient (β_3) of $RuleLaw_{i,t} \times CMF_{i,t}$ in both Model (7a), Model (7b) and Model (7c). The results indicate that the positive effect of commitment to forward-looking voluntary disclosure on firms' innovation success tends to be stronger for firms domiciled in countries with a more stringent legal and regulatory environment for the protection of investor interests. However, this effect is only observed when firms' innovation success is measured by the number of citations per patent, not when it is measured by the number of patents granted. Additionally, although the sign on *CMF* is negative and significant in Panel B of Table 9A, 9B and 9C, I still find the strengthen role of investor protection and the rule of law in the association between the managers' commitment to voluntary disclosure and corporate innovation. Due to the greater litigation concern associated with firms' forward-looking voluntary disclosure in countries with a greater level of investor protection and the rule of law, managers in these countries may be more likely to signal their innovation success by issuing higher-quality earnings forecasts when the anticipated quality of the innovation output is high.

[Table 9A Here]

[Table 9B Here]

[Table 9D Here]

4.2 The Relationship between the Commitment to Voluntary Disclosure and Corporate Innovation in the US Sample

Most empirical studies related to the relationship between voluntary disclosure and corporate innovation in the past two decades focus on the US context (e.g., Cheng et al. 2005; Chen et al. 2015; Huang et al. 2021). Therefore, I shift my attention from the global sample to the US sample to determine whether my conjectures still hold. In the first part of this section, I investigate the role of voluntary disclosure in corporate innovation (Hypothesis 1), as well as whether and how commitment to voluntary disclosure is associated with corporate innovation success (Hypothesis 2) in the US sample.

Upper echelons theory posits that the personal characteristics have a particularly large influence on decisions in which managers can exercise considerable discretion (Hambrick 2007). Studies provide extensive empirical evidence to support upper echelons theory in a variety of corporate settings (e.g., Bamber et al. 2010; Dyreng et al. 2010; Ge et al. 2011; Davis et al. 2015). However, most of this evidence is based on CEOs' observable characteristics (e.g., gender, age, and educational background); little is known about how unobservable characteristics (e.g., personality traits) influence CEOs' business decision-making. Thus, in the second part of this section, I first explore the role of CEOs' personality traits in corporate innovation success. Next, I examine whether the association between commitment to voluntary disclosure and corporate innovation varies with CEOs' personality traits.

4.2.1 Main Results

For the US sample, I conduct both univariate and multivariate analysis to examine Hypothesis 1 and Hypothesis 2. The detailed steps and results of my analysis are described in this section. Same to what I do in section 4.1.1, I use Model (1) and Model (2a-2c) in this subsection. Adding to the explanation on my observation of the empirical results, I compare the baseline results of the US sample to the baseline results of the global sample.

4.2.1.1 Univariate Analysis

Table 10 presents the Pearson correlation matrix of the variables used in the empirical analysis of the US sample. All continuous variables are winsorized at the 1% level. Bold values indicate that the correlation is significant at the 10% level or below. All variables are defined in Appendix A.

The results of the univariate analysis indicate that there is a positive relationship between the voluntary disclosure variables and corporate innovation success. Additionally, there is a positive relationship between corporate innovation success and extraversion, agreeableness, and conscientiousness. While no evidence is found to support the theory that CEO gender is related to corporate innovation success, younger CEOs tend to have more corporate innovation success.

[Table 10 Here]

4.2.1.2 Multivariate Analysis and Empirical Results

To test Hypothesis 1 and Hypothesis 2, in this subsection, I use Model (1) and Model (2a-2c) using the US sample. The empirical analysis and results in subsection 4.2.1.2.1 refer to Hypothesis 1, and those in subsection 4.2.1.2.2 refer to Hypothesis 2.

4.2.1.2.1 The Relationship between Voluntary Disclosure and Corporate Innovation

Table 11 presents the results of an OLS regression conducted to estimate whether and how the issuance of management earnings forecasts is related to firms' innovation success in the US sample using Model (1). I find a significant positive relationship between the propensity to issue management earnings forecasts and corporate innovation output, measured by the number of patents granted and the number of non-self-citations received per patent. This finding suggests that voluntary disclosure promotes corporate innovation success, thereby supporting Hypothesis 1.

In terms of the economic implications of my results regarding the control variables, my findings for the US sample are consistent with my observations in a global setting. Additionally, my results show that firms domiciled in the US are more successful in corporate innovation if they have a high level of market competitiveness, which is consistent with prior studies (e.g., He and Tian 2018).

[Table 11 Here]

4.2.1.2.2 The Relationship between the Commitment to Voluntary Disclosure and Corporate Innovation

In this section, I examine the association between the commitment to voluntary disclosure and corporate innovation by using three different measures of commitment to management earnings forecast.

4.2.1.2.2.1 The Frequency of Management Earnings Forecasts

In this subsection, I explore the association between management earnings forecast frequency and corporate innovation in the US sample. The results are reported in Table 12. In Panel A and Panel B of this table, I adopt Model (2a) based on the US full sample. The independent variable in this analysis is *MfFrequency*. Any firm-year observations with no earnings forecasts are assigned a value of zero. I find a significant positive coefficient (β_1) of management earnings forecast frequency in columns 1–4 of both Panel A and Panel B.

To check whether the empirical results are robust, I then exclude all firm-year observations with no earnings forecasts from the US full sample; I call this new subsample the “US MF sample.” Panel B reports the results. While the coefficients (β_1) of management earnings forecast frequency is statistically insignificant in some columns (see column 1 and 4 of Panel C, and column3 of Panel D), the regression results shown in both Panel C and Panel D support my observation in Panel A and B. Overall, the results of Table 12 suggest that firms that issue more frequent earnings forecasts are more likely to achieve innovation success, thus supporting Hypothesis 2, which is consistent with what I find in the global sample.

[Table 12 Here]

4.2.1.2.2.2 The Disaggregation of Management Earnings Forecasts

In this subsection, I examine the association between management earnings forecast disaggregation and corporate innovation in the US sample by using Model (2b). Table 13 reports the results. Panel A and Panel B show the findings for the US full sample; Panel C and Panel D show those for the US MF sample. Similar to what I find in the global sample, I obtain robust results for both the US full sample and the US MF sample. The coefficients (β_1) of management earnings forecast disaggregation is statistically significant and positive in all columns of all panels. The findings in Table 13 suggest that firms that issue more disaggregated management earnings forecasts tend to be more successful in corporate innovation in the current year and in the next three years, thus supporting Hypothesis 2, which is consistent with my findings in global setting.

[Table 13 Here]

4.2.1.2.2.3 The Aggregated Management Earnings Forecast Measure

To test which property of management earnings forecasts has the strongest relationship with corporate innovation in the US sample, I use model (6) that is introduced in subsection 4.1.1.2.2.3. The results are reported in Table 14. The estimated coefficients of *MfIssuance* (β_1) in all of the columns become significantly negative or insignificant after controlling for both earnings forecast properties in the same regression. Additionally, the estimated coefficients of both *MfFrequency*

(β_2) and *MfItems* (β_3) remain significantly positive in all of the columns. These findings are consistent with the findings for the global sample and with previous studies (e.g., Hirst et al. 2008). The findings shown in Table 14 suggest that the decision to issue a standalone earnings forecast does not signal firms' future innovation success and lends support to Hypothesis 2.

[Table 14 Here]

Then, similar to what I do in the analysis of the global sample, I use Model (2c) with *CMF* as the variable of interest to capture managers' commitment to forward-looking earnings forecast practices in the US context. The regression results are reported in Table 15. In all of the columns of all panels, the coefficients of *CMF* are significantly positive, supporting Hypothesis 2, which is consistent with my findings in the global sample. Taken together, in the US sample, I find that firms with more future-oriented CEO (i.e., more committed to forward-looking voluntary disclosure) are granted more patents and receive more citations per patent.

[Table 15 Here]

4.2.2 The Role of CEO Personality Traits

In this subsection, I first examine the role of CEOs' personality traits in corporate innovation success. Next, I study whether the association between commitment to forward-looking voluntary disclosure and corporate innovation success varies with CEOs' personality traits.

4.2.2.1 Corporate Innovation and CEO Personality Traits

To examine the role of CEO's personality traits in corporate innovation success. I use Model (3) to examine the role of CEO personality traits in corporate innovation. Table 16 reports the results of a regression conducted to investigate the relationship between the *CEO_Extraversion* and corporate innovation success. The results show a significant positive relationship between *CEO_Extraversion* and corporate innovation success. This finding is consistent with the finding of many psychology studies that people perceive extraversion as an important leadership quality (Mann 1959; Stogdill 1974; Bentz 1985). Among the Big Five personality traits, extraversion is the most closely associated with leadership ability (Judge et al. 2002) and the most important aspect of an individual's personality for success in job performance (Cain 2012; Green et al. 2019). More extraverted CEOs are more likely to attract social attention (Ashton et al. 2002), which leads to greater visibility and greater investor recognition for their firms (Green et al. 2019). In addition, firms with more extraverted CEOs tend to show superior performance in different dimensions such as sales growth, efficiency, investment, and acquisition announcement returns (Green et al. 2009). Therefore, hiring more extraverted CEOs could help firms obtain various economic benefits that support corporate innovation investment, which in turn could increase corporate innovation success.

However, I do not observe any empirical evidence of an association between any of the other four of CEO Big Five personality traits (*CEO_Emotion*, *CEO_Conscientious*, *CEO_Openness*, and *CEO_Agreeableness*) and corporate innovation success in Table 15. This is not surprising, as CEOs are hired by shareholders to make strategic and operational decisions for their firms and are expected to act in their firms' best interests rather than make decisions based on their own preferences (Kruger 2015), some personality traits (such as neuroticism, conscientiousness, agreeableness etc.) of CEOs may not have a discernible influence in firm outcomes (Hrazdil et al. 2019a).

Prior studies suggest that extraversion can be easily inferred from an individual's communication style (e.g., Dewaele and Furnham 1999). Extraverts have a greater verbal output, speak more quickly and with fewer pauses, use less word variety and more informal language, and are more assertive when communicating (Scherer 1979; Furnham 1990; Gill and Oberlander 2003). Thus, the level of *CEO_Extraversion* is relatively easy to be observed and measured by analyzing corporate conference call transcripts. The difficulty in measuring the other CEO personality traits in conference call transcripts can be an alternative explanation for why I do not find any association between *CEO_Emotion*, *CEO_Conscientious*, *CEO_Openness*, *CEO_Agreeableness* and corporate innovation in Table 16.

Overall, the regression results of Table 16 suggest that the firms with more extraverted CEOs are more likely to be successful in corporate innovation investment. The findings support the importance of considering candidates' level of extraversion when hiring a CEO.

[Table 16 Here]

4.2.2.2 Corporate Innovation, Voluntary Disclosure, and CEO Personality Traits

In this subsection, I examine whether and how the association between commitment to forward-looking voluntary disclosure and corporate innovation success varies with CEOs' personality traits by using Model (4). Because I do not observe any association between *CEO_Emotion, CEO_Conscientious*, *CEO_Openness*, *CEO_Agreeableness* and corporate innovation, which rejecting my prediction on the role of CEOs personality traits (including openness to experience, conscientiousness, agreeableness, and neuroticism), I focus the role of CEO extraversion in the positive association between managers' commitment to forward-looking voluntary disclosure and corporate innovation outcomes in this subsection. Therefore, to test the moderator role of CEO personality traits in the association between commitment to forward-looking voluntary disclosure and corporate innovation success using the US Big5 sample, I develop Model (4s) by modifying Model (4) as follows:

$$\begin{aligned} LnPatent_{i,t+x}\left(LnCitation_{i,t+x}\right) = {} & \beta_0 + \beta_1 CEO\_Extraversion_{i,t} + \beta_2 CMF_{i,t} \\ & + \beta_3 CEO\_Extraversion_{i,t} \times CMF_{i,t} + OtherBig5Traits_{i,t} \\ & + CEOChar_{i,t} + All\ Controls + \ YearFE \\ & + IndustyFE + \ \varepsilon_{i,t} \qquad (4s) \end{aligned}$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. The variable of interest in this model is $Extraversion_{i,t} \times CMF_{i,t}$: a significantly positive (negative) coefficient (β_3) of $Extraversion_{i,t} \times CMF_{i,t}$ indicates a positive (negative) moderating role of CEO extraversion in the association between commitment to voluntary disclosure and corporate innovation.

The results are reported in Table 17. Consistent with the findings in Table 16, I observe that *CEO_Extraversion* has a significant positive relationship with corporate innovation success. Moreover, in most of the columns, the coefficients of the interaction term $Extraversion_{i,t} \times CMF_{i,t}$ are statistically significant and positive. This finding indicates that CEO extraversion plays a positive role in the association between commitment to forward-looking voluntary disclosure and corporate innovation success. This result supports my prediction that CEOs personality traits positively moderates the association between commitment to voluntary disclosure and corporate innovation.

There are two possible explanations for the above finding. First, more extraverted CEOs may be better able to attract social attention, which may enhance the signaling role of commitment to forward-looking voluntary disclosure in corporate innovation success. Second, people perceive extraversion as an important leadership quality (Mann 1959; Stogdill 1974; Bentz 1985). Firms with more extraverted CEOs tend to show superior performance and receive more investor recognition (Green et al. 2019). Therefore, more extraverted CEOs may be more confident in their level of future orientation and their ability to achieve innovation success, which could strengthen the signaling role of commitment to forward-looking voluntary disclosure in corporate innovation for such CEOs.

While the empirical evidence reported in the section 4.2.3.1 indicates that there is no association between the other four of the Big Five personality traits (neuroticism, conscientiousness, openness to experience, and agreeableness) and corporate innovation success, In the additional texts, I regress corporate innovation success on each of these four variables and its interaction with $MF_{i,t}$. Untabulated results indicate that the signaling role of commitment to forward-looking voluntary disclosure in corporate innovation success does not depend on the CEO's level of neuroticism, conscientiousness, openness to experience, or agreeableness.

[Table 17 Here]

4.2.2.3 A Discussion of The Role of CEO Personality Traits from the Investor's Perspective

In subsections 4.1.1.2.2 and 4.2.1.2.2, my empirical findings show that firms with more future-oriented CEO (i.e., more committed to forward-looking voluntary disclosure) are granted more patents and receive more citations per patent, and such positive association is more pronounced in firms with more extraverted CEOs. However, whether and how investors react to managers' commitments to forward-looking earnings forecasts are still not clear.

In this subsection, I conduct additional analyses to examine whether and how the stock market reaction to the issuance of management earnings forecasts varies with CEO extraversion. To do this, I use the following model:

$$Abs\_Mf\_CAR_{i,t} = \beta_0 + \beta_1 Extraversion_{i,t} + OtherBig5Traits_{i,t} + CEOChar_{i,t}$$
$$+All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \quad (8)$$

where *i* denotes the firm and *t* denotes the year. The dependent variable is the two-day (0, +1) unsigned returns surrounding the day of issuance of management earnings forecasts.

The results of this analysis are presented in Table 19. As shown in columns 1–3, the coefficients on *Extraversion* are positive and significant, suggesting that investors tend to react more strongly to earnings forecasts issued by firms with more extraverted CEOs. This evidence is consistent with Green et al. (2019), who find that more extraverted CEOs tend to attract more investor recognition than less extraverted CEOs. Additionally, I observe a significant and negative effect of *MfFrequency* on the market reaction. It is plausible, as it indicates the investors believe the earnings forecast issued by those managers who do not frequently issue an earnings forecast contains more credibility. Taken together, my finding could thus be explained by the greater public exposure that tends to be associated with more extraverted CEOs, which may increase investors' attention to their firms' information disclosure.

[Table 18 here]

4.3 Additional Analyses

In this section, I first check the robustness of my findings. I then discuss endogeneity concerns of this research. In subsections 4.3.3 and 4.3.4, I conduct cross-sectional analysis of CEO characteristics and firm characteristics. In subsection 4.3.5 / 4.3.6 /4.3.7, I examine whether and how R&D capital / firm performance / CEO compensation plays a role in the relationship between commitment to forward-looking voluntary disclosure and corporate innovation. In subsection 4.3.8, I discuss the relationship between commitments to forward-looking management earnings forecasts and corporate innovation by considering both the precision and the accuracy of management earnings forecasts.

4.3.1 Robustness Tests

In this subsection, I conduct various additional analyses to enhance the confidence in the robustness of my findings. In the analyses, for simplicity, I adopt the aggregated measure of earnings forecast properties, *CMF* to capture managers' commitments to forward-looking earnings forecast. However, untabulated results indicate that my inference is unchanged even when I repeat all of the robustness tests using *MfFrequency* and *MfItems* to replace *CMF* in the regressions.

4.3.1.1 Excluding US firms from the Global Sample

In the first robustness test, I remove all US firms from the global full sample to ensure that my results are not driven by these firms. The dependent variable in panel A is *LnPatent.* The dependent variable in Panel B is *LnCitation*. The results are reported in Table 19A. Using Model (2c), a positive relationship is found between *CMF* and corporate innovation in both panels, which indicates the robustness of the empirical results in subsections 4.1.1.2.2.3 and 4.2.1.2.2.3.

[Table 19A here]

4.3.1.2 Using the Propensity-score-matched Sample

In the second robustness test, I adopt the PSM approach developed by Rosenbaum and Rubin (1983), in which observations are matched based on the probability of treatment, which in my case is a manager's decision to issue a management earnings forecast. This approach helps to reduce the likelihood that the observed positive relationship between managers' commitments to forward-looking earnings forecasts and corporate innovation is driven by omitted variables.[32] As the PSM approach involves pairing a treatment firm (a firm issuing earnings forecasts) and a benchmark firm (a firm issuing no earnings forecasts) based on similar observable characteristics (Dehejia and Wahha, 2002), I first estimate the probability of a firm issue earnings forecasts using the following logit model:

$$\begin{aligned} D_{i,t} = {} & \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 MB_{i,t} + \beta_4 ROA_{i,t} + \beta_5 Accrual_{i,t} \\ & + \beta_6 Age_{i,t} + \beta_7 R\&D_{i,t} + \beta_8 CapExp_{i,t} + \beta_9 Cash_{i,t} + \beta_{10} Competition_{i,t} \\ & + \beta_{11} Institution_{i,t} + \beta_{12} Insider_{i,t} + \beta_{13} Analyst_{i,t} + YearFE \\ & + IndustyFE + CountryFE + \varepsilon_{i,t} \end{aligned} \tag{9}$$

where $D_{i,t}$ is an indicator variable that is equal to one if a firm issues a management earnings forecast in a given year, and is equal to zero otherwise. Then, using the probability of the firm issuing a management earnings forecast obtained from the model (9), I match each firm-year observation with a management earnings forecast with an observation without an earnings forecast using the nearest-neighbor matching technique (without replacement). Thus, I assume that the

[32] However, if unobservable factors are correlated with the firms' level of innovation outcome, the coefficient estimates may be biased (Li and Prabhala 2007).

difference in the level of firm innovation output between the treatment and benchmark groups is mainly attributable to managers' earnings forecast practices. I then repeat all of the analyses using the PSM sample. The results are reported in Table 19B. A positive relationship is observed between managers' commitments to forward-looking earnings forecasts and corporate innovation.

[Table 19B here]

4.3.1.3 Controlling for CEO Gender and Age

Studies document the important role of CEOs' personal characteristics in corporate innovation (e.g., Malmendier and Tate 2005a, 2005b; Galasso and Simcoe 2011; Hirshleifer et al. 2012; He and Tian 2013). CEOs' personal characteristics, such CEO's age and gender is demonstrated to be associated with corporate innovation (e.g., Cho et al. 2016; Gao and Zhang 2017; Green et al. 2019). In the third robustness test, to see whether my main results are driven by omitting important factors. I include the age and gender of CEOs into Model (2c). Specifically, CEO age (*CEO_age*) is measured as the natural logarithm of the age of the CEO; CEO gender (*CEO_Male*) is measured by an indicator that is equal to one if the CEO is male and equal to zero otherwise. The coefficients of *CMF* remain statistically unchanged in most of the columns in Panel A and Panel B of Table 19C, which indicates the robustness of the empirical results in subsections 4.1.1.2.2.3 and 4.2.1.2.2.3.

[Table 19C here]

4.3.1.4 Using an Alternative Measure of Corporate Innovation Success

As patent applications generally take years to process, the number of patents is likely to be underreported in the later years of the sample period relative to the early years (He and Tian 2013;

Fang et al. 2014; Zhong 2018). To mitigate such underreporting, following prior studies (e.g., Hall et al. 2001; Fang et al. 2014), I compute the application–grant lag distribution function (W_s) for patents filed between 2004 and 2010; this function is measured as the percentage of patents filed in a given year that are granted within *s* years. I next estimate the truncation-adjusted number of patents granted by computing the adjusted number of patents granted $P_{adj} = \frac{P_{raw}}{\sum_{s=0}^{2016-t} W_s}$, where P_{raw} is the raw number of patent applications filed in year t and 2010 = < t < = 2016. Using same approach, I compute the truncation-adjusted number of citations-per-patent received.

Then, I repeat my analyses using the truncation-adjusted number of patents granted and the truncation-adjusted number of citations-per-patent received instead of the actual number of patents granted and the actual number of citations-per-patent received by using Model (2c). The results are reported in Table 20C. The dependent variable in Panel A and Panel C are *LnAdjPatent*. The dependent variable in Panel B and Panel D are *LnAdjCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. I find a positive relationship between management earnings forecasts and corporate innovation (as measured by the adjusted number of patents granted and the adjusted number of citations-per-patent received).

[Table 19D Here]

4.3.2 Discussion on the Endogeneity Concern

While the baseline results support my hypothesis that firms that issue forward-looking voluntary disclosures tend to be more successful in corporate innovation, the endogeneity problem of commitment to voluntary disclosure is a potential concern. Therefore, there may be reverse causality between commitment to voluntary disclosure and corporate innovation success. On the one hand, the better a firm's voluntary disclosure, the more confidence the firm has in its level of future orientation and its ability to achieve innovation success, which indicates a signaling role of commitment to forward-looking voluntary disclosure in future corporate innovation success. On the other hand, successful innovation output may lead to more frequent disclosure if information asymmetry between a firm and investors increases investors' demand for information about the firm (Huang et al. 2021).

To alleviate the above concern, in all of the regression models, I advance the dependent variables $(LnPatent_{i,t+x}(LnCitation_{i,t+x})$ by between one and three years (i.e., x = 1–3) because the innovation process generally takes longer than one year. This allows me to explore the time taken to observe the predicted role of commitment to management earnings forecasts in a firm's future innovation success.

More importantly, in this research, CEOs' commitment to forward-looking voluntary disclosure is an empirical proxy for CEO's level of future orientation. Future orientation is the ability to anticipate, plan for, and manage future uncertainties (Seijts 1998). It is a personal characteristic / trait of an individual. That is, this research is not studying the association between two CEOs behaviors (voluntary disclosure and corporate innovation) but investigating whether and how CEO's characteristics / traits (CEO's level of future orientation) influence corporate innovative activities, or whether and how the corporate innovation success is predictable by observing CEO's characteristics / trait (CEO's level of future orientation). The former refers to CEOs' choices and decision outcomes, there may be reverse causality between voluntary disclosure and corporate innovation success. However, the latter emphasizes the nature of CEO's personal characteristics /

trait (more futured-oriented vs. less futured-oriented), which supports the perspective that corporate strategic choices and decision outcomes can be predicted based on the characteristics and idiosyncrasies of individual managers (Hambrick and Mason 1984). In this case, while my analysis cannot distinguish between CEOs' choice to convey their level of future orientation (an active signal) and the implications of CEOs' level of future orientation for corporate innovation outcomes (a passive signal), the direction of the causality in Hypotheses 1 and 2 can only go from CEO's level of future orientation to firm's future innovation success.

4.3.3 Cross-sectional Variation in CEO Characteristics

Studies recognize the important roles that CEOs' personal traits and skill sets play in corporate innovation outcomes (e.g., Galasso and Simcoe 2011; Hirshleifer et al. 2012; Faleye et al. 2014; Sunder et al. 2017). For example, CEOs with more advanced managerial skills accumulated over their working lives are more likely to succeed in corporate innovation (Custodio et al. 2017). Following this line of the literature, I conduct cross-sectional analysis to examine whether the role of commitment to forward-looking voluntary disclosure practices in signaling firms' innovation success varies with CEOs' work experience.

I conjecture that the managers who have accumulated more advanced managerial skills over the course of their careers are likely to deliver a stronger signal of their propensity for successful innovation via commitment to forward-looking voluntary disclosure practices. This conjecture is consistent with the argument that a firm's reputation for good voluntary disclosure is normally built over an extended period of time (Hirst et al. 2008). I suggest that voluntary disclosure by CEOs with greater managerial ability is likely to be perceived as more credible. I use their work experience as an empirical proxy for CEOs' managerial ability. I measure work experience by the total number of words in a CEO's biographical entry in the CIQ database.

In addition to work experience, I argue that educational background is another, easily observable signal of CEOs' ability. To the extent that management earnings forecasts issued by CEOs with a stronger educational background are perceived by capital-market participants as more credible, such voluntary disclosure is likely to have a stronger relationship with firms' innovation success. I measure a CEO's educational background by the total number of university or college degrees they hold, as obtained from the CIQ database.[33]

The models I use in this subsection are as follows:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 WorkExp_{i,t} + \beta_2 CMF_{i,t} + \beta_3 WorkExp_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (10a)$$

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 EduBack_{i,t} + \beta_2 CMF_{i,t} + \beta_3 EduBack_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (10b)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. *WorkEXP* is the number of words of the CEO biographical information for a given CEO. *EduBack* is the number of university or college degrees holding by a given CEO.

[33] I test the validity of using the number of words in a CEO's biographical description and the number of degrees held by the CEO as proxies for the CEO's level of work experience and educational background, respectively, using the General Ability Index (GAI) created by Custódio et al. (2013). Custódio et al. (2013) measure the general managerial skills of a CEO based on five aspects of the CEO's professional career, namely the number of (1) positions, (2) firms, and (3) industries in which the CEO has worked, (4) whether the CEO has ever been the CEO of a different company, and (5) whether the CEO has ever worked for a conglomerate. The significant positive correlation between the GAI and both the number of words in a CEO's biographical entry and the number of college degrees they hold supports the validity of these proxies (the Pearson correlation coefficients between each of these two factors and the GAI are 0.13 [p < 0.01] and 0.40 [p < 0.01], respectively). I further confirm the validity of these two CEO ability measures by observing significant positive correlations with the managerial ability data from Sarah McVay's website (http://faculty.washington.edu/smcvay/abilitydata.html).

The results are presented in Table 20A and Table 20B, respectively. The findings in both tables suggest that the positive signaling role of CEO's future orientation in firm's innovation success (as measured by the number of patents granted and the number of citations per patent) is greater when the forecasting CEO have more work experience (Table 20A) or greater educational background (Table 20B).

[Table 20A Here]

[Table 20B Here]

4.3.4 Cross-sectional Variation of Firm Characteristics

In this subsection, I examine whether and how the positive influence of commitment to better earnings forecast practices on firm innovation outcomes varies with firm characteristics. Prior studies show that the perceived credibility of voluntary disclosure increases with the firm's level of commitment to financial statement verification (Ball et al. 2012; Liu et al. 2018). Therefore, I use a firm's choice of Big Four auditor as a proxy for its commitment to financial reporting quality. I measure this choice using the indicator variable *Big4*, which is equal to one if a firm's auditor is from a Big Four auditing firm and equal to zero otherwise. Moreover, studies show a positive association between a firm's institutional ownership and its voluntary disclosure, which is presumably due to the greater corporate monitoring role of institutional investors (e.g., Ajinkya 2005). I investigate the role of the presence of a Big Four auditor (a firm's level of institutional ownership) in the relationship between voluntary disclosure and corporate innovation.

The models I use in this subsection is as following:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Big4_{i,t} + \beta_2 CMF_{i,t} + \beta_3 Big4_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (11a)$$

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Institution_{i,t} + \beta_2 CMF_{i,t} + \beta_3 Institution_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (11b)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. *Big4* is an indicator variable that equals to one if a firm's auditor is a Big Four auditor, and zero otherwise. *Institution* is the percentage of a firm's shares held by institutional investors at the end of each year.

The results are shown in Table 21A and Table 21B, respectively. My analysis consistently shows that the positive role of CEO's level of future orientation in signaling firms' innovation success is more pronounced when a firm hires a Big Four auditor or backups with higher level of institutional ownership. This is in line with the previous finding that auditor choice and institutional ownership influence perceived credibility (e.g., Ajinkya 2005).

[Table 21A Here]

[Table 21B Here]

4.3.5 Corporate Innovation, Voluntary Disclosure, and R&D Capital

In this subsection, I investigate the role of R&D capital in the relationship between commitment to forward-looking voluntary disclosure and corporate innovation. If commitment to forward-looking voluntary disclosure signals CEO' ability (CEO's level of future orientation) to achieve innovation success, this signaling may be stronger when a firm has more R&D capital. Thus, I conduct additional cross-sectional analysis by interacting *CMF* with firms' R&D capital measured over a five-year rolling window. Specifically, I use the following model:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 R\&D_{i,t} + \beta_2 CMF_{i,t} + \beta_3 R\&D_{i,t} \times CMF_{i,t}$$
$$+All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (12)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. *R&D* is calculated as the research and development expenditure scaled by total assets. The results are shown in Table 22. After regression, I find the positive signaling role of managers' commitments to forward-looking earnings forecast to in firm's future innovation success tends to be stronger when firms have more R&D capital.

[Table 22 Here]

4.3.6 Corporate Innovation, Voluntary Disclosure, and Firm Performance

In this subsection, I study whether the positive signaling role of CEO's future-orientation in firms' future innovation success varies with firm performance. Future orientation is the ability to anticipate, plan for, and manage future uncertainties (Seijts 1998), firms with more future-oriented CEO perform better than those firms with less future-oriented CEO (Trueman 1986). Studies show that CEOs' future orientation is crucial to the success of corporate innovation (Tansuhaj et al. 1991; Kitchell 1995; Yadav et al. 2007; Rohrbeck and Kum 2018). I predict that better firm performance strengthens the positive signaling role of CEO's future orientation in firm's future innovation success. To examine my prediction, I first develop the following model:

$$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Loss_{i,t} + \beta_2 CMF_{i,t} + \beta_3 Loss_{i,t} \times CMF_{i,t}$$
$$+All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t} \qquad (13)$$

where *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. *Loss* is a proxy for firm performance, it equals to one if a firm experiences loss in the given year, zero otherwise.

The regression results are presented in Table 23. The coefficients β_3 of the interest variable $Loss_{i,t} \times CMF_{i,t}$ in column 1-3 of both panels are significantly negative. The finding supports my prediction that more future-oriented CEOs in the firms with better financial performance tend to signal their ability in firm's future innovation success.

[Table 23 Here]

4.3.7 The Role of CEO Compensation in the Relationship between Corporate Innovation and Voluntary Disclosure

Several studies investigate the role of CEO compensation in corporate innovation (e.g., Manso 2011; Ederer and Manso 2013; Baranchuk et al. 2014; Gonzalez-Uribe and Xu 2015; He and Tian 2018). Relative to CEOs who receive standard pay-for-performance compensation, CEOs who receive incentive plans that reward long-run successes are more likely to engage in innovation and have better performance in innovation investment (Ederer and Manso 2013). Therefore, in this subsection, I explore the role of CEO compensation in the relationship between commitment to forward-looking voluntary disclosure and corporate innovation. I conduct cross-sectional analysis by interacting *CMF* with CEO compensation measured by pay premiums in a given year. I find that the relationship between commitment to forward-looking voluntary disclosure and corporate innovation does not vary with the levels of CEO compensation.

4.3.8 The Role of the Precision and Accuracy of Management Earnings Forecasts in Corporate Innovation

In their examination of CEO ability and management earnings forecasts, in addition to the likelihood and frequency of management earnings forecasts, Baik et al. (2011) consider the accuracy of management earnings forecasts (an *ex-post* measure of earnings forecast quality). However, because I argue that *ex-ante* commitment to forward-looking voluntary disclosure signals managers' future orientation and the likelihood of innovation success, I rely on variables measuring the *ex-ante* level of earnings forecast quality.[34]

In this subsection, I examine the relationship between management earnings forecasts and corporate innovation by considering both the precision and the accuracy of earnings forecasts; however, earnings forecast accuracy data are available for only a very small subsample of firms issuing either point or range forecasts. I assign precision scores of 1, 2, 3, and 4 to qualitative, open-ended (where only the minimum or maximum earnings are provided), range (where both the minimum and maximum earnings are provided), and point forecasts, respectively. A higher score indicates a more precise management earnings forecast. I take the mean earnings forecast precision score during the year as the precision score for that year. Earnings forecast accuracy is the absolute value of the difference between the forecasted and actual earnings, scaled by the absolute value of the actual earnings (in percentage form). As calculating this variable requires earnings information, it is limited to point and range forecasts only. When a range forecast is provided, I use the midpoint value of the range as the forecasted earnings. After controlling for firms' earnings forecast frequency and disaggregation, neither management earnings forecast precision nor accuracy is found to have a significant relationship with corporate innovation.

[34] In line with the results of this research, prior studies suggest that managers who provide earnings forecasts may engage in earnings management or other suboptimal behavior to meet their own forecasts (Kasznik 1999; Fuller and Jensen 2002; Hirst et al. 2008; Krishnan et al. 2012). Concerns about earnings management in the period following the issuance of earnings forecasts is more pronounced for non-US firms because of the difference in country-level institutional development (e.g., Leuz et al. 2003).

CHAPTER FIVE:

CONCLUSION

In recent decades, corporate innovation investment has become increasingly important for firms due to accelerating technological development (Tsang et al. 2019). Because of the weak link between innovation investment and innovation success, coupled with the fact that innovation success is central to the survival and success of firms (Porter 1992; Hall et al. 2005; Hsu et al. 2014), examining the determinants of corporate innovation is important.

As the top manager in a firm, a CEO has a substantial influence on the direction, focus, and progress of the firm's innovation investment (He and Tian 2018). Trueman (1986) argues that managers can signal their ability to manage future-oriented activities by committing to the issuance of earnings forecasts. Thus, following the view that committing to forward-looking voluntary disclosure (i.e., more frequent and more disaggregated forecasts) signals managers' ability to manage their firms' innovation investment, I examine the relationship between commitment to forward-looking voluntary disclosure and firm's future innovation success in this research.

I find that firms that commit more to forward-looking management earnings forecast practices (i.e., issuing more frequent and more disaggregated earnings forecasts) have greater innovation success (as measured by the number of patents granted and the number of citations per patent). Additional analysis also indicates that firms that commit more to forward-looking management earnings forecasts tend to spend more on innovation (as measured by R&D capital). While this evidence supports the crucial role of committing to management earnings forecast in signaling the success of corporate innovation, I find no evidence of a positive relationship between the likelihood of issuing management earnings forecasts *per se* and corporate innovation. This finding is consistent with the view that management earnings forecasts can be self-serving and opportunistic and can lack credibility.

The results of cross-sectional analyses further indicate that the relationship between management earnings forecasts and corporate innovation tends to vary with CEO characteristics, firm characteristics, and country-level characteristics. The results show that CEOs' work experience and educational background, firms' choices of auditors and level of institutional investment, and the country-level stringency of shareholder protection and the rule of law strengthen the positive relationship between voluntary disclosure and corporate innovation. The results also indicate that firms with more R&D capital or with better finance performance are likely to exhibit a more positive association between voluntary disclosure and corporate innovation. All of the findings are robust for firms in both global sample and US sample.

Additionally, I examine the role of CEOs' personality traits in corporate innovation and in the association between commitment to voluntary disclosure and corporate innovation success. The results indicate that firms with more extraverted CEOs tend to be more successful in innovation investment and that the signaling role of commitment to forward-looking voluntary disclosure in corporate innovation success is more pronounced for such firms. Furthermore, the market reaction to management forecasts is found to be positively associated with CEO extraversion; this suggests that more extraverted CEOs attract more investor attention when they make voluntary disclosures, which supports the conjecture that more extraverted CEOs receive a high level of investor recognition (Green et al. 2019).

Nevertheless, this research has limitations. First, I do not require that CEOs in my sample that actively convey their level of future orientation when they commit to management earnings forecasts; I assume merely that CEOs' commitment to management earnings forecasts "signals" information about their level of future orientation. This definition of signaling is consistent with the literature. For example, Lys et al. (2015) posit that a firm may undertake a corporate social responsibility activity when it expects strong future financial performance (i.e., the firm "signals" its future prospects by undertaking CSR initiatives). My empirical analysis cannot distinguish between CEOs' choice to convey their level of future orientation (an active signal) and the implications of CEOs' level of future orientation for corporate innovation outcomes (a passive signal). Second, the international management earnings forecasts that are used in this research are only available from 2004 onward. Additionally, I estimate the truncation-adjusted number of patents granted by computing the adjusted number of patents granted $P_{adj} = \frac{P_{raw}}{\sum_{s=0}^{2016-t} W_s}$, where P_{raw} is the raw number of patent applications filed in year t and 2010 = < t < = 2016. Therefore, while my final sample period is from year 2004 to 2016, my empirical results for regression are actually based on a sample of data that spans the period of 2004 to 2010, which limits my ability to investigate the effects of voluntary disclosure on corporate innovation in longer sample period. Third, the moderating effect of CEO extraversion on the association between commitment to management earnings forecasts and corporate innovation outcomes may not be fully generalizable, as data on CEO extraversion for non-US firms are not available. Last, I assume that managers credibly issue earnings forecast to the investors. Therefore, I use forecast frequency and forecast disaggregation to measure managers' commitments to management earnings forecasts. Because of the unavailability of the data on forecast revision, one limitation of this research is that I cannot find any evidence on the role of forecast revision. It is possible that the high frequency of earnings forecasts is due to managers' revision to their previous forecasts, rather than commit to management earnings forecast.

Taken together, the findings in this research support the conjecture that commitment to forward-looking voluntary disclosure practices signals the level of CEOs' future orientation. Given the considerable uncertainty associated with firms' future-oriented capital investment, such as innovation investment, the findings may help investors evaluate firms' future prospects While investors cannot directly observe a manager's ability to innovate or the likelihood of a firm's innovation success, my results indicate that investors can infer such information based on the provision and properties of firms' forward-looking voluntary disclosure. Furthermore, the results indicate the importance of considering candidates' level of extraversion when hiring a CEO. Finally, I believe that the findings could help global regulators design rules to enhance the credibility of forward-looking voluntary corporate disclosure.

Table 1A – Sample Distribution – Global Sample

Panel A - Sample distribution by country

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					Full Sample ***(N=151,456)***			**Patent Sample** ***(N=18,300)***	**Citation Sample** ***(N=7,620)***	**MF Sample** ***(N=29,537)***	
	Country	**N**	***Patent (raw)***	***Citation(raw)***	***Issuance***	***Frequency***	***Items***	***Patent(raw)***	***Citation(raw)***	***Frequency***	***Items***
1	Australia	8,632	0.157	0.030	0.209	0.420	0.207	5.700	4.414	2.010	0.924
2	Austria	489	1.008	0.102	0.474	1.037	0.395	5.245	2.273	2.185	0.802
3	Belgium	848	1.744	0.177	0.250	0.500	0.166	14.221	5.172	2.000	0.644
4	Canada	15,415	0.139	0.064	0.076	0.159	0.046	5.016	5.308	2.081	0.544
5	Denmark	989	2.275	0.130	0.526	1.481	0.578	18.443	4.300	2.817	1.078
6	Finland	794	2.994	0.239	0.674	1.683	0.705	11.652	4.524	2.497	1.038
7	France	4,334	1.880	0.105	0.257	0.558	0.173	12.995	4.204	2.173	0.656
8	Germany	5,321	1.747	0.184	0.341	0.843	0.327	13.629	3.791	2.476	0.945
9	Greece	1,264	0.021	0.003	0.098	0.135	0.113	2.167	1.333	1.379	1.131
10	Hong Kong	8,293	0.530	0.023	0.118	0.157	0.094	17.023	2.395	1.332	0.645
11	Indonesia	1,873	0.001	0.000	0.167	0.262	0.145	1.000	0.000	1.565	0.825
13	Israel	1,649	0.223	0.093	0.035	0.071	0.073	5.111	5.276	2.017	1.071
14	Italy	1,665	1.013	0.123	0.277	0.479	0.232	8.607	3.942	1.727	0.784
15	Malaysia	5,452	0.018	0.001	0.123	0.158	0.073	4.950	8.000	1.287	0.522
16	Netherlands	761	2.268	0.088	0.386	0.812	0.307	26.554	5.583	2.102	0.781
17	New Zealand	675	0.132	0.040	0.359	0.687	0.334	3.296	3.857	1.917	0.872
18	Norway	1,482	0.497	0.114	0.127	0.200	0.009	6.700	4.971	1.580	0.047
19	Philippines	1,212	0.005	0.000	0.163	0.286	0.118	3.000	0.000	1.761	0.688
20	Singapore	4,280	0.204	0.039	0.103	0.138	0.075	12.853	4.829	1.333	0.641
21	South Africa	1,600	0.066	0.017	0.188	0.256	0.151	2.865	4.500	1.363	0.749
22	South Korea	9,330	4.402	0.317	0.033	0.053	0.034	10.902	2.311	1.636	0.990
23	Sweden	2,714	1.130	0.114	0.101	0.168	0.061	12.079	4.612	1.668	0.559
24	Switzerland	1,629	1.164	0.144	0.312	0.566	0.299	12.474	4.896	1.815	0.920
25	Taiwan	10,052	5.719	0.328	0.028	0.055	0.025	13.363	3.113	1.958	0.833
26	Thailand	3,095	0.013	0.006	0.239	0.438	0.267	3.417	2.111	1.835	1.057
27	UK	9,694	0.178	0.051	0.183	0.285	0.116	6.338	4.721	1.556	0.591
28	USA	47,914	1.987	0.451	0.292	0.913	0.335	15.415	5.841	3.130	1.117
	Overall	***151,456***	***1.572***	***0.219***	***0.195***	***0.485***	***0.191***	***13.012***	***4.564***	***2.488***	***0.938***

Panel B - Sample distribution by year

	(1) Year	(2) N	(3) *Patent(raw)*	(4) *Citation(raw)*	(5) *Issuance*	(6) *Frequency*	(7) *Items*	(8) *Patent(raw)*	(9) *Citation(raw)*	(10) *Frequency*	(11) *Items*
1	2004	17,927	1.539	0.307	0.175	0.439	0.210	13.268	5.886	2.507	1.199
2	2005	19,865	1.532	0.278	0.163	0.398	0.175	12.558	5.193	2.446	1.075
3	2006	21,404	1.606	0.280	0.171	0.420	0.181	12.714	4.833	2.451	1.054
4	2007	22,484	1.587	0.227	0.175	0.433	0.160	13.037	4.539	2.466	0.911
5	2008	23,402	1.572	0.188	0.185	0.474	0.193	13.036	4.135	2.558	1.043
6	2009	23,700	1.539	0.152	0.212	0.516	0.198	12.881	3.710	2.440	0.933
7	2010	22,674	1.623	0.134	0.273	0.691	0.222	13.608	3.495	2.527	0.612
	Overall	***151,456***	***1.572***	***0.219***	***0.195***	***0.485***	***0.191***	***13.012***	***4.564***	***2.488***	***0.938***

Panel C - Sample distribution by industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Full Sample ***(N=151,456)***				**Patent Sample** ***(N=18,300)***	**Citation Sample** ***(N=7,620)***	**MF Sample** ***(N=29,537)***	
	Industry	**N**	***Patent(raw)***	***Citation(raw)***	***Issuance***	***Frequency***	***Items***	***Patent(raw)***	***Citation(raw)***	***Frequency***	***Items***
1	Mining/Construction	16,073	0.150	0.024	0.085	0.175	0.074	8.959	3.411	2.069	0.762
2	Food	4,321	0.966	0.087	0.218	0.511	0.212	10.414	3.310	2.344	0.934
3	Textiles/Print/Publish	7,005	0.801	0.107	0.209	0.510	0.217	9.256	3.984	2.439	1.000
4	Chemicals	3,914	3.928	0.226	0.225	0.567	0.233	17.312	3.695	2.515	0.997
5	Pharmaceuticals	6,723	3.115	0.382	0.177	0.451	0.181	11.133	4.659	2.552	0.975
6	Extractive	7,045	0.461	0.084	0.151	0.316	0.075	13.868	5.500	2.093	0.445
7	Manf: Rubber/Glass/Etc.	3,803	1.443	0.236	0.199	0.446	0.196	8.084	3.473	2.245	0.947
8	Manf: Metal	4,774	1.566	0.233	0.186	0.427	0.169	9.193	3.766	2.290	0.866
9	Manf: Machinery	4,705	4.304	0.542	0.244	0.630	0.272	13.227	4.218	2.579	1.078
10	Manf: Electrical Equipment	5,794	3.527	0.465	0.213	0.546	0.215	12.056	4.391	2.561	0.980
11	Manf: Transport Equipment	2,912	4.950	0.440	0.273	0.736	0.261	19.801	4.238	2.699	0.948
12	Manf: Instruments	4,585	3.984	0.904	0.304	0.861	0.360	11.613	5.306	2.835	1.160
13	Manf: Misc.	1,117	2.309	0.484	0.230	0.578	0.247	12.165	5.945	2.514	1.033
14	Computers	19,408	4.244	0.536	0.234	0.640	0.248	16.112	4.749	2.733	1.026
15	Transportation	7,202	0.766	0.119	0.301	0.731	0.246	13.937	4.983	2.426	0.789
16	Utilities	2,565	0.483	0.130	0.359	1.022	0.328	7.792	4.562	2.846	0.884
17	Retail: Wholesale	4,939	0.137	0.083	0.200	0.474	0.212	3.705	4.618	2.365	1.002
18	Retail: Misc.	4,047	0.157	0.100	0.361	1.044	0.397	4.424	5.459	2.895	1.078
19	Retail: Restaurant	890	0.043	0.043	0.360	1.129	0.418	2.375	4.222	3.141	1.149
20	Financial	13,142	0.097	0.047	0.141	0.293	0.130	6.370	4.968	2.087	0.868
21	Insurance/Real Estate	13,734	0.052	0.016	0.076	0.149	0.056	11.629	5.769	1.965	0.629
22	Services	10,357	0.250	0.085	0.244	0.610	0.255	5.998	4.580	2.499	1.009
23	Others	2,401	0.999	0.077	0.142	0.302	0.137	27.884	4.895	2.132	0.899
	Overall	***151,456***	***1.572***	***0.219***	***0.195***	***0.485***	***0.191***	***13.012***	***4.564***	***2.488***	***0.938***

Note: Panel A, B, and C of Table 1 present the sample distributions in global sample by country, year, and industry, respectively. The industry definition of Panel C is based on the industry classification defined by Barth et al. (1998).

Table 1B. Sample Distribution – US Sample

Panel A - Sample distribution by year

	(1) Year	(2) N	(3) *Patent(raw)*	(4) *Citation(raw)*	(5) *Issuance*	(6) *Frequency*	(7) *Items*	(8) *Patent(raw)*	(9) *Citation(raw)*	(10) *Frequency*	(11) *Items*
1	2004	6,092	2.747	13.126	0.268	0.819	0.352	17.488	120.795	3.053	1.311
2	2005	6,459	2.659	11.499	0.257	0.791	0.316	17.455	115.326	3.081	1.229
3	2006	6,875	2.700	9.762	0.260	0.810	0.309	17.580	95.879	3.117	1.188
4	2007	7,086	2.659	9.535	0.269	0.839	0.318	18.381	110.225	3.119	1.182
5	2008	7,339	2.512	7.180	0.270	0.890	0.334	17.642	88.266	3.294	1.235
6	2009	7,191	2.489	6.366	0.333	1.011	0.359	17.706	83.993	3.037	1.079
7	2010	6,872	2.760	5.489	0.381	1.214	0.395	17.614	72.120	3.189	0.876
	Overall	***47,914***	***2.643***	***8.872***	***0.292***	***0.913***	***0.340***	***17.697***	***99.232***	***3.130***	***1.136***

Panel B - Sample distribution by industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Full Sample (N=47,914)				Patent Sample (N=7,155)	Citation Sample (N=4,284)	MF Sample (N=13,981)	
	Industry	**N**	***Patent(raw)***	***Citation(raw)***	***Issuance***	***Frequency***	***Items***	***Patent(raw)***	***Citation(raw)***	***Frequency***	***Items***
1	Mining/Construction	1,739	0.133	0.585	0.192	0.563	0.196	5.156	33.933	2.931	0.955
2	Food	786	1.812	3.347	0.384	1.340	0.459	13.825	65.775	3.487	1.159
3	Textiles/Print/Publish	1,260	3.048	5.268	0.489	1.617	0.637	16.207	65.723	3.308	1.282
4	Chemicals	1,131	6.084	10.755	0.356	1.106	0.428	25.675	112.630	3.104	1.182
5	Pharmaceuticals	3,164	6.460	10.761	0.219	0.604	0.235	16.920	78.449	2.758	1.040
6	Extractive	2,213	0.776	2.217	0.205	0.473	0.106	18.462	81.767	2.306	0.477
7	Manf: Rubber/Glass/Etc.	561	4.893	6.629	0.396	1.339	0.538	17.825	47.679	3.383	1.320
8	Manf: Metal	824	2.143	8.575	0.408	1.252	0.446	9.103	55.203	3.071	1.064
9	Manf: Machinery	1,172	7.413	27.306	0.430	1.376	0.539	22.277	126.494	3.200	1.243
10	Manf: Electrical Equipment	1,821	5.000	17.365	0.366	1.114	0.432	15.591	86.399	3.040	1.153
11	Manf: Transport Equipment	837	8.274	26.244	0.381	1.305	0.476	31.335	145.470	3.423	1.249
12	Manf: Instruments	2,187	6.458	29.363	0.410	1.352	0.563	13.942	100.025	3.299	1.368
13	Manf: Misc.	388	5.410	28.951	0.376	1.149	0.460	17.788	140.413	3.055	1.222
14	Computers	5,963	6.585	27.314	0.421	1.401	0.549	23.886	134.720	3.331	1.280
15	Transportation	2,356	0.707	3.160	0.355	1.011	0.271	9.680	60.032	2.846	0.739
16	Utilities	1,040	0.205	0.634	0.558	1.898	0.523	3.610	16.897	3.403	0.927
17	Retail: Wholesale	1,324	0.193	1.103	0.347	1.106	0.425	3.592	30.438	3.190	1.182
18	Retail: Misc.	1,522	0.296	2.061	0.560	2.020	0.724	4.639	44.814	3.605	1.279
19	Retail: Restaurant	453	0.053	0.779	0.477	1.795	0.638	2.400	44.125	3.764	1.333
20	Financial	8,102	0.152	0.595	0.120	0.277	0.123	8.092	43.071	2.318	0.962
21	Insurance/Real Estate	4,653	0.188	0.757	0.061	0.178	0.050	19.043	100.600	2.929	0.663
22	Services	3,594	0.525	1.307	0.356	1.145	0.466	7.770	31.730	3.221	1.289
23	Others	824	0.934	3.530	0.126	0.377	0.141	23.333	145.450	2.990	1.017
	Overall	***47,914***	***2.643***	***8.872***	***0.292***	***0.913***	***0.340***	***17.697***	***99.232***	***3.130***	***1.136***

Note: Panel A, B, and C of Table 1 present the sample distributions in US sample by year, and industry, respectively. The industry definition of Panel C is based on the industry classification defined by Barth et al. (1998).

Table 2 – Summary Statistics

Panel A – Global Sample

(1) Variable	(2) N	(3) Mean	(4) Std. Dev.	(5) 25%	(6) 50%	(7) 75%
Dependent Variables						
Patent (raw)	151,456	1.572	7.823	0.000	0.000	0.000
LnPatent	151,456	0.219	1.236	0.000	0.000	0.000
Patent (raw)	18,300	13.012	18.911	1.000	4.000	14.000
LnPatent	18,300	1.927	1.137	1.099	1.609	2.708
Citation (raw)	151,456	0.233	0.742	0.000	0.000	0.000
LnCitation	151,456	0.072	0.353	0.000	0.000	0.000
Citation (raw)	7,260	4.564	3.469	1.000	3.000	8.000
LnCitation	7,260	1.511	0.651	0.693	1.386	2.197
Independent Variables						
MfIssuance	151,456	0.195	0.396	0.000	0.000	0.000
MfFrequency	151,456	0.485	1.178	0.000	0.000	0.000
MfItems	151,456	0.191	0.536	0.000	0.000	0.000
Control Variables						
Size	151,456	4.676	2.443	2.987	4.583	6.279
Leverage	151,456	0.698	1.303	0.262	0.491	0.712
MB	151,456	0.020	0.064	0.005	0.011	0.022
ROA	151,456	-0.070	0.350	-0.05	0.013	0.065
Accrual	151,456	-0.027	0.331	-0.003	-0.007	0.001
Age	151,456	2.535	1.490	1.609	2.833	3.584
R&D	151,456	0.071	0.415	0.000	0.000	0.000
CapExp	151,456	0.055	0.092	0.004	0.022	0.063
Cash	151,456	0.154	0.200	0.026	0.078	0.194
Competition	151,456	0.190	0.279	0.000	0.051	0.263
Institution	151,456	0.036	0.101	0.000	0.000	0.008
Insider	151,456	-0.144	0.160	-0.185	-0.082	-0.042
Analyst	151,456	0.164	0.611	0.000	0.000	0.000
CEO-level Variables						
WorkExp	151,456	3.488	2.232	0.000	4.522	5.193
EduBack	151,456	0.531	0.833	0.000	0.000	1.000
Country-level Variables						
ShareProtect	27	5.324	0.489	5.013	5.417	5.708
RegQuality	27	1.224	0.603	1.090	1.370	1.670
RuelLaw	27	73.570	18.550	61.500	81.000	89.000

Panel B – US Sample						
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variable	**N**	**Mean**	**Std. Dev.**	**25%**	**50%**	**75%**
Dependent Variables						
Patent (raw)	47,914	2.643	12.73	0.000	0.000	0.000
LnPatent	47,914	0.307	0.879	0.000	0.000	0.000
Patent (raw)	7,155	17.697	28.614	2.000	5.000	18.000
LnPatent	7,155	2.056	1.255	1.099	1.792	2.944
Citation (raw)	47,914	8.872	51.73	0.000	0.000	0.000
LnCitation	47,914	0.307	1.095	0.000	0.000	0.000
Citation (raw)	4,284	99.232	144.816	7.000	24.000	118.500
LnCitation	4,284	3.433	1.638	2.079	3.219	4.783
Independent Variables						
MfIssuance	47,914	0.292	0.455	0.000	0.000	1.000
MfFrequency	47,914	0.913	1.628	0.000	0.000	1.000
MfItems	47,914	0.340	0.708	0.000	0.000	0.000
CEO_Extraversion	4,875	4.218	0.368	3.980	4.207	4.454
CEO_Agreeableness	4,875	3.665	0.129	3.587	3.667	3.752
CEO_Emotion	4,875	3.240	0.180	3.112	3.236	3.370
CEO_Conscientious	4,875	3.691	0.208	3.559	3.688	3.821
CEO_Openness	4,875	3.734	0.120	3.661	3.737	3.808
Control Variables						
Size	47,914	4.858	2.774	2.636	5.128	6.880
Leverage	47,914	1.424	4.233	0.318	0.597	0.903
MB	47,914	0.022	0.159	0.002	0.013	0.026
ROA	47,914	-0.154	0.568	-0.075	0.004	0.050
Accrual	47,914	-0.190	1.254	-0.066	-0.001	0.014
Age	47,914	2.744	1.375	2.079	2.890	3.689
R&D	47,914	0.274	1.610	0.000	0.000	1.000
CapExp	47,914	0.045	0.085	0.001	0.014	0.047
Cash	47,914	0.155	0.216	0.019	0.066	0.193
Competition	47,914	-0.063	0.080	-0.073	-0.038	-0.019
Institution	47,914	0.312	0.373	0.000	0.104	0.641
Insider	47,914	0.036	0.099	0.000	0.004	0.011
Analyst	47,914	0.848	1.105	0.000	0.000	1.791
CEO-level Variables						
WorkExp	47,914	4.566	1.579	4.431	5.017	5.455
EduBack	47,914	0.872	0.947	0.000	1.000	1.000
CEO_Age	4,875	59.080	9.417	52.000	58.000	66.000
CEO_Male	4,875	0.975	0.155	1.000	1.000	1.000

Note: This table presents the summary statistics for the main variables used in the regression analyses. All of the continuous variables are winsorized at the 1% level. All of the variables are defined in Appendix A.

Table 3 – Pearson's Correlation Matrix – Global Sample

		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
1	*LnPatent*																	
2	*LnCitation*	***0.47***																
3	*MfIssuance*	***0.15***	***0.13***															
4	*MfFrequency*	***0.2***	***0.17***	***0.84***														
5	*MfItems*	***0.16***	***0.15***	***0.69***	***0.71***													
6	*Size*	***0.19***	***0.08***	***0.35***	***0.36***	***0.27***												
7	*Leverage*	***-0.05***	***-0.03***	***-0.05***	***-0.05***	***-0.04***	***-0.22***											
8	*MB*	***0.02***	***0.02***	***0.03***	***0.04***	***0.03***	***-0.04***	***-0.18***										
9	*ROA*	***0.05***	0.01	***0.09***	***0.09***	***0.09***	***0.32***	***-0.11***	***-0.08***									
10	*Accrual*	***0.02***	***-0.01***	0.01	***-0.01***	***-0.01***	0.01	***-0.04***	0.01	-0.01								
11	*Age*	***0.13***	***0.07***	***0.19***	***0.19***	***0.15***	***0.39***	***-0.03***	***-0.02***	***0.16***	0.01							
12	*R&D*	***0.06***	***0.05***	***-0.03***	***-0.02***	***-0.02***	***-0.14***	***0.08***	***0.04***	***-0.28***	***0.03***	***-0.06***						
13	*CapExp*	***-0.01***	***-0.02***	***-0.04***	***-0.03***	***-0.04***	***-0.15***	***-0.01***	***0.03***	***-0.07***	-0.01	***-0.13***	***-0.02***					
14	*Cash*	***0.01***	***0.02***	***-0.07***	***-0.06***	***-0.05***	***0.35***	0.01	***0.12***	***-0.18***	***0.01***	***-0.21***	***0.19***	***0.01***				
15	*Competition*	***0.02***	***0.05***	***0.01***	***0.04***	***0.03***	***0.02***	***0.05***	***-0.02***	0.01	***-0.05***	***0.06***	***-0.03***	***-0.06***	***-0.06***			
16	*Institution*	***0.15***	***0.16***	***0.39***	***0.45***	***0.35***	***0.48***	***-0.08***	***0.04***	***0.13***	***-0.02***	***0.23***	***-0.02***	***-0.05***	***-0.08***	***0.10***		
17	*Insider*	***-0.03***	***-0.01***	***-0.03***	***-0.04***	***-0.03***	***-0.11***	***0.02***	-0.01	***0.04***	0.00	***-0.02***	***-0.02***	***0.01***	***0.02***	***0.01***	***-0.10***	
18	*Analysts*	***0.09***	***0.01***	***0.18***	***0.13***	***0.12***	***0.25***	***-0.03***	***0.01***	***0.08***	***0.02***	***0.15***	***-0.03***	***-0.03***	***-0.06***	***-0.11***	***0.10***	***-0.03***

Note: This table reports Pearson's correlation matrix among the key variables used in the regression analyses. All continuous variables are winsorized at the 1% level. Bold indicates that the correlation is significant at the 10% level or below. All of these variables are defined in Appendix A.

Table 4 – Corporate Innovation and Management Earnings Forecast Issuance – Global Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfIssuance	**0.009*****	**0.008*****	**0.009*****	**0.008*****
	(0.003)	**(0.003)**	**(0.003)**	**(0.003)**
Size	0.042***	0.041***	0.036***	0.034***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051***	0.040***	0.028**	0.014
	(0.014)	(0.014)	(0.013)	(0.013)
ROA	-0.007**	0.007**	0.005*	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.005**	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.004	0.008**	-0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.048***	0.032***	0.020*	0.002
	(0.012)	(0.012)	(0.012)	(0.011)
Cash	0.036***	0.051***	0.039***	0.031***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.012	-0.004	-0.006	-0.008
	(0.015)	(0.015)	(0.015)	(0.014)
Institution	0.089***	0.104***	0.115***	0.113***
	(0.007)	(0.007)	(0.007)	(0.007)
Insider	-0.044***	-0.023	-0.003	-0.011
	(0.015)	(0.015)	(0.015)	(0.015)
Analyst	0.032***	0.035***	0.037***	0.035***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.169***	-0.155***	-0.125***	-0.106***
	(0.017)	(0.017)	(0.017)	(0.017)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.250	0.251	0.249	0.246

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfIssuance	**0.018*****	**0.014*****	**0.019*****	**0.015*****
	(0.003)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.012***	0.011***	0.009***	0.007***
	(0.001)	(0.001)	(0.001)	(0.000)
Leverage	-0.003***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.027**	0.018	0.006	-0.007
	(0.013)	(0.012)	(0.011)	(0.010)
ROA	-0.006**	-0.001	0.002	-0.001
	(0.003)	(0.003)	(0.002)	(0.002)
Accrual	0.001	0.001	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.003***	0.002**	0.001*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.009***	0.012***	0.007***	0.004**
	(0.003)	(0.002)	(0.002)	(0.002)
CapExp	0.011	0.006	0.016*	0.008
	(0.011)	(0.010)	(0.009)	(0.008)
Cash	0.033***	0.036***	0.030***	0.020***
	(0.005)	(0.005)	(0.004)	(0.004)
Competition	0.020**	0.018**	0.012*	0.009
	(0.009)	(0.008)	(0.007)	(0.006)
Institution	0.108***	0.096***	0.083***	0.073***
	(0.005)	(0.005)	(0.004)	(0.004)
Insider	-0.020*	-0.020*	-0.006	-0.006
	(0.011)	(0.010)	(0.009)	(0.007)
Analyst	-0.001	-0.001	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)
Constant	-0.038***	-0.029***	-0.010*	-0.007
	(0.007)	(0.007)	(0.006)	(0.005)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.182	0.177	0.176	0.165

Note: This table presents the OLS regression results for the effect of earnings forecast issuance on firm innovation output. The results are based on global full sample. *MfIssuance* is an indicator that equals 1 if the firm issues any earnings forecast during the year, and 0 otherwise. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 – Corporate Innovation and Management Earnings Forecast Frequency – Global Sample

Panel A – Measured by LnPatent – Global Full Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfFrequency	**0.008*****	**0.007*****	**0.006*****	**0.007*****
	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**
Size	0.042***	0.040***	0.036***	0.033***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051***	0.040***	0.028**	0.013
	(0.014)	(0.014)	(0.013)	(0.013)
ROA	-0.007**	0.007**	0.005*	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.005**	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.004	0.008**	-0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.047***	0.032***	0.020*	0.002
	(0.012)	(0.012)	(0.012)	(0.011)
Cash	0.036***	0.051***	0.039***	0.031***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.011	-0.003	-0.006	-0.008
	(0.015)	(0.015)	(0.015)	(0.014)
Institution	0.087***	0.102***	0.114***	0.112***
	(0.007)	(0.007)	(0.007)	(0.007)
Insider	-0.043***	-0.023	-0.002	-0.011
	(0.015)	(0.015)	(0.015)	(0.015)
Analyst	0.031***	0.035***	0.037***	0.034***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.168***	-0.154***	-0.125***	-0.105***
	(0.017)	(0.017)	(0.017)	(0.017)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.251	0.253	0.250	0.247

Panel B – Measured by LnCitation – Global Full Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfFrequency	**0.013*****	**0.009*****	**0.010*****	**0.010*****
	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**
Size	0.011***	0.010***	0.008***	0.006***
	(0.001)	(0.001)	(0.001)	(0.000)
Leverage	-0.003***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.026**	0.017	0.005	-0.008
	(0.013)	(0.012)	(0.011)	(0.010)
ROA	-0.006**	-0.002	0.001	-0.001
	(0.003)	(0.003)	(0.002)	(0.002)
Accrual	0.001	0.001	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.003***	0.002**	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.010***	0.012***	0.007***	0.004**
	(0.003)	(0.002)	(0.002)	(0.002)
CapExp	0.010	0.006	0.015*	0.008
	(0.011)	(0.010)	(0.009)	(0.008)
Cash	0.033***	0.035***	0.030***	0.019***
	(0.005)	(0.005)	(0.004)	(0.004)
Competition	0.020**	0.018**	0.012*	0.009
	(0.009)	(0.008)	(0.007)	(0.006)
Institution	0.101***	0.091***	0.078***	0.068***
	(0.005)	(0.005)	(0.004)	(0.004)
Insider	-0.019*	-0.019*	-0.006	-0.005
	(0.011)	(0.010)	(0.009)	(0.007)
Analyst	-0.001	-0.001	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)
Constant	-0.036***	-0.027***	-0.008	-0.005
	(0.007)	(0.007)	(0.006)	(0.005)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.188	0.182	0.181	0.172

Panel C – Measured by LnPatent – Global MF Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global MF Sample			
MfFrequency	**0.004***	**0.004**	**0.001**	**0.005****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.089***	0.088***	0.081***	0.077***
	(0.004)	(0.004)	(0.004)	(0.004)
Leverage	-0.012	-0.005	-0.008	-0.005
	(0.008)	(0.008)	(0.008)	(0.008)
MB	0.055	0.183***	0.042	0.027
	(0.058)	(0.057)	(0.057)	(0.056)
ROA	-0.020	0.013	0.006	-0.011
	(0.015)	(0.015)	(0.015)	(0.015)
Accrual	-0.004	0.014**	0.007	0.004
	(0.006)	(0.006)	(0.006)	(0.006)
Age	0.018***	0.017***	0.019***	0.020***
	(0.006)	(0.006)	(0.006)	(0.006)
R&D	0.030*	0.064***	0.023	0.044***
	(0.016)	(0.016)	(0.016)	(0.016)
CapExp	0.178***	0.156**	0.071	0.033
	(0.063)	(0.063)	(0.062)	(0.062)
Cash	0.064**	0.098***	0.167***	0.127***
	(0.028)	(0.028)	(0.027)	(0.027)
Competition	-0.069	-0.030	-0.039	-0.004
	(0.048)	(0.048)	(0.047)	(0.047)
Institution	0.124***	0.162***	0.200***	0.199***
	(0.020)	(0.020)	(0.019)	(0.019)
Insider	-0.103*	-0.109*	-0.049	-0.098*
	(0.057)	(0.057)	(0.057)	(0.057)
Analyst	0.041***	0.045***	0.039***	0.039***
	(0.008)	(0.008)	(0.008)	(0.008)
Constant	-0.565***	-0.562***	-0.520***	-0.476***
	(0.049)	(0.049)	(0.049)	(0.049)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.276	0.284	0.284	0.278

Panel D – Measured by LnCitation – Global MF Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global MF Sample			
MfFrequency	**0.018*** **	**0.012*** **	**0.008*** **	**0.011*** **
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.020***	0.017***	0.015***	0.011***
	(0.002)	(0.002)	(0.002)	(0.001)
Leverage	-0.032***	-0.026***	-0.025***	-0.022***
	(0.006)	(0.006)	(0.005)	(0.004)
MB	0.145**	0.097*	0.087*	0.060
	(0.062)	(0.055)	(0.049)	(0.043)
ROA	-0.011	0.007	0.004	0.002
	(0.014)	(0.013)	(0.011)	(0.010)
Accrual	0.007	-0.006	-0.005	-0.004
	(0.008)	(0.008)	(0.007)	(0.006)
Age	0.003	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.101***	0.077***	0.049***	0.050***
	(0.013)	(0.011)	(0.010)	(0.009)
CapExp	0.013	0.056	-0.003	0.004
	(0.055)	(0.049)	(0.043)	(0.038)
Cash	0.146***	0.112***	0.117***	0.078***
	(0.023)	(0.021)	(0.018)	(0.016)
Competition	0.045*	0.034	0.039**	0.029*
	(0.025)	(0.022)	(0.020)	(0.017)
Institution	0.138***	0.123***	0.114***	0.093***
	(0.012)	(0.010)	(0.009)	(0.008)
Insider	-0.079**	-0.072**	-0.036	-0.031
	(0.034)	(0.030)	(0.027)	(0.023)
Analyst	0.004	0.006**	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.002)
Constant	-0.118***	-0.125***	-0.058***	-0.046***
	(0.023)	(0.021)	(0.019)	(0.016)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.178	0.171	0.170	0.159

Note: This table presents the OLS regression results for the effect of earnings forecast frequency on firm innovation output. Panel A and Panel B is based on global full sample. Panel C and Panel D is based on global MF sample. *MfFrequency* is the total number of earnings forecasts provided by a firm in a given year. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6 – Corporate Innovation and Management Earnings Forecast Disaggregation – Global Sample

Panel A – Measured by LnPatent – Global Full Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfItems	**0.015*****	**0.013*****	**0.011*****	**0.012*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.042***	0.041***	0.036***	0.034***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051***	0.040***	0.028**	0.013
	(0.014)	(0.014)	(0.013)	(0.013)
ROA	-0.007**	0.007**	0.005*	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.005**	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.004	0.008**	-0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.047***	0.032***	0.020*	0.001
	(0.012)	(0.012)	(0.012)	(0.011)
Cash	0.036***	0.051***	0.039***	0.030***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.011	-0.003	-0.006	-0.008
	(0.015)	(0.015)	(0.015)	(0.014)
Institution	0.088***	0.103***	0.115***	0.113***
	(0.007)	(0.007)	(0.007)	(0.007)
Insider	-0.044***	-0.023	-0.003	-0.011
	(0.015)	(0.015)	(0.015)	(0.015)
Analyst	0.031***	0.035***	0.037***	0.035***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.170***	-0.156***	-0.126***	-0.107***
	(0.017)	(0.017)	(0.017)	(0.017)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.251	0.252	0.249	0.247

Panel B – Measured by LnCitation – Global Full Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfItems	**0.022*****	**0.018*****	**0.019*****	**0.015*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.001)**
Size	0.012***	0.011***	0.009***	0.007***
	(0.001)	(0.001)	(0.001)	(0.000)
Leverage	-0.003***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.027**	0.017	0.006	-0.008
	(0.013)	(0.012)	(0.011)	(0.010)
ROA	-0.006**	-0.002	0.001	-0.001
	(0.003)	(0.003)	(0.002)	(0.002)
Accrual	0.001	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.003***	0.002**	0.001*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.010***	0.012***	0.007***	0.004**
	(0.003)	(0.002)	(0.002)	(0.002)
CapExp	0.010	0.006	0.015*	0.008
	(0.011)	(0.010)	(0.009)	(0.008)
Cash	0.033***	0.036***	0.030***	0.020***
	(0.005)	(0.005)	(0.004)	(0.004)
Competition	0.021**	0.018**	0.012*	0.009
	(0.009)	(0.008)	(0.007)	(0.006)
Institution	0.106***	0.093***	0.081***	0.072***
	(0.005)	(0.005)	(0.004)	(0.004)
Insider	-0.020*	-0.019*	-0.006	-0.005
	(0.011)	(0.010)	(0.009)	(0.007)
Analyst	-0.001	-0.001	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)
Constant	-0.040***	-0.030***	-0.011*	-0.008
	(0.007)	(0.007)	(0.006)	(0.005)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.186	0.180	0.180	0.169

Panel C – Measured by LnPatent – Global MF Sample				
Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global MF Sample			
MfItems	**0.015*****	**0.010*****	**0.007****	**0.008****
	(0.004)	**(0.003)**	**(0.003)**	**(0.003)**
Size	0.089***	0.088***	0.081***	0.078***
	(0.004)	(0.004)	(0.004)	(0.004)
Leverage	-0.012	-0.005	-0.008	-0.005
	(0.008)	(0.008)	(0.008)	(0.008)
MB	0.055	0.184***	0.042	0.027
	(0.058)	(0.057)	(0.057)	(0.056)
ROA	-0.021	0.012	0.005	-0.011
	(0.015)	(0.015)	(0.015)	(0.015)
Accrual	-0.004	0.014**	0.007	0.004
	(0.006)	(0.006)	(0.006)	(0.006)
Age	0.018***	0.017***	0.019***	0.020***
	(0.006)	(0.006)	(0.006)	(0.006)
R&D	0.030*	0.064***	0.024	0.044***
	(0.016)	(0.016)	(0.016)	(0.016)
CapExp	0.180***	0.158**	0.071	0.036
	(0.063)	(0.063)	(0.062)	(0.062)
Cash	0.065**	0.098***	0.167***	0.127***
	(0.028)	(0.028)	(0.027)	(0.027)
Competition	-0.068	-0.029	-0.038	-0.003
	(0.048)	(0.048)	(0.047)	(0.047)
Institution	0.124***	0.162***	0.200***	0.200***
	(0.020)	(0.020)	(0.019)	(0.019)
Insider	-0.105*	-0.111*	-0.050	-0.100*
	(0.057)	(0.057)	(0.057)	(0.057)
Analyst	0.041***	0.045***	0.039***	0.039***
	(0.008)	(0.008)	(0.008)	(0.008)
Constant	-0.573***	-0.567***	-0.524***	-0.479***
	(0.049)	(0.049)	(0.049)	(0.049)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.276	0.284	0.284	0.278

Panel D – Measured by LnCitation – Global MF Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global MF Sample			
MfItems	**0.025*****	**0.021*****	**0.016*****	**0.012*****
	(0.004)	**(0.003)**	**(0.003)**	**(0.003)**
Size	0.023***	0.019***	0.016***	0.013***
	(0.002)	(0.002)	(0.001)	(0.001)
Leverage	-0.032***	-0.026***	-0.025***	-0.023***
	(0.006)	(0.006)	(0.005)	(0.004)
MB	0.145**	0.096*	0.086*	0.060
	(0.062)	(0.055)	(0.049)	(0.043)
ROA	-0.013	0.004	0.002	0.002
	(0.014)	(0.013)	(0.011)	(0.010)
Accrual	0.006	-0.006	-0.006	-0.004
	(0.008)	(0.008)	(0.007)	(0.006)
Age	0.003	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.102***	0.078***	0.050***	0.051***
	(0.013)	(0.011)	(0.010)	(0.009)
CapExp	0.029	0.067	0.005	0.013
	(0.055)	(0.049)	(0.043)	(0.038)
Cash	0.152***	0.116***	0.119***	0.081***
	(0.023)	(0.021)	(0.018)	(0.016)
Competition	0.047*	0.036	0.040**	0.030*
	(0.025)	(0.022)	(0.020)	(0.017)
Institution	0.141***	0.124***	0.115***	0.096***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.082**	-0.075**	-0.038	-0.033
	(0.034)	(0.030)	(0.027)	(0.023)
Analyst	0.004	0.006*	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.002)
Constant	-0.128***	-0.136***	-0.067***	-0.050***
	(0.024)	(0.021)	(0.019)	(0.016)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.177	0.171	0.170	0.158

Note: This table presents the OLS regression results for the effect of earnings forecast disaggregation on firm innovation output. Panel A and Panel B is based on global full sample. Panel C and Panel D is based on global MF sample. *MfItems* is the total number of performance measures forecasted in addition to earnings contained in a forecast. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7 – Corporate Innovation and Management Earnings Forecast Properties – Global Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfIssuance	**-0.017****	**-0.016****	**0.006**	**-0.004**
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**
MfFrequency	**0.008*****	**0.001**	**-0.000**	**0.004**
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
MfItems	**0.017*****	**0.019*****	**0.012*****	**0.016*****
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**
Size	0.057***	0.056***	0.052***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.003**	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.015	0.011	0.007	-0.003
	(0.019)	(0.019)	(0.019)	(0.018)
ROA	-0.014***	-0.002	-0.001	0.001
	(0.005)	(0.004)	(0.004)	(0.004)
Accrual	-0.001	0.006**	0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.021***	0.018***	0.017***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.005	0.011***	-0.007*	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
CapExp	0.048**	0.022	0.010	0.047**
	(0.023)	(0.023)	(0.023)	(0.022)
Cash	0.022**	0.046***	0.051***	0.054***
	(0.011)	(0.011)	(0.010)	(0.010)
Competition	0.134**	0.150**	0.157***	0.119**
	(0.060)	(0.060)	(0.060)	(0.059)
Institution	0.138***	0.160***	0.167***	0.168***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.066**	-0.043	-0.023	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.022	-0.013	-0.018	-0.016
	(0.039)	(0.038)	(0.038)	(0.037)
Constant	-0.173***	-0.170***	-0.148***	-0.148***
	(0.036)	(0.036)	(0.037)	(0.036)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.252	0.253	0.250	0.248

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
MfIssuance	**-0.036****	**-0.019**	**0.017**	**-0.029****
	(0.017)	**(0.016)**	**(0.015)**	**(0.014)**
MfFrequency	**0.024*****	**0.011****	**0.008**	**0.019*****
	(0.005)	**(0.005)**	**(0.005)**	**(0.004)**
MfItems	**0.042*****	**0.038*****	**0.029*****	**0.029*****
	(0.009)	**(0.008)**	**(0.008)**	**(0.007)**
Size	0.043***	0.039***	0.036***	0.026***
	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	-0.001	-0.001	0.001	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)
MB	0.112**	0.051	0.042	-0.019
	(0.044)	(0.042)	(0.039)	(0.036)
ROA	-0.019**	-0.009	0.002	-0.006
	(0.010)	(0.009)	(0.009)	(0.008)
Accrual	0.007	0.009	0.007	0.009
	(0.007)	(0.007)	(0.006)	(0.006)
Age	0.008	0.006	0.004	0.001
	(0.005)	(0.005)	(0.004)	(0.004)
R&D	0.033***	0.029***	0.022***	0.012*
	(0.008)	(0.008)	(0.007)	(0.007)
CapExp	0.038	0.016	0.039	0.011
	(0.052)	(0.049)	(0.046)	(0.041)
Cash	0.093***	0.133***	0.123***	0.081***
	(0.023)	(0.021)	(0.020)	(0.018)
Competition	0.310***	0.281***	0.254***	0.212***
	(0.074)	(0.068)	(0.061)	(0.052)
Institution	0.271***	0.256***	0.215***	0.207***
	(0.021)	(0.020)	(0.018)	(0.016)
Insider	-0.132**	-0.108**	-0.072	-0.066*
	(0.052)	(0.048)	(0.044)	(0.039)
Analyst	-0.076	-0.082	-0.088	-0.084
	(0.072)	(0.067)	(0.061)	(0.054)
Constant	-0.062	-0.057	-0.019	-0.002
	(0.038)	(0.035)	(0.031)	(0.027)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.191	0.184	0.184	0.174

Note: This table presents the OLS regression results for the effect of earnings forecasts on corporate innovation output. *MflikeLihood* is an indicator that equals 1 if the firm issues any earnings forecast during the year, and 0 otherwise. *MfFrequency* is the total number of earnings forecasts provided by a firm in a given year. *MfItems* is the total number of performance measures forecasted in addition to earnings contained in a forecast. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8 – Corporate Innovation and Aggregated Management Earnings Forecast Property Measure – Global Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.010*****	**0.004***	**0.009*****	**0.011*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.057***	0.056***	0.051***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.003**	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.015	0.012	0.007	-0.003
	(0.019)	(0.019)	(0.019)	(0.018)
ROA	-0.014***	-0.002	-0.001	0.001
	(0.005)	(0.004)	(0.004)	(0.004)
Accrual	0.001	0.006**	0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.021***	0.018***	0.017***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.005	0.011***	-0.007*	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
CapExp	0.049**	0.023	0.010	0.048**
	(0.023)	(0.023)	(0.023)	(0.022)
Cash	0.022**	0.046***	0.051***	0.054***
	(0.011)	(0.011)	(0.010)	(0.010)
Competition	0.133**	0.147**	0.155***	0.117**
	(0.060)	(0.060)	(0.060)	(0.059)
Institution	0.140***	0.161***	0.166***	0.168***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.067**	-0.043	-0.023	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.022	-0.012	-0.018	-0.016
	(0.039)	(0.038)	(0.038)	(0.037)
Constant	-0.173***	-0.169***	-0.147***	-0.148***
	(0.036)	(0.036)	(0.037)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.251	0.252	0.250	0.247

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.039*****	**0.026*****	**0.033*****	**0.028*****
	(0.005)	**(0.005)**	**(0.004)**	**(0.004)**
Size	0.043***	0.039***	0.036***	0.026***
	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	-0.001	-0.001	0.001	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)
MB	0.112**	0.051	0.042	-0.019
	(0.044)	(0.042)	(0.039)	(0.036)
ROA	-0.018*	-0.008	0.003	-0.005
	(0.010)	(0.009)	(0.009)	(0.008)
Accrual	0.007	0.009	0.007	0.009
	(0.007)	(0.007)	(0.006)	(0.006)
Age	0.008	0.006	0.004	0.001
	(0.005)	(0.005)	(0.004)	(0.004)
R&D	0.033***	0.029***	0.022***	0.012*
	(0.008)	(0.008)	(0.007)	(0.007)
CapExp	0.041	0.017	0.040	0.014
	(0.052)	(0.049)	(0.046)	(0.041)
Cash	0.093***	0.133***	0.123***	0.081***
	(0.023)	(0.021)	(0.020)	(0.018)
Competition	0.312***	0.282***	0.254***	0.214***
	(0.074)	(0.068)	(0.061)	(0.052)
Institution	0.276***	0.259***	0.216***	0.211***
	(0.021)	(0.020)	(0.018)	(0.016)
Insider	-0.134***	-0.108**	-0.072	-0.067*
	(0.052)	(0.048)	(0.044)	(0.039)
Analyst	-0.077	-0.084	-0.089	-0.086
	(0.072)	(0.067)	(0.061)	(0.054)
Constant	-0.063*	-0.056	-0.018	-0.004
	(0.038)	(0.035)	(0.031)	(0.027)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.188	0.182	0.182	0.172

Note: This table presents the OLS regression results for the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. *CMF*=b+c where b=1 if the total number of earnings forecasts provided by a firm in a given year is more than 1, and b=0 otherwise; c=1 if the total number of performance measures forecasted in addition to earnings contained in a forecast is more than 1, and c=0 otherwise. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9A – Country-level Cross-sectional Tests on Investor Protection

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
ShareProtect	0.031***	0.020***	0.012**	0.006
	(0.005)	(0.005)	(0.005)	(0.005)
CMF	0.017	0.018	-0.003	-0.017
	(0.012)	(0.011)	(0.011)	(0.011)
CMF* × *ShareProtect	**0.001**	**-0.001**	**0.003***	**0.005*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.047***	0.045***	0.041***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.004***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.052***	0.049***	0.037***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.009***	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.006**	0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.013***	0.010***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.056***	0.041***	0.022*	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.040***	0.055***	0.049***	0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.005	0.004	0.004	-0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.093***	0.108***	0.118***	0.119***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.054***	-0.028*	-0.008	-0.017
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.030***	0.033***	0.037***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.359***	-0.285***	-0.209***	-0.157***
	(0.034)	(0.034)	(0.034)	(0.033)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.258	0.258	0.255	0.252

Panel B – Measured by LnCitation

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
ShareProtect	0.040***	0.014	0.024***	0.027***
	(0.010)	(0.009)	(0.009)	(0.008)
CMF	-0.082***	-0.080***	-0.105***	-0.080***
	(0.020)	(0.019)	(0.017)	(0.016)
CMF* × *ShareProtect	**0.020*** (0.003)**	**0.017*** (0.002)**	**0.021*** (0.002)**	**0.017*** (0.002)**
Size	0.032***	0.030***	0.026***	0.020***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003*	-0.003*	-0.002	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.090***	0.058**	0.041*	-0.004
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.018***	-0.009*	-0.003	-0.006
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007	0.004	0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.033***	0.034***	0.027***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.029	0.026	0.034*	0.020
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.079***	0.090***	0.078***	0.055***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.041**	0.036**	0.031**	0.028**
	(0.018)	(0.017)	(0.016)	(0.013)
Institution	0.198***	0.190***	0.167***	0.151***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.049**	-0.040*	-0.012	-0.015
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.001	0.002	0.005	0.006*
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.329***	-0.167***	-0.180***	-0.181***
	(0.057)	(0.054)	(0.051)	(0.047)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.210	0.201	0.198	0.187

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with the level of investor protection in a country based on global full sample. *CMF* is an aggregated measure of earnings forecast properties. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9B – Country-level Cross-sectional Tests on Regulation Quality

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
RegQuality	-0.037***	-0.026**	-0.028**	-0.050***
	(0.011)	(0.011)	(0.011)	(0.011)
CMF	0.008	0.007	0.014	0.011
	(0.009)	(0.009)	(0.009)	(0.009)
CMF* × *RegQuality	**0.008**	**0.006**	**0.002**	**0.004**
	(0.006)	**(0.006)**	**(0.006)**	**(0.006)**
Size	0.047***	0.045***	0.041***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.054***	0.050***	0.038***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.009***	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.005**	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.010***	0.008***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.055***	0.040***	0.022*	0.007
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.040***	0.055***	0.049***	0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.004	0.005	0.005	0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.093***	0.108***	0.119***	0.120***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.051***	-0.026*	-0.007	-0.016
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.030***	0.033***	0.036***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.123***	-0.125***	-0.094***	-0.036
	(0.026)	(0.026)	(0.026)	(0.026)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.258	0.258	0.255	0.251

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
RegQuality	0.110***	0.121***	0.111***	0.113***
	(0.021)	(0.020)	(0.019)	(0.017)
CMF	-0.049***	-0.061***	-0.052***	-0.048***
	(0.016)	(0.015)	(0.014)	(0.013)
CMF* × *RegQuality	**0.077*** (0.010)**	**0.074*** (0.010)**	**0.068*** (0.009)**	**0.064*** (0.008)**
Size	0.032***	0.030***	0.026***	0.020***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003*	-0.003**	-0.002	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.092***	0.059**	0.042*	-0.003
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.017***	-0.008	-0.002	-0.005
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.005	0.009**	0.005	0.006
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.032***	0.033***	0.026***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.031	0.028	0.036*	0.022
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.081***	0.092***	0.080***	0.057***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.040**	0.035**	0.030*	0.027**
	(0.018)	(0.017)	(0.016)	(0.013)
Institution	0.204***	0.195***	0.174***	0.157***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.050**	-0.042**	-0.014	-0.017
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.004	-0.001	0.001	0.003
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.305***	-0.309***	-0.248***	-0.234***
	(0.040)	(0.038)	(0.036)	(0.032)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.208	0.200	0.196	0.185

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with the level of regulation quality in a country based on global full sample. *CMF* is an aggregated measure of earnings forecast properties. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9C – Country-level Cross-sectional Tests on Rule of Law

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
RuleLaw	0.530***	0.399***	0.160***	0.079
	(0.055)	(0.053)	(0.053)	(0.053)
CMF	0.016	0.030**	0.034**	0.020
	(0.015)	(0.015)	(0.015)	(0.015)
CMF* × *RuleLaw	**0.006**	**-0.017**	**-0.021**	**-0.003**
	(0.019)	**(0.019)**	**(0.019)**	**(0.018)**
Size	0.046***	0.044***	0.040***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.052***	0.049***	0.037***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.009***	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.006**	0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.013***	0.011***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.055***	0.040***	0.022*	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.040***	0.054***	0.049***	0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.009	0.002	0.003	-0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.096***	0.111***	0.119***	0.120***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.056***	-0.030*	-0.009	-0.018
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.032***	0.035***	0.037***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.659***	-0.526***	-0.286***	-0.194***
	(0.052)	(0.051)	(0.050)	(0.050)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.258	0.258	0.255	0.251

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
RuleLaw	0.424***	0.226**	0.068	0.197**
	(0.101)	(0.097)	(0.092)	(0.084)
CMF	-0.069***	-0.073***	-0.072***	-0.040*
	(0.027)	(0.025)	(0.024)	(0.021)
CMF* × *RuleLaw	**0.166*** **	**0.149*** **	**0.149*** **	**0.107*** **
	(0.033)	**(0.032)**	**(0.030)**	**(0.027)**
Size	0.032***	0.030***	0.026***	0.020***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003**	-0.003**	-0.002	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.091***	0.058**	0.042*	-0.004
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.018***	-0.008	-0.003	-0.006
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007*	0.004	0.005
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.032***	0.034***	0.027***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.028	0.025	0.034*	0.019
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.079***	0.090***	0.078***	0.055***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.039**	0.035**	0.031**	0.027**
	(0.018)	(0.017)	(0.016)	(0.014)
Institution	0.207***	0.197***	0.175***	0.159***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.051**	-0.041**	-0.014	-0.017
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.004	-0.001	0.001	0.003
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.489***	-0.296***	-0.114	-0.212***
	(0.091)	(0.088)	(0.083)	(0.076)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.207	0.199	0.195	0.185

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with the level of rule of law in a country based on global full sample. *CMF* is an aggregated measure of earnings forecast properties. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10 – Pearson's Correlation Matrix – US Sample

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*LnPatent*																	
2	*LnCitation*	**0.69**																
3	*MfIssuance*	**0.28**	**0.21**															
4	*MfFrequency*	**0.31**	**0.23**	**0.87**														
5	*MfItems*	**0.28**	**0.22**	**0.72**	**0.75**													
6	*CEO_Extraversion*	**0.06**	**0.05**	**0.05**	**0.05**	**0.04**												
7	*CEO_Agreeableness*	**0.06**	**0.04**	**-0.02**	**-0.03**	**-0.02**	**0.30**											
8	*CEO_Emotion*	-0.01	-0.01	**-0.03**	**-0.03**	**-0.02**	**0.37**	**0.53**										
9	*CEO_Conscientious*	**0.15**	**0.10**	**0.03**	**0.03**	**0.03**	**0.19**	**0.50**	**0.23**									
10	*CEO_Openness*	0.01	-0.01	0.01	-0.01	0.01	**0.09**	**0.45**	**0.26**	**0.69**								
11	*CEO_Age*	**-0.04**	**-0.05**	-0.01	-0.01	-0.01	**-0.02**	**-0.04**	**-0.03**	**-0.02**	**-0.04**							
12	*CEO_Male*	0.02	**0.03**	**-0.03**	**-0.03**	-0.01	0.01	**0.07**	**0.05**	**0.06**	**0.06**	**0.05**						
13	*Size*	**0.20**	**0.13**	**0.39**	**0.40**	**0.31**	**0.12**	**0.03**	-0.01	**0.04**	**-0.04**	**0.09**	0.02					
14	*Leverage*	**-0.07**	**-0.06**	**-0.12**	**-0.12**	**-0.10**	**0.04**	**-0.03**	**-0.03**	**-0.03**	-0.01	**0.07**	-0.01	**0.03**				
15	*MB*	**0.03**	**0.02**	**0.02**	**0.02**	**0.02**	**0.08**	**0.05**	**0.05**	**0.04**	**0.02**	**-0.06**	**-0.02**	0.01	**0.11**			
16	*ROA*	**0.02**	**0.02**	**0.14**	**0.15**	**0.14**	**0.04**	0.01	**0.03**	0.01	**-0.03**	**0.03**	0.02	**0.33**	**-0.05**	**-0.03**		
17	*Accrual*	0.01	-0.01	**0.02**	**0.02**	**0.01**	**-0.04**	0.02	**-0.04**	-0.01	-0.01	**0.02**	-0.01	**0.03**	**-0.03**	-0.01	0.01	
18	*Age*	**0.13**	**0.08**	**0.22**	**0.22**	**0.18**	**-0.02**	**-0.04**	**-0.07**	0.01	**-0.04**	**0.12**	0.01	**0.43**	**-0.11**	0.01	**0.17**	**0.02**
19	*R&D*	**0.05**	**0.04**	**-0.07**	**-0.07**	**-0.06**	**-0.05**	**0.09**	0.01	**0.13**	**0.08**	**-0.07**	-0.01	**-0.15**	**0.06**	0.01	**-0.24**	**0.01**
20	*CapExp*	**-0.02**	**-0.01**	0.01	0.01	-0.01	**0.04**	-0.01	**0.05**	**-0.10**	**-0.05**	**-0.03**	-0.01	**-0.12**	**0.03**	0.01	**-0.06**	**0.02**
21	*Cash*	**0.07**	**0.06**	**-0.06**	**-0.06**	**-0.04**	0.01	**0.04**	-0.01	**0.09**	**0.06**	**-0.09**	**-0.02**	**-0.36**	**0.06**	**0.08**	**-0.17**	-0.01
22	*Competition*	**-0.02**	-0.01	**0.01**	**0.02**	**0.03**	**-0.03**	**0.03**	**0.07**	**0.04**	0.02	0.01	-0.01	**0.15**	**-0.06**	0.01	**0.07**	**-0.02**
23	*Institution*	**0.30**	**0.22**	**0.50**	**0.52**	**0.43**	**0.10**	**0.02**	**0.08**	0.01	-0.01	**-0.03**	0.02	**0.62**	**-0.17**	**0.02**	**0.23**	**0.01**
24	*Insider*	**-0.07**	**-0.05**	**-0.06**	**-0.07**	**-0.05**	**-0.07**	**-0.09**	**-0.04**	**-0.10**	**-0.08**	-0.02	**0.03**	**-0.18**	**0.04**	**0.01**	**0.03**	-0.01
25	*Analysts*	**-0.01**	-0.01	**0.02**	**0.01**	0.01	**0.16**	**0.05**	**0.04**	**0.07**	-0.01	0.01	0.02	**0.04**	-0.01	**0.01**	**0.01**	0.01

- Continued

		18	19	20	21	22	23	24
19	*R&D*	**-0.07**						
20	*CapExp*	**-0.13**	**0.01**					
21	*Cash*	**-0.18**	**0.18**	**-0.02**				
22	*Competition*	**0.08**	**-0.05**	**-0.15**	**-0.14**			
23	*Institution*	**0.33**	**-0.08**	**-0.01**	**-0.13**	**0.06**		
24	*Insider*	**-0.08**	-0.01	**0.05**	**0.08**	**-0.04**	**-0.13**	
25	*Analysts*	**0.03**	-0.01	0.01	-0.01	**-0.07**	**0.02**	-0.01

Note: This table reports Pearson's correlation matrix among the key variables used in the regression analyses. All continuous variables are winsorized at the 1% level. Bold indicates that the correlation is significant at the 10% level or below. All of these variables are defined in Appendix A.

Table 11 – Corporate Innovation and Management Earnings Forecast Issuance – US Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfIssuance	**0.012****	**0.011****	**0.014*****	**0.015*****
	(0.005)	**(0.005)**	**(0.005)**	**(0.005)**
Size	0.059***	0.057***	0.053***	0.050***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.004	-0.004
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.010***	-0.002	-0.002	0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.051**	0.026	0.012	0.049**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.022**	0.044***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.190**	0.216***	0.237***	0.188**
	(0.075)	(0.075)	(0.074)	(0.074)
Institution	0.132***	0.153***	0.158***	0.162***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.066**	-0.042	-0.022	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.019	-0.010	-0.016	-0.013
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.173***	-0.164***	-0.142***	-0.143***
	(0.037)	(0.037)	(0.038)	(0.038)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.246	0.245	0.241	0.237

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfIssuance	**0.058*****	**0.040*****	**0.064*****	**0.051*****
	(0.012)	**(0.012)**	**(0.011)**	**(0.010)**
Size	0.054***	0.049***	0.044***	0.035***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014	-0.007	0.001	-0.005
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.049	0.027	0.050	0.017
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.103***	0.143***	0.135***	0.093***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.440***	0.389***	0.356***	0.311***
	(0.099)	(0.091)	(0.082)	(0.073)
Institution	0.296***	0.281***	0.236***	0.235***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.144**	-0.117**	-0.078	-0.074
	(0.057)	(0.054)	(0.050)	(0.045)
Analyst	-0.080	-0.089	-0.095	-0.094
	(0.080)	(0.075)	(0.069)	(0.062)
Constant	-0.078*	-0.067*	-0.029	-0.005
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.233	0.222	0.215	0.201

Note: This table presents the OLS regression results for the effect of earnings forecast issuance on firm innovation output. The results are based on US full sample. *MfIssuance* is an indicator that equals 1 if the firm issues any earnings forecast during the year, and 0 otherwise. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 12 – Corporate Innovation and Management Earnings Forecast Frequency – US Sample

Panel A – Measured by LnPatent – US Full Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfFrequency	**0.008*****	**0.004****	**0.004****	**0.006*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Size	0.058***	0.054***	0.053***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.004	-0.004
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.011***	-0.002	-0.002	0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.051**	0.026	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.022**	0.045***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.188**	0.215***	0.238***	0.187**
	(0.075)	(0.075)	(0.074)	(0.074)
Institution	0.130***	0.152***	0.159***	0.162***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.065**	-0.042	-0.022	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.020	-0.010	-0.016	-0.014
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.171***	-0.164***	-0.142***	-0.143***
	(0.037)	(0.037)	(0.038)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.248	0.245	0.241	0.239

Panel B – Measured by LnCitation – US Full Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfFrequency	**0.029*****	**0.017*****	**0.021*****	**0.024*****
	(0.004)	**(0.004)**	**(0.003)**	**(0.003)**
Size	0.052***	0.047***	0.044***	0.033***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051**	0.020	0.032	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014*	-0.007	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.047	0.026	0.047	0.015
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.102***	0.143***	0.135***	0.093***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.429***	0.384***	0.352***	0.304***
	(0.099)	(0.091)	(0.082)	(0.072)
Institution	0.283***	0.275***	0.232***	0.223***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.141**	-0.116**	-0.075	-0.071
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.081	-0.089	-0.096	-0.094
	(0.079)	(0.075)	(0.069)	(0.062)
Constant	-0.072*	-0.064*	-0.026	-0.000
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.237	0.224	0.217	0.205

Panel C – Measured by LnPatent – US MF Sample				
Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
MfFrequency	**0.003**	**0.004****	**0.006****	**0.001**
	(0.003)	**(0.002)**	**(0.003)**	**(0.003)**
Size	0.123***	0.126***	0.112***	0.107***
	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	0.005	0.008	0.006	0.005
	(0.006)	(0.006)	(0.006)	(0.006)
MB	0.006	0.055	-0.003	-0.026
	(0.048)	(0.047)	(0.046)	(0.045)
ROA	-0.033*	-0.018	-0.012	-0.045**
	(0.019)	(0.019)	(0.019)	(0.019)
Accrual	-0.002	0.008***	0.003	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.045***	0.041***	0.047***	0.050***
	(0.012)	(0.012)	(0.012)	(0.012)
R&D	-0.003	0.005	-0.022***	0.008
	(0.009)	(0.009)	(0.009)	(0.009)
CapExp	0.232**	0.215*	-0.009	0.059
	(0.118)	(0.116)	(0.113)	(0.113)
Cash	0.060	0.053	0.170***	0.103**
	(0.044)	(0.043)	(0.042)	(0.042)
Competition	0.199	0.125	0.169	0.205
	(0.181)	(0.181)	(0.180)	(0.180)
Institution	0.124***	0.147***	0.201***	0.206***
	(0.030)	(0.030)	(0.029)	(0.029)
Insider	-0.406***	-0.380***	-0.288**	-0.323***
	(0.125)	(0.124)	(0.123)	(0.123)
Analyst	-0.114	-0.100	-0.090	-0.078
	(0.093)	(0.091)	(0.090)	(0.090)
Constant	-0.875***	-0.888***	-0.832***	-0.817***
	(0.107)	(0.108)	(0.108)	(0.108)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.269	0.269	0.268	0.264

Panel D – Measured by LnCitation – US MF Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
MfFrequency	**0.030*****	**0.015***	**0.012**	**0.024*****
	(0.009)	**(0.009)**	**(0.008)**	**(0.008)**
Size	0.101***	0.096***	0.086***	0.074***
	(0.009)	(0.008)	(0.008)	(0.007)
Leverage	-0.004	-0.006	-0.005	-0.008
	(0.011)	(0.010)	(0.010)	(0.009)
MB	0.305**	0.207*	0.291***	0.194*
	(0.121)	(0.118)	(0.111)	(0.107)
ROA	-0.072*	-0.048	-0.051	-0.044
	(0.041)	(0.039)	(0.036)	(0.035)
Accrual	0.007	0.002	-0.006	0.007
	(0.010)	(0.010)	(0.009)	(0.009)
Age	0.014	0.009	0.004	-0.002
	(0.014)	(0.013)	(0.011)	(0.010)
R&D	0.046**	0.035*	0.016	0.060***
	(0.019)	(0.018)	(0.017)	(0.016)
CapExp	0.273	0.478**	0.177	0.032
	(0.256)	(0.241)	(0.225)	(0.205)
Cash	0.411***	0.418***	0.518***	0.397***
	(0.095)	(0.089)	(0.083)	(0.075)
Competition	0.694***	0.732***	0.698***	0.716***
	(0.225)	(0.201)	(0.184)	(0.156)
Institution	0.316***	0.295***	0.295***	0.272***
	(0.047)	(0.043)	(0.039)	(0.033)
Insider	-0.414**	-0.416**	-0.289*	-0.259**
	(0.181)	(0.165)	(0.151)	(0.132)
Analyst	-0.186	-0.177	-0.158	-0.149
	(0.148)	(0.133)	(0.121)	(0.100)
Constant	-0.672***	-0.673***	-0.535***	-0.452***
	(0.122)	(0.111)	(0.101)	(0.088)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.225	0.218	0.212	0.197

Note: This table presents the OLS regression results for the effect of earnings forecast frequency on firm innovation output. Panel A and Panel B is based on US full sample. Panel C and panel D is based on US MF sample. *MfFrequency* is the total number of earnings forecasts provided by a firm in a given year. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 13 – Corporate Innovation and Management Earnings Forecast Disaggregation – US Sample

Panel A – Measured by LnPatent – US Full Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfItems	**0.018*****	**0.014*****	**0.013*****	**0.017*****
	(0.003)	**(0.003)**	**(0.003)**	**(0.003)**
Size	0.058***	0.056***	0.053***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.003	-0.005
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.011***	-0.002	-0.002	0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.050**	0.025	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.022**	0.044***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.191**	0.215***	0.240***	0.190**
	(0.075)	(0.075)	(0.074)	(0.074)
Institution	0.130***	0.150***	0.158***	0.161***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.066**	-0.042	-0.022	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.020	-0.010	-0.016	-0.014
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.173***	-0.163***	-0.142***	-0.144***
	(0.037)	(0.037)	(0.038)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.248	0.247	0.242	0.239

Panel B – Measured by LnCitation –US Full Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfItems	**0.056*****	**0.044*****	**0.046*****	**0.044*****
	(0.008)	**(0.007)**	**(0.007)**	**(0.006)**
Size	0.054***	0.048***	0.045***	0.035***
	(0.004)	(0.003)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009*	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.046	0.025	0.047	0.014
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.103***	0.143***	0.135***	0.094***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.434***	0.383***	0.354***	0.307***
	(0.099)	(0.091)	(0.082)	(0.072)
Institution	0.290***	0.274***	0.235***	0.230***
	(0.023)	(0.021)	(0.020)	(0.018)
Insider	-0.143**	-0.117**	-0.077	-0.073
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.079	-0.087	-0.094	-0.092
	(0.079)	(0.075)	(0.069)	(0.062)
Constant	-0.080*	-0.068*	-0.032	-0.007
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.236	0.225	0.218	0.205

Panel C – Measured by LnPatent – US MF Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
MfItems	**0.017*****	**0.014****	**0.007**	**0.012****
	(0.006)	**(0.006)**	**(0.006)**	**(0.006)**
Size	0.123***	0.124***	0.110***	0.106***
	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	0.005	0.008	0.006	0.005
	(0.006)	(0.006)	(0.006)	(0.006)
MB	0.005	0.054	-0.003	-0.026
	(0.048)	(0.047)	(0.046)	(0.045)
ROA	-0.036*	-0.020	-0.013	-0.047**
	(0.019)	(0.019)	(0.019)	(0.019)
Accrual	-0.001	0.008***	0.003	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.045***	0.041***	0.047***	0.050***
	(0.012)	(0.012)	(0.012)	(0.012)
R&D	-0.003	0.005	-0.022***	0.008
	(0.009)	(0.009)	(0.009)	(0.009)
CapExp	0.228*	0.206*	-0.017	0.052
	(0.118)	(0.116)	(0.113)	(0.113)
Cash	0.060	0.056	0.173***	0.104**
	(0.044)	(0.043)	(0.042)	(0.042)
Competition	0.196	0.117	0.162	0.200
	(0.181)	(0.181)	(0.180)	(0.180)
Institution	0.123***	0.143***	0.197***	0.204***
	(0.030)	(0.030)	(0.029)	(0.029)
Insider	-0.409***	-0.382***	-0.288**	-0.325***
	(0.125)	(0.124)	(0.123)	(0.123)
Analyst	-0.114	-0.101	-0.091	-0.079
	(0.093)	(0.091)	(0.090)	(0.090)
Constant	-0.879***	-0.896***	-0.839***	-0.822***
	(0.107)	(0.107)	(0.108)	(0.108)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.270	0.271	0.269	0.265

Panel D – Measured by LnCitation – US MF Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
MfItems	**0.041*****	**0.031****	**0.023***	**0.034*****
	(0.015)	**(0.014)**	**(0.013)**	**(0.012)**
Size	0.105***	0.098***	0.087***	0.078***
	(0.009)	(0.008)	(0.008)	(0.006)
Leverage	-0.005	-0.006	-0.005	-0.008
	(0.011)	(0.010)	(0.010)	(0.009)
MB	0.299**	0.203*	0.288***	0.188*
	(0.121)	(0.118)	(0.111)	(0.107)
ROA	-0.076*	-0.052	-0.054	-0.047
	(0.041)	(0.039)	(0.037)	(0.035)
Accrual	0.007	0.002	-0.006	0.007
	(0.010)	(0.010)	(0.009)	(0.009)
Age	0.014	0.009	0.004	-0.002
	(0.014)	(0.013)	(0.011)	(0.010)
R&D	0.047**	0.036*	0.017	0.061***
	(0.019)	(0.018)	(0.017)	(0.016)
CapExp	0.288	0.485**	0.183	0.046
	(0.256)	(0.241)	(0.225)	(0.205)
Cash	0.413***	0.419***	0.519***	0.402***
	(0.095)	(0.089)	(0.083)	(0.075)
Competition	0.694***	0.723***	0.692***	0.712***
	(0.225)	(0.201)	(0.184)	(0.156)
Institution	0.323***	0.296***	0.296***	0.277***
	(0.047)	(0.042)	(0.039)	(0.033)
Insider	-0.424**	-0.422**	-0.294*	-0.268**
	(0.181)	(0.164)	(0.151)	(0.132)
Analyst	-0.184	-0.175	-0.157	-0.146
	(0.148)	(0.133)	(0.121)	(0.100)
Constant	-0.666***	-0.678***	-0.539***	-0.450***
	(0.122)	(0.111)	(0.101)	(0.088)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.225	0.219	0.212	0.198

Note: This table presents the OLS regression results for the effect of earnings forecast disaggregation on firm innovation output. Panel A and Panel B is based on US full sample. Panel C and panel D is based on US MF sample. *MfItems* is the total number of performance measures forecasted in addition to earnings contained in a forecast. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 14 – Corporate Innovation and Management Earnings Forecast Properties – US Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfIssuance	**-0.017****	**-0.015****	**0.007**	**-0.004**
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**
MfFrequency	**0.008*****	**0.006*****	**0.007*****	**0.004**
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
MfItems	**0.016*****	**0.018*****	**0.011*****	**0.015*****
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**
Size	0.058***	0.057***	0.053***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.003	-0.005
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.011***	-0.002	-0.002	0.000
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002*	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.049**	0.024	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.022**	0.044***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.190**	0.218***	0.239***	0.189**
	(0.075)	(0.075)	(0.074)	(0.074)
Institution	0.129***	0.151***	0.158***	0.160***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.065**	-0.042	-0.023	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.021	-0.011	-0.016	-0.014
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.171***	-0.164***	-0.142***	-0.143***
	(0.037)	(0.037)	(0.037)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.250	0.247	0.242	0.240

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
MfIssuance	**-0.041****	**-0.019**	**0.012**	**-0.032****
	(0.019)	**(0.018)**	**(0.017)**	**(0.016)**
MfFrequency	**0.028*****	**0.012****	**0.011****	**0.023*****
	(0.006)	**-0.006**	**(0.005)**	**(0.005)**
MfItems	**0.039*****	**0.037*****	**0.030*****	**0.028*****
	(0.009)	**(0.009)**	**(0.008)**	**(0.008)**
Size	0.052***	0.047***	0.043***	0.033***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.000	-0.007
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.045	0.025	0.048	0.014
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.102***	0.143***	0.135***	0.093***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.426***	0.380***	0.349***	0.301***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.279***	0.270***	0.227***	0.221***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.140**	-0.116**	-0.076	-0.070
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.080	-0.088	-0.094	-0.093
	(0.079)	(0.075)	(0.069)	(0.062)
Constant	-0.073*	-0.066*	-0.028	-0.001
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.239	0.227	0.219	0.207

Note: This table presents the OLS regression results for the effect of earnings forecasts on corporate innovation output. *MflikeLihood* is an indicator that equals 1 if the firm issues any earnings forecast during the year, and 0 otherwise. *MfFrequency* is the total number of earnings forecasts provided by a firm in a given year. *MfItems* is the total number of performance measures forecasted in addition to earnings contained in a forecast. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 15 – Corporate Innovation and Aggregated Management Earnings Forecast Property Measure – US Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.016*****	**0.011*****	**0.015*****	**0.017*****
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**
Size	0.058***	0.057***	0.052***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.004	-0.004
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.011***	-0.002	-0.002	0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.050**	0.025	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.022**	0.044***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.189**	0.215***	0.237***	0.188**
	(0.075)	(0.075)	(0.074)	(0.074)
Institution	0.131***	0.152***	0.158***	0.161***
	(0.012)	(0.012)	(0.012)	(0.012)
Insider	-0.065**	-0.042	-0.022	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.021	-0.011	-0.017	-0.014
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.172***	-0.163***	-0.141***	-0.143***
	(0.037)	(0.037)	(0.037)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.248	0.246	0.243	0.240

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.069*****	**0.047*****	**0.058*****	**0.053*****
	(0.009)	**(0.008)**	**(0.008)**	**(0.007)**
Size	0.052***	0.047***	0.044***	0.034***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.045	0.025	0.046	0.014
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.103***	0.143***	0.135***	0.093***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.429***	0.382***	0.349***	0.304***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.283***	0.272***	0.229***	0.225***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.141**	-0.116**	-0.076	-0.072
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.082	-0.090	-0.096	-0.094
	(0.079)	(0.075)	(0.069)	(0.062)
Constant	-0.074*	-0.065*	-0.027	-0.003
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.238	0.226	0.220	0.206

Note: This table presents the OLS regression results for the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. *CMF*=b+c where b=1 if the total number of earnings forecasts provided by a firm in a given year is more than 1, and b=0 otherwise; c=1 if the total number of performance measures forecasted in addition to earnings contained in a forecast is more than 1, and c=0 otherwise. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 16 – Corporate Innovation and CEO Personality Traits

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Big5 Sample			
CEO_Extraversion	**0.110****	**0.091***	**0.107****	**0.090***
	(0.052)	**(0.052)**	**(0.052)**	**(0.052)**
CEO_Agreeableness	**0.081**	**0.199**	**0.302**	**0.104**
	(0.311)	**(0.310)**	**(0.312)**	**(0.313)**
CEO_Emotion	**0.027**	**-0.014**	**-0.058**	**0.002**
	(0.228)	**(0.227)**	**(0.228)**	**(0.229)**
CEO_Conscientious	**-0.284**	**-0.224**	**-0.264**	**-0.147**
	(0.227)	**(0.227)**	**(0.228)**	**(0.229)**
CEO_Openness	**0.226**	**0.135**	**0.114**	**0.034**
	(0.341)	**(0.340)**	**(0.341)**	**(0.343)**
CEO_Age	0.003	0.007**	0.005*	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
CEO_Male	0.129	0.161	0.146	0.170
	(0.115)	(0.115)	(0.115)	(0.116)
Size	0.205***	0.232***	0.206***	0.191***
	(0.019)	(0.019)	(0.020)	(0.019)
Leverage	0.005	-0.138*	-0.222***	-0.135*
	(0.081)	(0.081)	(0.082)	(0.080)
MB	0.656**	0.602*	0.216	0.925***
	(0.328)	(0.328)	(0.335)	(0.326)
ROA	0.039	-0.031	0.028	0.152*
	(0.084)	(0.084)	(0.085)	(0.083)
Accrual	-0.002	0.006	0.003	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Age	0.070**	0.047	0.067**	0.081***
	(0.030)	(0.030)	(0.030)	(0.030)
R&D	2.707***	2.355***	2.218***	2.420***
	(0.331)	(0.331)	(0.336)	(0.330)
CapExp	0.719***	0.276	0.234	0.598**
	(0.265)	(0.265)	(0.270)	(0.263)
Cash	0.124	0.305***	0.273***	0.118
	(0.098)	(0.098)	(0.100)	(0.098)
Competition	1.206*	1.004	0.669	0.180
	(0.632)	(0.631)	(0.640)	(0.631)
Institution	0.103*	-0.040	0.031	0.138**
	(0.062)	(0.062)	(0.063)	(0.062)
Insider	-1.073*	-1.499**	-1.343**	-1.508**
	(0.627)	(0.626)	(0.634)	(0.626)
Analyst	0.019	0.008	-0.000	-0.009
	(0.015)	(0.015)	(0.016)	(0.015)
Constant	-2.408*	-2.624**	-2.462**	-2.080*
	(1.254)	(1.249)	(1.255)	(1.261)
Fixed Effect	YES	YES	YES	YES
N	4,875	4,875	4,875	4,875
R^2	0.415	0.418	0.409	0.410

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Big5 Sample			
CEO_Extraversion	**0.046**	**0.078****	**0.081****	**0.080****
	(0.055)	**(0.039)**	**(0.040)**	**(0.040)**
CEO_Agreeableness	**-0.093**	**0.400**	**0.352**	**0.296**
	(0.322)	**(0.294)**	**(0.271)**	**(0.235)**
CEO_Emotion	**0.282**	**0.059**	**-0.097**	**-0.044**
	(0.234)	**(0.213)**	**(0.197)**	**(0.171)**
CEO_Conscientious	**-0.187**	**-0.403***	**-0.465****	**-0.404****
	(0.234)	**(0.212)**	**(0.196)**	**(0.170)**
CEO_Openness	**-0.130**	**0.241**	**0.335**	**0.149**
	(0.352)	**(0.321)**	**(0.296)**	**(0.257)**
CEO_Age	0.007	0.005	0.005	0.001
	(0.005)	(0.005)	(0.004)	(0.004)
CEO_Male	-0.012	-0.012	0.048	0.065
	(0.116)	(0.106)	(0.097)	(0.084)
Size	0.178***	0.168***	0.146***	0.093***
	(0.027)	(0.025)	(0.023)	(0.020)
Leverage	-0.393**	-0.464***	-0.393***	-0.380***
	(0.166)	(0.155)	(0.144)	(0.128)
MB	1.896**	1.186	1.432*	1.249
	(0.941)	(0.909)	(0.859)	(0.786)
ROA	0.081	-0.122	0.095	0.064
	(0.252)	(0.245)	(0.233)	(0.215)
Accrual	-0.005	0.006	-0.003	-0.002
	(0.014)	(0.014)	(0.014)	(0.013)
Age	0.053	0.044	0.016	0.025
	(0.033)	(0.030)	(0.028)	(0.024)
R&D	6.017***	4.831***	4.177***	3.459***
	(0.560)	(0.518)	(0.481)	(0.422)
CapExp	0.910	0.509	0.316	-0.371
	(0.710)	(0.678)	(0.637)	(0.576)
Cash	0.610**	0.484**	0.105	-0.031
	(0.258)	(0.246)	(0.232)	(0.209)
Competition	2.418**	1.557*	1.400*	1.282*
	(0.964)	(0.884)	(0.818)	(0.714)
Institution	0.047	-0.081	0.024	0.034
	(0.119)	(0.110)	(0.103)	(0.090)
Insider	-0.778	-0.713	-0.404	-0.231
	(0.910)	(0.835)	(0.773)	(0.675)
Analyst	0.048	0.074**	0.078**	0.080**
	(0.039)	(0.037)	(0.035)	(0.032)
Constant	-1.174	-2.353**	-1.707	-0.790
	(1.314)	(1.196)	(1.104)	(0.958)
Fixed Effect	YES	YES	YES	YES
N	4,875	4,875	4,875	4,875
R^2	0.342	0.336	0.319	0.313

Note: This table presents the OLS regression results for the effect of CEO's personality traits, measured by Big Five personality traits factors, on corporate innovation output. *CEO_Extraversion* is the extraversion score of an CEO on his or her speech during the question-and-answer (Q&A) portion of a conference call. *CEO_Agreeableness* is the weighted average call-level measure of agreeableness. *CEO_Emotion* is the weighted average call-level measure of emotional stability. *CEO_Conscientious* is the weighted average call-level measure of conscientiousness. *CEO_Openness* is the weighted average call-level measure of openness. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 17 – Corporate Innovation, Management Earnings Forecast and CEO Personality Traits

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Big5 Sample			
CEO_Extraversion	0.092*	0.080	0.108*	0.096*
	(0.055)	(0.055)	(0.055)	(0.055)
CMF	-0.006	0.004	0.001	0.008
	(0.013)	(0.013)	(0.014)	(0.013)
CMF* × *CEO_Extraversion	**0.038****	**0.036****	**-0.002**	**0.037****
	(0.018)	**(0.018)**	**(0.018)**	**(0.018)**
CEO_Agreeableness	0.075	0.201	0.303	0.109
	(0.311)	(0.310)	(0.311)	(0.313)
CEO_Emotion	0.026	-0.015	-0.058	0.002
	(0.228)	(0.227)	(0.228)	(0.229)
CEO_Conscientious	-0.283	-0.223	-0.264	-0.147
	(0.227)	(0.226)	(0.227)	(0.229)
CEO_Openness	0.228	0.133	0.114	0.030
	(0.340)	(0.339)	(0.341)	(0.343)
CEO_Age	0.003	0.007**	0.005*	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
CEO_Male	0.130	0.161	0.146	0.170
	(0.115)	(0.114)	(0.115)	(0.116)
Size	0.205***	0.232***	0.206***	0.191***
	(0.019)	(0.019)	(0.020)	(0.019)
Leverage	0.003	-0.138*	-0.222***	-0.134*
	(0.081)	(0.081)	(0.082)	(0.080)
MB	0.661**	0.605*	0.218	0.927***
	(0.328)	(0.328)	(0.335)	(0.327)
ROA	0.038	-0.031	0.028	0.152*
	(0.084)	(0.084)	(0.085)	(0.083)
Accrual	-0.002	0.006	0.003	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Age	0.071**	0.047	0.067**	0.081***
	(0.030)	(0.030)	(0.030)	(0.030)
R&D	2.716***	2.360***	2.223***	2.421***
	(0.331)	(0.331)	(0.336)	(0.331)
CapExp	0.720***	0.279	0.235	0.601**
	(0.265)	(0.265)	(0.270)	(0.264)
Cash	0.126	0.306***	0.273***	0.119
	(0.098)	(0.098)	(0.100)	(0.098)
Competition	1.199*	1.007	0.672	0.188
	(0.632)	(0.631)	(0.641)	(0.631)
Institution	0.102*	-0.041	0.031	0.137**
	(0.062)	(0.062)	(0.063)	(0.062)
Insider	-1.074*	-1.497**	-1.343**	-1.504**
	(0.627)	(0.626)	(0.634)	(0.626)
Analyst	0.019	0.008	-0.000	-0.009
	(0.015)	(0.015)	(0.016)	(0.015)
Constant	-2.391*	-2.625**	-2.465**	-2.089*
	(1.252)	(1.248)	(1.254)	(1.260)
Fixed Effect	YES	YES	YES	YES

N	4,875	4,875	4,875	4,875
R^2	0.415	0.418	0.409	0.410

Panel B – Measured by LnCitation

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Big5 Sample			
CEO_Extraversion	0.139*	0.127*	0.119*	-0.038
	(0.071)	(0.066)	(0.061)	(0.054)
CMF	0.004	0.010	0.030	-0.02
	(0.037)	(0.035)	(0.033)	(0.030)
***CMF* ×**	**0.096****	**0.088****	**0.085****	**0.121*****
CEO_Extraversion	**(0.047)**	**(0.045)**	**(0.042)**	**(0.038)**
CEO_Agreeableness	-0.108	0.391	0.354	0.267
	(0.323)	(0.293)	(0.272)	(0.236)
CEO_Emotion	0.273	0.049	-0.109	-0.054
	(0.234)	(0.212)	(0.197)	(0.170)
CEO_Conscientious	-0.184	-0.400*	-0.460**	-0.404**
	(0.233)	(0.212)	(0.196)	(0.169)
CEO_Openness	-0.141	0.226	0.307	0.149
	(0.353)	(0.321)	(0.297)	(0.257)
CEO_Age	0.008	0.005	0.006	0.001
	(0.005)	(0.005)	(0.004)	(0.004)
CEO_Male	-0.006	-0.006	0.054	0.071
	(0.116)	(0.105)	(0.097)	(0.084)
Size	0.179***	0.168***	0.147***	0.092***
	(0.027)	(0.025)	(0.023)	(0.020)
Leverage	-0.391**	-0.463***	-0.393***	-0.378***
	(0.166)	(0.155)	(0.144)	(0.128)
MB	1.889**	1.187	1.428*	1.218
	(0.941)	(0.908)	(0.859)	(0.785)
ROA	0.061	-0.143	0.068	0.039
	(0.252)	(0.246)	(0.233)	(0.215)
Accrual	-0.005	0.006	-0.003	-0.003
	(0.014)	(0.014)	(0.014)	(0.013)
Age	0.054*	0.045	0.017	0.026
	(0.033)	(0.030)	(0.028)	(0.024)
R&D	5.999***	4.819***	4.156***	3.444***
	(0.560)	(0.516)	(0.480)	(0.421)
CapExp	0.895	0.495	0.314	-0.421
	(0.710)	(0.677)	(0.638)	(0.576)
Cash	0.622**	0.495**	0.119	-0.020
	(0.258)	(0.246)	(0.232)	(0.209)
Competition	2.402**	1.550*	1.405*	1.247*
	(0.964)	(0.881)	(0.818)	(0.712)
Institution	0.037	-0.092	0.009	0.030
	(0.119)	(0.110)	(0.103)	(0.090)
Insider	-0.825	-0.760	-0.450	-0.307
	(0.910)	(0.833)	(0.773)	(0.673)
Analyst	0.043	0.068*	0.069*	0.079**
	(0.040)	(0.038)	(0.036)	(0.032)
Constant	-1.045	-2.230*	-1.584	-0.631
	(1.314)	(1.193)	(1.105)	(0.957)

Fixed Effect	YES	YES	YES	YES
N	4,875	4,875	4,875	4,875
R^2	0.344	0.341	0.321	0.317

Note: This table presents the OLS regression results for the examination on whether the association between corporate innovation output and management earnings forecast varies with CEO's personality traits, measured by Big Five personality traits factors. *CEO_Extraversion* is the extraversion score of an CEO on his or her speech during the question-and-answer (Q&A) portion of a conference call. *CEO_Agreeableness* is the weighted average call-level measure of agreeableness. *CEO_Emotion* is the weighted average call-level measure of emotional stability. *CEO_Conscientious* is the weighted average call-level measure of conscientiousness. *CEO_Openness* is the weighted average call-level measure of openness. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 18 – CEO Personality Traits and Stock Market Reaction Associated with Management Earnings Forecasts

Dep. Var.	*Abs_Mf_CAR*		
	(1)	(2)	(3)
Sample	US Big5 Sample		
CEO_Extraversion	**0.168***	**0.234***	**0.253***
	(0.089)	**(0.128)**	**(0.132)**
MfFrequency	-0.707***	-0.694***	-0.695***
	(0.034)	(0.051)	(0.051)
MfItems	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
CEO_Age		0.016	0.017
		(0.012)	(0.012)
CEO_Male		0.303	0.295
		(0.267)	(0.268)
CEO_Agreeableness			-0.588
			(0.546)
CEO_Emotion			0.252
			(0.558)
CEO_Conscientious			0.748
			(0.872)
CEO_Openness			0.416
			(0.773)
Size	-0.422***	-0.327***	-0.321***
	(0.047)	(0.073)	(0.073)
Leverage	1.135***	0.947**	0.942**
	(0.287)	(0.429)	(0.429)
MB	2.552	0.592	0.664
	(1.753)	(2.625)	(2.627)
ROA	-2.173***	-3.169***	-3.192***
	(0.516)	(0.723)	(0.724)
Accrual	-0.014	-0.016	-0.015
	(0.034)	(0.044)	(0.044)
Age	-0.184***	-0.166**	-0.175**
	(0.058)	(0.081)	(0.082)
R&D	-0.457	-2.458*	-2.495*
	(0.925)	(1.316)	(1.318)
CapExp	0.660	0.775	0.862
	(1.290)	(1.956)	(1.958)
Cash	0.665	0.627	0.556
	(0.474)	(0.680)	(0.682)
Competition	1.740	1.065	1.069
	(1.645)	(2.137)	(2.145)
Institution	-0.119	-0.381	-0.343
	(0.205)	(0.296)	(0.297)
Insider	-0.779	1.214	1.436
	(1.496)	(2.132)	(2.147)
Analyst	0.036	0.007	0.008
	(0.073)	(0.084)	(0.090)
Constant	8.377***	6.768***	3.397
	(0.560)	(1.029)	(3.247)
Fixed Effect	YES	YES	YES
N	3,542	3,542	3,542

R^2	0.256	0.256	0.257

Note: This table presents the OLS regression results for the effect of CEO's personality traits, measured by Big Five personality traits factors on the market reaction to management earnings forecasts. *MfFrequency* is the total number of earnings forecasts provided by a firm in a given year. *MfItems* is the total number of performance measures forecasted in addition to earnings contained in a forecast. *CEO_Extraversion* is the extraversion score of an CEO on his or her speech during the question-and-answer (Q&A) portion of a conference call. *CEO_Agreeableness* is the weighted average call-level measure of agreeableness. *CEO_Emotion* is the weighted average call-level measure of emotional stability. *CEO_Conscientious* is the weighted average call-level measure of conscientiousness. *CEO_Openness* is the weighted average call-level measure of openness. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable is *Abs_Mf_CAR,* the two-day abnormal cumulative return during the [0, +1] day earnings forecast window. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 19A – Robustness Tests – Excluding US from Global Full Sample

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample excluding US			
CMF	**0.007***** **(0.002)**	**0.007***** **(0.002)**	**0.006***** **(0.002)**	**0.004*** **(0.002)**
Size	0.039***	0.037***	0.033***	0.031***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.007***	0.006***	0.006***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)
MB	0.093***	0.093***	0.070***	0.040*
	(0.022)	(0.022)	(0.022)	(0.022)
ROA	-0.003	0.008*	0.005	0.003
	(0.005)	(0.004)	(0.004)	(0.004)
Accrual	0.002	0.001	0.001	-0.002
	(0.006)	(0.005)	(0.005)	(0.005)
Age	0.007***	0.005*	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
R&D	0.013**	0.006	0.002	0.003
	(0.005)	(0.005)	(0.005)	(0.005)
CapExp	0.065***	0.052***	0.031**	-0.003
	(0.015)	(0.014)	(0.014)	(0.014)
Cash	0.048***	0.056***	0.044***	0.028***
	(0.008)	(0.008)	(0.008)	(0.008)
Competition	-0.014	-0.003	-0.006	-0.007
	(0.016)	(0.016)	(0.016)	(0.016)
Institution	0.024**	0.039***	0.051***	0.050***
	(0.010)	(0.010)	(0.010)	(0.010)
Insider	-0.036*	-0.008	0.011	0.005
	(0.019)	(0.019)	(0.019)	(0.019)
Analyst	0.040***	0.043***	0.046***	0.044***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.165***	-0.143***	-0.114***	-0.086***
	(0.017)	(0.018)	(0.018)	(0.018)
Fixed Effect	YES	YES	YES	YES
N	103,542	103,542	103,542	103,542
R^2	0.277	0.277	0.276	0.274

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.016***** **(0.003)**	**0.013***** **(0.003)**	**0.011***** **(0.003)**	**0.012***** **(0.002)**
Size	0.022*** (0.001)	0.021*** (0.001)	0.018*** (0.001)	0.014*** (0.001)
Leverage	0.003 (0.002)	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)
MB	0.054* (0.032)	0.057* (0.031)	0.033 (0.029)	0.013 (0.026)
ROA	-0.012* (0.006)	-0.004 (0.006)	-0.003 (0.006)	-0.001 (0.005)
Accrual	0.010 (0.008)	0.009 (0.008)	0.002 (0.008)	-0.001 (0.007)
Age	0.001 (0.002)	-0.001 (0.002)	-0.001 (0.001)	-0.001 (0.001)
R&D	0.020*** (0.006)	0.028*** (0.006)	0.023*** (0.006)	0.014*** (0.005)
CapExp	0.051*** (0.020)	0.054*** (0.019)	0.055*** (0.018)	0.044*** (0.016)
Cash	0.064*** (0.010)	0.059*** (0.010)	0.047*** (0.009)	0.036*** (0.008)
Competition	0.010 (0.014)	0.005 (0.013)	0.003 (0.012)	0.002 (0.011)
Institution	0.037*** (0.012)	0.043*** (0.011)	0.039*** (0.010)	0.029*** (0.009)
Insider	0.011 (0.020)	0.008 (0.019)	0.028 (0.017)	0.019 (0.015)
Analyst	0.021*** (0.003)	0.020*** (0.003)	0.019*** (0.003)	0.018*** (0.002)
Constant	-0.096*** (0.012)	-0.078*** (0.011)	-0.042*** (0.010)	-0.028*** (0.009)
Fixed Effect	YES	YES	YES	YES
N	103,542	103,542	103,542	103,542
R^2	0.167	0.171	0.171	0.164

Note: This table presents the OLS regression results for robustness tests on the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. This table is based on global full sample but excluding US. *CMF* is the aggregated measure of management earnings forecasts. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 19B – Robustness Tests – Using Propensity Score Matching (PSM) Approach

Panel A – Measured by LnPatent – Global Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.015***** **(0.004)**	**0.011***** **(0.004)**	**0.011***** **(0.004)**	**0.016***** **(0.004)**
Size	0.094*** (0.003)	0.093*** (0.003)	0.091*** (0.003)	0.088*** (0.003)
Leverage	-0.015** (0.007)	-0.010 (0.007)	-0.011 (0.007)	0.002 (0.007)
MB	0.140*** (0.050)	0.149*** (0.049)	0.127*** (0.049)	0.037 (0.049)
ROA	-0.029* (0.015)	0.005 (0.015)	-0.004 (0.015)	-0.009 (0.015)
Accrual	-0.001 (0.005)	0.010* (0.005)	0.012** (0.005)	0.005 (0.005)
Age	0.010** (0.005)	0.009* (0.005)	0.007 (0.005)	0.007 (0.005)
R&D	0.036*** (0.012)	0.062*** (0.012)	0.024** (0.012)	0.025** (0.012)
CapExp	0.261*** (0.053)	0.209*** (0.052)	0.165*** (0.052)	0.164*** (0.052)
Cash	0.106*** (0.023)	0.156*** (0.023)	0.187*** (0.023)	0.141*** (0.023)
Competition	-0.044 (0.038)	-0.020 (0.038)	-0.010 (0.038)	-0.020 (0.038)
Institution	0.092*** (0.016)	0.129*** (0.015)	0.136*** (0.015)	0.158*** (0.015)
Insider	-0.158*** (0.050)	-0.144*** (0.049)	-0.078 (0.049)	-0.097** (0.049)
Analyst	0.041*** (0.007)	0.043*** (0.007)	0.042*** (0.007)	0.038*** (0.007)
Constant	-0.498*** (0.039)	-0.492*** (0.039)	-0.474*** (0.039)	-0.438*** (0.039)
Fixed Effect	YES	YES	YES	YES
N	40,740	40,740	40,740	40,740
R^2	0.274	0.276	0.277	0.272

Panel B – Measured by LnCitation – Global Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.096*****	**0.089*****	**0.076*****	**0.065*****
	(0.007)	**(0.007)**	**(0.006)**	**(0.005)**
Size	0.064***	0.060***	0.053***	0.040***
	(0.003)	(0.003)	(0.003)	(0.002)
Leverage	-0.053***	-0.049***	-0.048***	-0.039***
	(0.010)	(0.010)	(0.009)	(0.008)
MB	0.564***	0.383***	0.338***	0.169**
	(0.099)	(0.093)	(0.086)	(0.077)
ROA	-0.072***	-0.020	-0.028	-0.030
	(0.027)	(0.025)	(0.023)	(0.021)
Accrual	0.013	-0.002	0.004	0.002
	(0.013)	(0.013)	(0.012)	(0.010)
Age	0.005	0.004	0.001	0.001
	(0.004)	(0.004)	(0.003)	(0.003)
R&D	0.158***	0.142***	0.117***	0.082***
	(0.018)	(0.017)	(0.015)	(0.014)
CapExp	0.140*	0.221***	0.136*	0.111*
	(0.085)	(0.080)	(0.074)	(0.066)
Cash	0.371***	0.381***	0.332***	0.235***
	(0.037)	(0.034)	(0.032)	(0.028)
Competition	0.111***	0.116***	0.117***	0.098***
	(0.041)	(0.038)	(0.035)	(0.031)
Institution	0.202***	0.196***	0.181***	0.167***
	(0.019)	(0.017)	(0.016)	(0.014)
Insider	-0.227***	-0.177***	-0.100**	-0.125***
	(0.057)	(0.053)	(0.049)	(0.044)
Analyst	-0.001	0.006	0.001	0.002
	(0.006)	(0.005)	(0.005)	(0.004)
Constant	-0.415***	-0.401***	-0.269***	-0.193***
	(0.040)	(0.037)	(0.034)	(0.030)
Fixed Effect	YES	YES	YES	YES
N	40,740	40,740	40,740	40,740
R^2	0.194	0.186	0.173	0.160

Panel C – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.062*****	**0.049*****	**0.064*****	**0.055*****
	(0.012)	**(0.011)**	**(0.010)**	**(0.010)**
Size	0.084***	0.074***	0.071***	0.056***
	(0.007)	(0.006)	(0.005)	(0.005)
Leverage	-0.009	-0.011	-0.009	-0.012
	(0.010)	(0.010)	(0.009)	(0.009)
MB	0.185**	0.102	0.159**	0.022
	(0.085)	(0.082)	(0.078)	(0.073)
ROA	-0.039	-0.028	-0.073**	-0.029
	(0.034)	(0.032)	(0.030)	(0.028)
Accrual	0.004	0.005	0.003	0.007
	(0.007)	(0.006)	(0.006)	(0.006)
Age	0.016*	0.015*	0.013*	0.006
	(0.010)	(0.009)	(0.008)	(0.007)
R&D	0.036***	0.035***	0.013	0.018
	(0.013)	(0.013)	(0.012)	(0.011)
CapExp	0.218	0.270*	0.203	0.153
	(0.154)	(0.147)	(0.136)	(0.125)
Cash	0.362***	0.376***	0.415***	0.318***
	(0.060)	(0.056)	(0.052)	(0.048)
Competition	0.749***	0.663***	0.635***	0.595***
	(0.166)	(0.150)	(0.134)	(0.118)
Institution	0.236***	0.226***	0.211***	0.205***
	(0.034)	(0.031)	(0.028)	(0.025)
Insider	-0.303**	-0.275**	-0.208**	-0.165*
	(0.122)	(0.112)	(0.101)	(0.090)
Analyst	-0.126	-0.131	-0.128	-0.117
	(0.114)	(0.103)	(0.091)	(0.080)
Constant	-0.360***	-0.361***	-0.306***	-0.198***
	(0.080)	(0.073)	(0.066)	(0.059)
Fixed Effect	YES	YES	YES	YES
N	23,076	23,076	23,076	23,076
R^2	0.240	0.226	0.220	0.200

Panel D – Measured by LnCitation – US Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.062*****	**0.049*****	**0.064*****	**0.055*****
	(0.012)	**(0.011)**	**(0.010)**	**(0.010)**
Size	0.084***	0.074***	0.071***	0.056***
	(0.007)	(0.006)	(0.005)	(0.005)
Leverage	-0.009	-0.011	-0.009	-0.012
	(0.010)	(0.010)	(0.009)	(0.009)
MB	0.185**	0.102	0.159**	0.022
	(0.085)	(0.082)	(0.078)	(0.073)
ROA	-0.039	-0.028	-0.073**	-0.029
	(0.034)	(0.032)	(0.030)	(0.028)
Accrual	0.004	0.005	0.003	0.007
	(0.007)	(0.006)	(0.006)	(0.006)
Age	0.016*	0.015*	0.013*	0.006
	(0.010)	(0.009)	(0.008)	(0.007)
R&D	0.036***	0.035***	0.013	0.018
	(0.013)	(0.013)	(0.012)	(0.011)
CapExp	0.218	0.270*	0.203	0.153
	(0.154)	(0.147)	(0.136)	(0.125)
Cash	0.362***	0.376***	0.415***	0.318***
	(0.060)	(0.056)	(0.052)	(0.048)
Competition	0.749***	0.663***	0.635***	0.595***
	(0.166)	(0.150)	(0.134)	(0.118)
Institution	0.236***	0.226***	0.211***	0.205***
	(0.034)	(0.031)	(0.028)	(0.025)
Insider	-0.303**	-0.275**	-0.208**	-0.165*
	(0.122)	(0.112)	(0.101)	(0.090)
Analyst	-0.126	-0.131	-0.128	-0.117
	(0.114)	(0.103)	(0.091)	(0.080)
Constant	-0.360***	-0.361***	-0.306***	-0.198***
	(0.080)	(0.073)	(0.066)	(0.059)
Fixed Effect	YES	YES	YES	YES
N	23,076	23,076	23,076	23,076
R^2	0.240	0.226	0.220	0.200

Note: This table presents the OLS regression results for robustness tests on the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. This table is based on US full sample but using Propensity Score Matching approach. *CMF* is the aggregated measure of management earnings forecasts. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in panel A and C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 19C – Robustness Tests – Controlling for CEO Gender and Age

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.013****	**0.001**	**0.012****	**0.013****
	(0.006)	**(0.006)**	**(0.006)**	**(0.006)**
CEO_Age	0.003	0.006	0.038	0.034
	(0.050)	(0.050)	(0.049)	(0.048)
CEO_Male	-0.005	-0.006*	-0.006*	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
Size	0.114***	0.123***	0.089***	0.074***
	(0.014)	(0.014)	(0.014)	(0.014)
Leverage	-0.205***	-0.287***	-0.287***	-0.159***
	(0.054)	(0.053)	(0.052)	(0.051)
MB	0.319	0.594**	0.022	-0.154
	(0.251)	(0.248)	(0.243)	(0.239)
ROA	0.104	0.109*	0.076	0.091
	(0.066)	(0.065)	(0.064)	(0.063)
Accrual	0.002	0.009**	0.005	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Age	0.069**	0.066**	0.073***	0.055**
	(0.027)	(0.027)	(0.027)	(0.027)
R&D	3.450***	3.135***	2.382***	2.635***
	(0.247)	(0.244)	(0.241)	(0.238)
CapExp	0.313	0.063	-0.160	-0.024
	(0.196)	(0.193)	(0.189)	(0.186)
Cash	0.059	0.111	0.248***	0.117*
	(0.073)	(0.072)	(0.070)	(0.069)
Competition	-1.678***	-1.784***	-1.525***	-1.843***
	(0.441)	(0.438)	(0.434)	(0.429)
Institution	0.007	-0.013	0.016	0.049
	(0.044)	(0.043)	(0.042)	(0.042)
Insider	-0.592	-1.387***	-1.025**	-0.358
	(0.503)	(0.498)	(0.492)	(0.486)
Analyst	0.015	0.004	0.010	0.011
	(0.011)	(0.011)	(0.011)	(0.010)
Constant	-0.099	-0.010	0.187	0.261
	(0.236)	(0.237)	(0.238)	(0.237)
Fixed Effect	YES	YES	YES	YES
N	9,171	9,171	9,171	9,171
R^2	0.282	0.272	0.281	0.283

Panel B – Measured by LnCitation				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.066*****	**0.057*****	**0.070*****	**0.051*****
	(0.018)	**(0.017)**	**(0.016)**	**(0.015)**
CEO_Age	0.186	0.109	0.156	0.174
	(0.137)	(0.131)	(0.125)	(0.115)
CEO_Male	-0.005	-0.005	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
Size	0.099***	0.091***	0.087***	0.063***
	(0.023)	(0.021)	(0.020)	(0.018)
Leverage	-0.634***	-0.636***	-0.675***	-0.610***
	(0.132)	(0.125)	(0.119)	(0.108)
MB	1.748**	0.304	0.297	0.017
	(0.740)	(0.719)	(0.690)	(0.649)
ROA	0.054	0.015	-0.051	0.144
	(0.203)	(0.198)	(0.191)	(0.181)
Accrual	-0.008	-0.001	0.006	0.008
	(0.012)	(0.012)	(0.012)	(0.011)
Age	0.067**	0.051*	0.036	0.024
	(0.031)	(0.028)	(0.026)	(0.023)
R&D	7.300***	6.745***	5.927***	5.385***
	(0.446)	(0.418)	(0.390)	(0.347)
CapExp	-0.189	-0.335	-0.873*	-1.153***
	(0.504)	(0.481)	(0.456)	(0.418)
Cash	0.557***	0.523***	0.379**	0.169
	(0.206)	(0.199)	(0.190)	(0.178)
Competition	-1.868***	-2.068***	-2.290***	-1.728***
	(0.652)	(0.603)	(0.560)	(0.490)
Institution	0.092	0.037	0.066	0.062
	(0.100)	(0.095)	(0.089)	(0.081)
Insider	-0.381	-0.401	-0.298	-0.010
	(0.840)	(0.782)	(0.728)	(0.642)
Analyst	0.111***	0.134***	0.125***	0.117***
	(0.030)	(0.029)	(0.027)	(0.025)
Constant	-0.279	-0.135	-0.087	0.119
	(0.306)	(0.285)	(0.266)	(0.237)
Fixed Effect	YES	YES	YES	YES
N	9,171	9,171	9,171	9,171
R^2	0.289	0.290	0.287	0.293

Note: This table presents the OLS regression results for robustness tests on the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. This table is based on US full sample. *CMF* is the aggregated measure of management earnings forecasts. *LnPatent* is the natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year. *LnCitation* is the natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 19D – Robustness Tests – Using Alternative Measure of *Patent/Citation*

Panel A – Measured by LnAdjPatent – Global Sample

Dep. Var.	*LnAdjPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.011*****	**0.010*****	**0.012*****	**0.013*****
	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**
Size	0.020***	0.019***	0.018***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.026***	0.025***	0.015*	0.011
	(0.008)	(0.008)	(0.008)	(0.008)
ROA	-0.005***	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Accrual	0.001	0.002	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.005***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.006***	0.010***	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
CapExp	0.030***	0.022***	0.020***	0.015**
	(0.007)	(0.007)	(0.007)	(0.007)
Cash	0.023***	0.033***	0.036***	0.032***
	(0.003)	(0.003)	(0.003)	(0.004)
Competition	0.002	0.008	0.008	0.004
	(0.008)	(0.008)	(0.008)	(0.008)
Institution	0.054***	0.062***	0.068***	0.071***
	(0.004)	(0.004)	(0.004)	(0.004)
Insider	-0.022***	-0.013	-0.001	-0.007
	(0.008)	(0.008)	(0.008)	(0.009)
Analyst	0.006***	0.008***	0.011***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Constant	-0.085***	-0.081***	-0.074***	-0.073***
	(0.008)	(0.008)	(0.008)	(0.008)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.298	0.302	0.302	0.301

Panel B – Measured by LnAdjCitation – Global Sample

Dep. Var.	*LnAdjCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
CMF	**0.014*****	**0.010*****	**0.010*****	**0.010*****
	(0.002)	**(0.002)**	**(0.001)**	**(0.001)**
Size	0.022***	0.021***	0.019***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	-0.000	0.001	0.001**	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.041***	0.022**	0.024***	0.004
	(0.010)	(0.009)	(0.009)	(0.008)
ROA	-0.006***	-0.001	0.001	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)
Accrual	0.002	0.005***	0.006***	0.003**
	(0.002)	(0.002)	(0.002)	(0.001)
Age	0.004***	0.003**	0.002**	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.009***	0.009***	0.007***	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
CapExp	0.021***	0.001	0.005	0.002
	(0.008)	(0.008)	(0.007)	(0.007)
Cash	0.024***	0.026***	0.021***	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)
Competition	0.018**	0.021**	0.014*	0.007
	(0.009)	(0.009)	(0.008)	(0.008)
Institution	0.082***	0.082***	0.078***	0.071***
	(0.005)	(0.005)	(0.004)	(0.004)
Insider	-0.031***	-0.019**	-0.007	-0.005
	(0.010)	(0.009)	(0.009)	(0.008)
Analyst	0.006**	0.012***	0.012***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
Constant	-0.078***	-0.057***	-0.038***	-0.026***
	(0.008)	(0.008)	(0.008)	(0.007)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.242	0.237	0.230	0.219

Panel C – Measured by LnAdjCitation – US Sample				
Dep. Var.	*LnAdjCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.013*****	**0.005***	**0.004***	**0.010*****
	(0.003)	**(0.003)**	**(0.003)**	**(0.002)**
Size	0.030***	0.029***	0.027***	0.024***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	0.001	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.015*	0.003	0.013*	-0.001
	(0.008)	(0.007)	(0.007)	(0.007)
ROA	-0.006**	-0.003	0.001	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)
Accrual	0.001	0.002*	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.012***	0.010***	0.010***	0.009***
	(0.003)	(0.003)	(0.002)	(0.002)
R&D	0.003***	0.001	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.017	-0.011	-0.003	0.007
	(0.018)	(0.017)	(0.016)	(0.015)
Cash	0.015*	0.031***	0.029***	0.011*
	(0.008)	(0.008)	(0.007)	(0.007)
Competition	0.250***	0.240***	0.220***	0.160***
	(0.046)	(0.043)	(0.041)	(0.039)
Institution	0.116***	0.109***	0.100***	0.091***
	(0.009)	(0.008)	(0.008)	(0.007)
Insider	-0.056***	-0.041**	-0.015	-0.025
	(0.020)	(0.019)	(0.018)	(0.017)
Analyst	-0.015	-0.018	-0.018	-0.006
	(0.029)	(0.027)	(0.026)	(0.024)
Constant	-0.051**	-0.039**	-0.027	-0.020
	(0.020)	(0.019)	(0.018)	(0.017)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.261	0.252	0.242	0.232

Panel D – Measured by LnAdjCitation – US Sample

Dep. Var.	*LnAdjCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
CMF	**0.013*****	**0.005***	**0.004***	**0.010*****
	(0.003)	**(0.003)**	**(0.003)**	**(0.002)**
Size	0.030***	0.029***	0.027***	0.024***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	0.001	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
MB	0.015*	0.003	0.013*	-0.001
	(0.008)	(0.007)	(0.007)	(0.007)
ROA	-0.006**	-0.003	0.001	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)
Accrual	0.001	0.002*	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.012***	0.010***	0.010***	0.009***
	(0.003)	(0.003)	(0.002)	(0.002)
R&D	0.003***	0.001	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.017	-0.011	-0.003	0.007
	(0.018)	(0.017)	(0.016)	(0.015)
Cash	0.015*	0.031***	0.029***	0.011*
	(0.008)	(0.008)	(0.007)	(0.007)
Competition	0.250***	0.240***	0.220***	0.160***
	(0.046)	(0.043)	(0.041)	(0.039)
Institution	0.116***	0.109***	0.100***	0.091***
	(0.009)	(0.008)	(0.008)	(0.007)
Insider	-0.056***	-0.041**	-0.015	-0.025
	(0.020)	(0.019)	(0.018)	(0.017)
Analyst	-0.015	-0.018	-0.018	-0.006
	(0.029)	(0.027)	(0.026)	(0.024)
Constant	-0.051**	-0.039**	-0.027	-0.020
	(0.020)	(0.019)	(0.018)	(0.017)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.261	0.252	0.242	0.232

Note: This table presents the OLS regression results for robustness tests on the effect of earnings forecasts, measured by aggregated measure of earnings forecast, on corporate innovation output. This table is based on US full sample. *CMF* is the aggregated measure of management earnings forecasts. *LnAdjPatent is* the natural logarithm of one plus patent counts adjusted for truncation bias. *LnAdjCiation* is the natural logarithm of one plus citation counts adjusted for trucation bias. The dependent variable in Panel A and Panel C is *LnAdjPatent*. The dependent variable in Panel B and Panel D is *LnAdjCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 20A – CEO-level Cross-sectional Tests on CEO's Working Experience

Panel A – Measured by LnPatent – Global Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
WorkExp	0.017***	0.017***	0.018***	0.018***
	(0.002)	(0.002)	(0.002)	(0.002)
CMF	-0.003	-0.001	0.001	-0.001
	(0.007)	(0.007)	(0.007)	(0.007)
CMF* × *WorkExp	**0.005*** **	**0.004*** **	**0.003** **	**0.004*** **
	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**
Size	0.046***	0.044***	0.040***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.053***	0.050***	0.038***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.008**	0.004	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.005**	0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.009***	0.008***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.055***	0.040***	0.021*	0.007
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.039***	0.054***	0.048***	0.038***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.005	0.004	0.004	-0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.088***	0.104***	0.114***	0.115***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.052***	-0.026*	-0.007	-0.017
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.028***	0.032***	0.035***	0.031***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.257***	-0.242***	-0.218***	-0.200***
	(0.020)	(0.020)	(0.020)	(0.020)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.259	0.258	0.255	0.252

Panel B – Measured by LnCitation – Global Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
WorkExp	0.003	0.003*	0.001	0.001
	(0.002)	(0.002)	(0.001)	(0.001)
CMF	-0.014	-0.021*	-0.044***	-0.016*
	(0.012)	(0.011)	(0.010)	(0.009)
CMF* × *WorkExp	**0.017*** (0.002)**	**0.015*** (0.002)**	**0.020*** (0.002)**	**0.013*** (0.002)**
Size	0.032***	0.030***	0.026***	0.020***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003**	-0.003**	-0.002	-0.002**
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.092***	0.059**	0.042*	-0.003
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.017***	-0.008	-0.002	-0.006
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007	0.004	0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.032***	0.033***	0.027***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.027	0.024	0.033*	0.019
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.078***	0.089***	0.078***	0.055***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.040**	0.035**	0.030*	0.027**
	(0.018)	(0.017)	(0.016)	(0.013)
Institution	0.199***	0.191***	0.169***	0.154***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.049**	-0.040*	-0.013	-0.016
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.004	-0.001	0.002	0.003
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.118***	-0.103***	-0.055***	-0.037***
	(0.017)	(0.015)	(0.014)	(0.012)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.209	0.201	0.198	0.187

Panel C – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
WorkExp	0.001	0.001	-0.001	-0.002
	(0.005)	(0.004)	(0.004)	(0.003)
CMF	0.132***	0.145***	0.189***	0.134***
	(0.042)	(0.039)	(0.037)	(0.033)
***CMF* ×**	**0.040*** **	**0.038*** **	**0.049*** **	**0.037*** **
WorkExp	**(0.008)**	**(0.008)**	**(0.007)**	**(0.006)**
Size	0.052***	0.047***	0.043***	0.034***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.046	0.025	0.047	0.015
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.103***	0.143***	0.136***	0.094***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.412***	0.365***	0.333***	0.292***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.277***	0.266***	0.224***	0.222***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.140**	-0.114**	-0.072	-0.069
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.078	-0.086	-0.091	-0.091
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.080*	-0.070	-0.021	0.004
	(0.047)	(0.043)	(0.039)	(0.035)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.241	0.229	0.224	0.210

Panel D – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
WorkExp	0.001	0.001	-0.001	-0.002
	(0.005)	(0.004)	(0.004)	(0.003)
CMF	0.132***	0.145***	0.189***	0.134***
	(0.042)	(0.039)	(0.037)	(0.033)
***CMF* ×**	**0.040*****	**0.038*****	**0.049*****	**0.037*****
WorkExp	**(0.008)**	**(0.008)**	**(0.007)**	**(0.006)**
Size	0.052***	0.047***	0.043***	0.034***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.046	0.025	0.047	0.015
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.103***	0.143***	0.136***	0.094***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.412***	0.365***	0.333***	0.292***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.277***	0.266***	0.224***	0.222***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.140**	-0.114**	-0.072	-0.069
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.078	-0.086	-0.091	-0.091
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.080*	-0.070	-0.021	0.004
	(0.047)	(0.043)	(0.039)	(0.035)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.241	0.229	0.224	0.210

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with CEO's working experience based on US full sample. *CMF* is an aggregated measure of earnings forecast properties. *WorkExp* is the number of words of the CEO biographical information for a given CEO. The dependent variable in panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 20B – CEO-level Cross-sectional Tests on CEO's Education Background

Panel A – Measured by LnPatent – Global Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
EduBack	0.042***	0.044***	0.045***	0.043***
	(0.005)	(0.005)	(0.005)	(0.005)
CMF	0.016***	0.013***	0.013***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
CMF **×**	**0.005***	**0.003**	**0.005****	**0.013*****
EduBack	**(0.003)**	**(0.003)**	**(0.003)**	**(0.002)**
Size	0.046***	0.044***	0.040***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.053***	0.050***	0.038***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.008***	0.004	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.005**	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.013***	0.010***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.055***	0.040***	0.022*	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.040***	0.054***	0.048***	0.038***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.005	0.005	0.004	-0.000
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.089***	0.105***	0.115***	0.116***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.051***	-0.026*	-0.007	-0.016
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.030***	0.033***	0.036***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.197***	-0.182***	-0.155***	-0.134***
	(0.017)	(0.018)	(0.018)	(0.018)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.260	0.259	0.257	0.254

Panel B – Measured by LnCitation – Global Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
EduBack	0.018***	0.016***	0.013***	0.008***
	(0.004)	(0.003)	(0.003)	(0.003)
CMF	0.031***	0.013***	0.018***	0.015***
	(0.005)	(0.005)	(0.005)	(0.004)
CMF **×**	**0.039*** **	**0.039*** **	**0.036*** **	**0.037*** **
EduBack	**(0.004)**	**(0.004)**	**(0.003)**	**(0.003)**
Size	0.031***	0.029***	0.026***	0.019***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003**	-0.003**	-0.002*	-0.002**
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.091***	0.058**	0.041*	-0.004
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.017***	-0.008	-0.002	-0.006
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007	0.004	0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.002	0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.032***	0.033***	0.026***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.027	0.024	0.032*	0.018
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.076***	0.087***	0.076***	0.053***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.042**	0.037**	0.032**	0.028**
	(0.018)	(0.017)	(0.016)	(0.013)
Institution	0.198***	0.189***	0.169***	0.152***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.047**	-0.039*	-0.012	-0.014
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.002	0.001	0.002	0.005
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.108***	-0.092***	-0.050***	-0.032***
	(0.015)	(0.014)	(0.013)	(0.011)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.213	0.205	0.200	0.190

Panel C – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
EduBack	0.024***	0.023***	0.016**	0.010*
	(0.008)	(0.008)	(0.007)	(0.006)
CMF	0.024*	0.025*	0.016	0.011
	(0.012)	(0.012)	(0.011)	(0.010)
CMF* × *EduBack	**0.040*** **	**0.037*** **	**0.038*** **	**0.038*** **
	(0.008)	**(0.007)**	**(0.007)**	**(0.006)**
Size	0.051***	0.046***	0.042***	0.033***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014*	-0.007	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.010*	0.007	0.004	0.002
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.043	0.023	0.044	0.012
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.100***	0.140***	0.133***	0.092***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.412***	0.366***	0.338***	0.297***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.278***	0.267***	0.225***	0.224***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.143**	-0.117**	-0.076	-0.072
	(0.057)	(0.053)	(0.049)	(0.045)
Analyst	-0.082	-0.089	-0.095	-0.094
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.088**	-0.078**	-0.036	-0.007
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.243	0.231	0.224	0.210

Panel D – Measured by LnCitation – US Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
EduBack	0.024***	0.023***	0.016**	0.010*
	(0.008)	(0.008)	(0.007)	(0.006)
CMF	0.024*	0.025*	0.016	0.011
	(0.012)	(0.012)	(0.011)	(0.010)
CMF* × *EduBack	**0.040*** **	**0.037*** **	**0.038*** **	**0.038*** **
	(0.008)	**(0.007)**	**(0.007)**	**(0.006)**
Size	0.051***	0.046***	0.042***	0.033***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014*	-0.007	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.010*	0.007	0.004	0.002
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.043	0.023	0.044	0.012
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.100***	0.140***	0.133***	0.092***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.412***	0.366***	0.338***	0.297***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.278***	0.267***	0.225***	0.224***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.143**	-0.117**	-0.076	-0.072
	(0.057)	(0.053)	(0.049)	(0.045)
Analyst	-0.082	-0.089	-0.095	-0.094
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.088**	-0.078**	-0.036	-0.007
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.243	0.231	0.224	0.210

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with CEO's education background based on US full sample. *CMF* is an aggregated measure of earnings forecast properties. *EduBack* is the number of university or college degrees holding by a given CEO. The dependent variable in panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on global sample. Panel C and D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 21A – Firm-level Cross-sectional Tests on Choice of Big Four Auditor

Panel A – Measured by LnPatent – Global Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
Big4	0.018***	0.016***	0.008***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
CMF	0.001	-0.001	-0.001	0.006
	(0.004)	(0.004)	(0.004)	(0.004)
CMF* × *Big4	**0.027*** (0.005)**	**0.023*** (0.005)**	**0.025*** (0.005)**	**0.017*** (0.005)**
Size	0.045***	0.044***	0.040***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.053***	0.050***	0.037***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.008***	0.003	0.002	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.005**	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.010***	0.008***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.055***	0.041***	0.022*	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.040***	0.054***	0.049***	0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.004	0.005	0.004	0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Institution	0.089***	0.106***	0.117***	0.118***
	(0.008)	(0.008)	(0.008)	(0.008)
Insider	-0.051***	-0.026*	-0.007	-0.017
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.030***	0.033***	0.036***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.187***	-0.171***	-0.143***	-0.124***
	(0.017)	(0.018)	(0.018)	(0.018)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.260	0.259	0.256	0.253

Panel B – Measured by LnCitation – Global Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
Big4	0.028***	0.024***	0.016***	0.016***
	(0.005)	(0.005)	(0.004)	(0.004)
CMF	0.016**	0.004	0.016**	0.008
	(0.007)	(0.007)	(0.007)	(0.006)
CMF* × *Big4	**0.062***** **(0.008)**	**0.056***** **(0.008)**	**0.042***** **(0.007)**	**0.050***** **(0.007)**
Size	0.029***	0.027***	0.025***	0.018***
	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.003**	-0.003**	-0.002*	-0.003**
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.090***	0.057**	0.041*	-0.004
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.017***	-0.008	-0.002	-0.005
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007	0.004	0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.032***	0.033***	0.026***	0.016***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.027	0.025	0.033*	0.019
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.075***	0.087***	0.075***	0.052***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.043**	0.038**	0.033**	0.029**
	(0.018)	(0.017)	(0.016)	(0.013)
Institution	0.194***	0.186***	0.168***	0.150***
	(0.011)	(0.010)	(0.009)	(0.008)
Insider	-0.045**	-0.037*	-0.010	-0.013
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.004	-0.001	0.001	0.003
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.106***	-0.090***	-0.049***	-0.032***
	(0.015)	(0.014)	(0.013)	(0.011)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.210	0.202	0.197	0.188

Panel C – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Big4	0.093***	0.087***	0.060***	0.047***
	(0.017)	(0.016)	(0.015)	(0.014)
CMF	0.009**	0.006**	0.014**	0.002
	(0.004)	(0.003)	(0.007)	(0.013)
CMF* × *Big4	**0.081***** **(0.017)**	**0.072***** **(0.016)**	**0.061***** **(0.015)**	**0.068***** **(0.014)**
Size	0.041***	0.037***	0.036***	0.028***
	(0.004)	(0.004)	(0.004)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014	-0.007	0.001	-0.005
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.043	0.023	0.045	0.014
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.094***	0.134***	0.128***	0.086***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.443***	0.396***	0.360***	0.313***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.251***	0.242***	0.206***	0.204***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.129**	-0.104*	-0.067	-0.063
	(0.057)	(0.053)	(0.049)	(0.045)
Analyst	-0.086	-0.094	-0.099	-0.097
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.066	-0.057	-0.021	0.004
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.243	0.230	0.224	0.211

Panel D – Measured by LnCitation – US Sample

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Big4	0.093***	0.087***	0.060***	0.047***
	(0.017)	(0.016)	(0.015)	(0.014)
CMF	0.009**	0.006**	0.014**	0.002
	(0.004)	(0.003)	(0.007)	(0.013)
CMF* × *Big4	**0.081*** **	**0.072*** **	**0.061*** **	**0.068*** **
	(0.017)	**(0.016)**	**(0.015)**	**(0.014)**
Size	0.041***	0.037***	0.036***	0.028***
	(0.004)	(0.004)	(0.004)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.014	-0.007	0.001	-0.005
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.043	0.023	0.045	0.014
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.094***	0.134***	0.128***	0.086***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.443***	0.396***	0.360***	0.313***
	(0.098)	(0.091)	(0.082)	(0.072)
Institution	0.251***	0.242***	0.206***	0.204***
	(0.023)	(0.022)	(0.020)	(0.018)
Insider	-0.129**	-0.104*	-0.067	-0.063
	(0.057)	(0.053)	(0.049)	(0.045)
Analyst	-0.086	-0.094	-0.099	-0.097
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.066	-0.057	-0.021	0.004
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.243	0.230	0.224	0.211

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with firm's choice on big four auditor based on US full sample. *CMF* is an aggregated measure of earnings forecast properties. *Big4* is an indicator variable which equals to 1 if a firm hires an auditor from big four firms, otherwise equals to 0. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 21B – Firm-level Cross-sectional Tests on Institutional Ownership

Panel A – Measured by LnPatent – Global Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
Institution	0.079***	0.097***	0.104***	0.104***
	(0.008)	(0.008)	(0.008)	(0.008)
CMF	0.002	0.000	-0.002	-0.004
	(0.004)	(0.003)	(0.003)	(0.003)
CMF* × *Institution	**0.047***** **(0.007)**	**0.041***** **(0.007)**	**0.051***** **(0.007)**	**0.057***** **(0.006)**
Size	0.047***	0.045***	0.041***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.054***	0.050***	0.038***	0.018
	(0.015)	(0.014)	(0.014)	(0.014)
ROA	-0.009***	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Accrual	0.001	0.005**	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age	0.012***	0.010***	0.008***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
R&D	0.009***	0.009***	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
CapExp	0.056***	0.041***	0.022*	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Cash	0.041***	0.055***	0.049***	0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
Competition	-0.005	0.005	0.004	-0.001
	(0.015)	(0.015)	(0.015)	(0.015)
Insider	-0.051***	-0.025	-0.006	-0.015
	(0.016)	(0.015)	(0.015)	(0.015)
Analyst	0.030***	0.033***	0.037***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	-0.185***	-0.169***	-0.141***	-0.122***
	(0.017)	(0.018)	(0.018)	(0.018)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.261	0.260	0.257	0.254

Panel B – Measured by LnCitation – Global Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	Global Full Sample			
Institution	0.146***	0.146***	0.121***	0.115***
	(0.011)	(0.011)	(0.010)	(0.009)
CMF	-0.001	-0.007	-0.009*	0.001
	(0.006)	(0.006)	(0.005)	(0.005)
CMF* × *Institution	**0.156*** **	**0.131*** **	**0.137*** **	**0.109*** **
	(0.011)	**(0.010)**	**(0.009)**	**(0.008)**
Size	0.033***	0.031***	0.027***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	-0.003**	-0.003**	-0.002*	-0.002**
	(0.002)	(0.001)	(0.001)	(0.001)
MB	0.091***	0.058**	0.041*	-0.003
	(0.026)	(0.025)	(0.023)	(0.021)
ROA	-0.018***	-0.008	-0.003	-0.006
	(0.005)	(0.005)	(0.005)	(0.004)
Accrual	0.004	0.007	0.004	0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Age	0.003	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
R&D	0.033***	0.034***	0.027***	0.017***
	(0.005)	(0.005)	(0.004)	(0.004)
CapExp	0.029	0.026	0.034*	0.020
	(0.021)	(0.020)	(0.019)	(0.017)
Cash	0.079***	0.090***	0.078***	0.055***
	(0.010)	(0.010)	(0.009)	(0.008)
Competition	0.042**	0.037**	0.033**	0.029**
	(0.018)	(0.017)	(0.015)	(0.013)
Insider	-0.043*	-0.036*	-0.008	-0.012
	(0.022)	(0.021)	(0.019)	(0.017)
Analyst	-0.001	0.002	0.004	0.005*
	(0.005)	(0.004)	(0.004)	(0.003)
Constant	-0.102***	-0.088***	-0.046***	-0.030***
	(0.015)	(0.014)	(0.013)	(0.011)
Fixed Effect	YES	YES	YES	YES
N	151,456	151,456	151,456	151,456
R^2	0.215	0.207	0.203	0.192

Panel C – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Institution	0.225***	0.233***	0.169***	0.183***
	(0.025)	(0.024)	(0.022)	(0.020)
CMF	0.008	0.006	-0.004	0.009
	(0.014)	(0.013)	(0.012)	(0.011)
CMF* × *Institution	**0.113*** **	**0.076*** **	**0.116*** **	**0.081*** **
	(0.020)	**(0.019)**	**(0.018)**	**(0.017)**
Size	0.055***	0.049***	0.046***	0.036***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050*	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.047	0.026	0.048	0.016
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.105***	0.145***	0.138***	0.096***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.428***	0.382***	0.350***	0.305***
	(0.098)	(0.091)	(0.082)	(0.072)
Insider	-0.135**	-0.111**	-0.069	-0.067
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.084	-0.091	-0.098	-0.095
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.074*	-0.065*	-0.027	-0.003
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.242	0.229	0.224	0.210

Panel D – Measured by LnCitation – US Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Institution	0.225***	0.233***	0.169***	0.183***
	(0.025)	(0.024)	(0.022)	(0.020)
CMF	0.008	0.006	-0.004	0.009
	(0.014)	(0.013)	(0.012)	(0.011)
***CMF* ×**	**0.113*** **	**0.076*** **	**0.116*** **	**0.081*** **
Institution	**(0.020)**	**(0.019)**	**(0.018)**	**(0.017)**
Size	0.055***	0.049***	0.046***	0.036***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050*	0.019	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.047	0.026	0.048	0.016
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.105***	0.145***	0.138***	0.096***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.428***	0.382***	0.350***	0.305***
	(0.098)	(0.091)	(0.082)	(0.072)
Insider	-0.135**	-0.111**	-0.069	-0.067
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.084	-0.091	-0.098	-0.095
	(0.079)	(0.075)	(0.068)	(0.062)
Constant	-0.074*	-0.065*	-0.027	-0.003
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.242	0.229	0.224	0.210

Note: This table examines whether the effect of earnings forecasts properties on corporate innovation output varies with the level of institutional ownership based on US full sample. *CMF* is an aggregated measure of earnings forecast properties. *Institution* is the percentage of a firm's shares held by institutional investors at the end of each year. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on global sample. Panel C and Panel D is based on US sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 22 – Corporate Innovation, Management Earnings Forecast and R&D Capital

Panel A – Measured by LnPatent – Full Sample

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
R&D	0.001	0.001	-0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CMF	0.016***	0.008**	0.015***	0.018***
	(0.004)	(0.004)	(0.004)	(0.004)
CMF* × *R&D	**0.012****	**0.009***	**0.011****	**0.001**
	(0.005)	**(0.005)**	**(0.005)**	**(0.005)**
Size	0.058***	0.057***	0.053***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.004	-0.004
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.011***	-0.002	-0.002	0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.019***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
CapExp	0.051**	0.025	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.023**	0.045***	0.051***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.191**	0.216***	0.238***	0.189**
	(0.075)	(0.074)	(0.074)	(0.074)
Insider	0.132***	0.153***	0.159***	0.163***
	(0.012)	(0.012)	(0.012)	(0.012)
Institution	-0.066**	-0.043	-0.023	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.021	-0.011	-0.017	-0.015
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.172***	-0.164***	-0.142***	-0.143***
	(0.037)	(0.037)	(0.037)	(0.037)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.249	0.247	0.243	0.240

Panel B – Measured by LnCitation – Full Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
R&D	0.008***	0.003	0.002	-0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
CMF	0.066***	0.045***	0.057***	0.048***
	(0.009)	(0.008)	(0.008)	(0.007)
CMF* × *R&D	**0.036*** (0.014)**	**0.036*** (0.013)**	**0.018 (0.013)**	**0.063*** (0.012)**
Size	0.052***	0.047***	0.044***	0.034***
	(0.004)	(0.003)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.050**	0.020	0.031	-0.010
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.015*	-0.008	0.001	-0.006
	(0.008)	(0.008)	(0.008)	(0.007)
Accrual	0.001	0.003	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.009	0.006	0.004	0.001
	(0.006)	(0.005)	(0.005)	(0.004)
CapExp	0.046	0.026	0.047	0.016
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.104***	0.145***	0.136***	0.095***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.429***	0.383***	0.350***	0.306***
	(0.098)	(0.091)	(0.082)	(0.072)
Insider	0.283***	0.272***	0.229***	0.226***
	(0.023)	(0.021)	(0.020)	(0.018)
Institution	-0.142**	-0.116**	-0.076	-0.072
	(0.057)	(0.053)	(0.049)	(0.045)
Analyst	-0.084	-0.091	-0.097	-0.097
	(0.079)	(0.074)	(0.068)	(0.062)
Constant	-0.075*	-0.065*	-0.027	-0.003
	(0.042)	(0.039)	(0.035)	(0.031)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.239	0.227	0.220	0.209

Panel C – Measured by LnPatent – MF Sample				
Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
R&D	-0.005	-0.015	-0.036***	0.015
	(0.012)	(0.012)	(0.011)	(0.011)
CMF	0.006	-0.001	0.003	0.006
	(0.007)	(0.007)	(0.007)	(0.007)
CMF* × *R&D	**0.034*** **	**0.032*** **	**0.021***	**-0.011**
	(0.012)	**(0.012)**	**(0.012)**	**(0.012)**
Size	0.123***	0.125***	0.110***	0.106***
	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	0.005	0.008	0.006	0.005
	(0.006)	(0.006)	(0.006)	(0.006)
MB	0.006	0.055	-0.003	-0.026
	(0.048)	(0.047)	(0.046)	(0.045)
ROA	-0.034*	-0.017	-0.012	-0.046**
	(0.019)	(0.019)	(0.019)	(0.019)
Accrual	-0.001	0.008***	0.003	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.045***	0.041***	0.047***	0.050***
	(0.012)	(0.012)	(0.012)	(0.012)
CapExp	0.232**	0.212*	-0.015	0.055
	(0.118)	(0.116)	(0.113)	(0.113)
Cash	0.060	0.060	0.176***	0.102**
	(0.044)	(0.043)	(0.042)	(0.042)
Competition	0.200	0.124	0.165	0.202
	(0.181)	(0.181)	(0.180)	(0.180)
Insider	0.125***	0.145***	0.198***	0.205***
	(0.030)	(0.030)	(0.029)	(0.029)
Institution	-0.406***	-0.381***	-0.288**	-0.323***
	(0.125)	(0.124)	(0.123)	(0.123)
Analyst	-0.114	-0.101	-0.091	-0.079
	(0.093)	(0.091)	(0.090)	(0.090)
Constant	-0.874***	-0.889***	-0.836***	-0.820***
	(0.107)	(0.108)	(0.108)	(0.108)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.269	0.270	0.269	0.264

Panel D – Measured by LnCitation – MF Sample				
Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US MF Sample			
R&D	0.023	0.001	-0.007	0.007
	(0.026)	(0.025)	(0.024)	(0.023)
CMF	0.054***	0.035**	0.035**	0.041***
	(0.018)	(0.017)	(0.016)	(0.015)
CMF* × *R&D	**0.041**	**0.060****	**0.062****	**0.090*****
	(0.030)	**(0.029)**	**(0.029)**	**(0.026)**
Size	0.103***	0.097***	0.086***	0.076***
	(0.009)	(0.008)	(0.008)	(0.006)
Leverage	-0.004	-0.006	-0.005	-0.007
	(0.011)	(0.010)	(0.010)	(0.009)
MB	0.299**	0.204*	0.287***	0.186*
	(0.121)	(0.118)	(0.111)	(0.107)
ROA	-0.077*	-0.052	-0.056	-0.048
	(0.041)	(0.039)	(0.037)	(0.035)
Accrual	0.008	0.003	-0.006	0.008
	(0.010)	(0.010)	(0.009)	(0.009)
Age	0.014	0.009	0.005	-0.001
	(0.014)	(0.013)	(0.011)	(0.010)
CapExp	0.271	0.475**	0.173	0.037
	(0.256)	(0.241)	(0.225)	(0.205)
Cash	0.415***	0.422***	0.520***	0.403***
	(0.095)	(0.089)	(0.083)	(0.075)
Competition	0.696***	0.728***	0.691***	0.717***
	(0.225)	(0.201)	(0.184)	(0.156)
Insider	0.316***	0.291***	0.290***	0.271***
	(0.047)	(0.043)	(0.039)	(0.033)
Institution	-0.416**	-0.414**	-0.288*	-0.257*
	(0.181)	(0.164)	(0.151)	(0.132)
Analyst	-0.187	-0.178	-0.159	-0.152
	(0.148)	(0.133)	(0.121)	(0.100)
Constant	-0.668***	-0.676***	-0.543***	-0.449***
	(0.122)	(0.111)	(0.101)	(0.088)
Fixed Effect	YES	YES	YES	YES
N	13,981	13,981	13,981	13,981
R^2	0.225	0.219	0.212	0.197

Note: This table examines the role of R&D in the relation between commitments to better voluntary disclosure practices and corporate innovation. *CMF* is an aggregated measure of earnings forecast properties. *R&D* is firm's R&D capital, which is calculated as *RDEXPt* +0.8×*RDEXPt−1* +0.6×*RDEXPt−2* +0.4×*RDEXPt−3* +0.2×*RDEXPt-4*, where *RDEXP* is R&D expenditure in millions. The dependent variable in Panel A and Panel C is *LnPatent*. The dependent variable in Panel B and Panel D is *LnCitation*. Panel A and Panel B is based on US full sample. Panel C and Panel D is based on US MF sample. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 23 – Corporate Innovation, Management Earnings Forecast and Firm Performance

Panel A – Measured by LnPatent

Dep. Var.	*LnPatent*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Loss	0.005	0.005	0.010**	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)
CMF	0.015***	0.012***	0.020***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)
CMF* × *Loss	**-0.010****	**-0.011****	**-0.016*****	**0.001**
	(0.005)	**(0.005)**	**(0.005)**	**(0.005)**
Size	0.059***	0.057***	0.053***	0.049***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
MB	0.006	0.002	0.004	-0.004
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	-0.010***	-0.001	-0.001	0.001
	(0.004)	(0.004)	(0.003)	(0.003)
Accrual	-0.001	0.003**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.023***	0.020***	0.018***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)
R&D	0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CapExp	0.051**	0.025	0.011	0.048**
	(0.024)	(0.023)	(0.023)	(0.023)
Cash	0.023**	0.044***	0.050***	0.052***
	(0.011)	(0.010)	(0.010)	(0.010)
Competition	0.191**	0.215***	0.237***	0.188**
	(0.075)	(0.075)	(0.074)	(0.074)
Insider	0.133***	0.152***	0.158***	0.162***
	(0.012)	(0.012)	(0.012)	(0.012)
Institution	-0.065**	-0.042	-0.022	-0.033
	(0.027)	(0.027)	(0.027)	(0.026)
Analyst	-0.020	-0.011	-0.017	-0.015
	(0.039)	(0.039)	(0.038)	(0.038)
Constant	-0.177***	-0.168***	-0.151***	-0.142***
	(0.037)	(0.037)	(0.038)	(0.038)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.248	0.247	0.243	0.240

Panel B – Measured by LnCitation

Dep. Var.	*LnCitation*			
Window	***t***	***t+1***	***t+2***	***t+3***
	(1)	(2)	(3)	(4)
Sample	US Full Sample			
Loss	0.039***	0.047***	0.065***	0.032***
	(0.012)	(0.012)	(0.011)	(0.010)
CMF	0.076***	0.060***	0.075***	0.057***
	(0.010)	(0.009)	(0.009)	(0.008)
***CMF* ×**	**-0.039*** **	**-0.037*** **	**-0.050*** **	**-0.011**
Loss	**(0.013)**	**(0.013)**	**(0.012)**	**(0.012)**
Size	0.054***	0.049***	0.047***	0.035***
	(0.004)	(0.004)	(0.003)	(0.003)
Leverage	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
MB	0.051**	0.020	0.032	-0.009
	(0.025)	(0.024)	(0.023)	(0.022)
ROA	-0.009	-0.001	0.010	-0.001
	(0.009)	(0.008)	(0.008)	(0.007)
Accrual	-0.001	0.002	0.001	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.010*	0.007	0.005	0.002
	(0.006)	(0.005)	(0.005)	(0.004)
R&D	0.009***	0.004	0.002	-0.004
	(0.003)	(0.003)	(0.003)	(0.002)
CapExp	0.047	0.026	0.048	0.016
	(0.057)	(0.054)	(0.051)	(0.048)
Cash	0.102***	0.142***	0.133***	0.093***
	(0.025)	(0.023)	(0.022)	(0.020)
Competition	0.430***	0.384***	0.352***	0.306***
	(0.098)	(0.091)	(0.082)	(0.072)
Insider	0.287***	0.275***	0.233***	0.229***
	(0.023)	(0.022)	(0.020)	(0.018)
Institution	-0.134**	-0.108**	-0.064	-0.065
	(0.057)	(0.054)	(0.049)	(0.045)
Analyst	-0.080	-0.088	-0.094	-0.093
	(0.079)	(0.075)	(0.069)	(0.062)
Constant	-0.109**	-0.106***	-0.084**	-0.031
	(0.043)	(0.040)	(0.036)	(0.032)
Fixed Effect	YES	YES	YES	YES
N	47,914	47,914	47,914	47,914
R^2	0.239	0.227	0.221	0.207

Note: This table examines the role of firm performance in the relation between commitments to better voluntary disclosure practices and corporate innovation. *CMF* is an aggregated measure of earnings forecast properties. *Loss* is an indicator variable, which equals to 1 if a firm is experiencing loss in the current period, otherwise equals to 0. The dependent variable in Panel A is *LnPatent*. The dependent variable in Panel B is *LnCitation*. All continuous variables are winsorized at the 1st and 99th percentiles. Year, industry and country fixed effected are controlled in all regressions. All of the other variables are defined in Appendix A. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

References

Acs, Z. J., and B. D. Audretsch. 1987. Innovation, market structure, and firm size. *The Review of Economics and Statistics* 69(4): 567–574.

Adhikari, B. K., and A. Agrawal. 2016. Religion, gambling attitudes and corporate innovation. *Journal of Corporate Finance* 37(c): 229–248.

Aggarwal, V. A., and D. H. Hsu. 2014. Entrepreneurial exits and innovation. *Management Science* 60(4): 805–1081.

Aghion, P., and J. Tirole. 1994. The management of innovation. *Quarterly Journal of Economics* 109(4): 1185–1209.

Aghion, P., N. Bloom, R. Blundell, R. Griffith, and P. Howitt. 2005. Competition and innovation: An inverted-U relationship. *The Quarterly Journal of Economics* 120(2): 701–728.

Aghion, P., J. V. Reenen, and L. Zingales. 2013. Innovation and institutional ownership. *American Economic Review* 103(1): 277–304.

Ahmed, A., and S. Duellman. 2013. Managerial overconfidence and accounting conservatism. *Journal of Accounting Research* 51 (1): 1–30.

Ajinkya, B., and M. Gift. 1984. Corporate managers' earnings forecasts and symmetrical adjustments of market expectations. *Journal of Accounting Research* 22(2):425–444.

Ajinkya, B., S. Bhojraj, and P. Sengupta. 2005. The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of Accounting Research* 43 (3): 343–376.

Alford, A., J. Jones, R. Leftwich, and M. Zmijewski. 1993. Relative informativeness of accounting disclosures in different countries. *Journal of Accounting Research* 31(Supplement): 183–223.

Ali, A., and L. Hwang. 2000. Country-specific factors related to financial reporting and the value relevance of accounting data. *Journal of Accounting Research* 38(1): 1–21.

Anglim, J., and P. O' Connor. 2018. Measurement and research using the big five, HEXACO, and narrow traits: A primer for researchers and practitioners. *Australian Journal of Psychology* 71(1):16-25.

Atiase, R. K., H. Li, S. Supattarakul, and S. Tse. 2005. Market reaction to multiple contemporaneous earnings signals: Earnings announcements and future earnings guidance. *Review of Accounting Studies* 10(4): 497–525.

Baginski, S. P., E. J. Conrad, and J. M. Hassell. 1993. The effects of management forecast precision on equity pricing and on the assessment of earnings uncertainty. *The Accounting Review* 68(4): 913–927.

Baginski, S. P., and J. M. Hassell. 1990. The market interpretation of management earnings forecasts as a predictor of subsequent financial analyst forecast revision. *The Accounting Review* 65(1): 175–190.

Baik, B., D. B. Farber, and S. Lee. 2011. CEO ability and management earnings forecasts. *Contemporary*

Accounting Research 28(5): 1645–1668.

Balasubramanian, N., and J. Lee. 2008. Firm age and innovation. *Industrial and Corporate Change* 17(5): 1019–1047.

Ball, R. 2001. Infrastructure requirements for an economically efficient system of public financial reporting and disclosure. *Brookings-Wharton Papers on Financial Services, Brookings Institution Press*: 127–169.

Ball, R., S. Jayaraman, and L. Shivakumar. 2012. Audited financial reporting and voluntary disclosure as complements: A test of the confirmation hypothesis. *Journal of Accounting and Economics* 53(1-2): 136–166.

Ball, R., S. P. Kothari, and A. Robin. 2000. The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics* 29(1): 1–51.

Ball, R., A. Robin, and J. Wu. 2003. Incentives versus standards: Properties of accounting income in four east Asia countries. *Journal of Accounting and Economics* 36(1): 235–270.

Balsmeier, B., L. Fleming, and G. Manso. 2017. Independent boards and innovation. *Journal of Financial Economics* 123(3): 536–557.

Bamber, L., J. Jiang, and I. Wang. 2010. What's my style? The influence of top managers on voluntary corporate disclosure. *The Accounting Review* 85 (4): 1131–1162.

Baranchuk, N., R. Kieschnick, and R. Moussawi. 2014. Motivating innovation in newly public firms. *Journal of Financial Economics* 111(3): 578–588.

Barrick, R. M., and K. M. Mount.1991. The big five personality dimensions and job performance: a meta-analysis. *Personnel Psychology* 44(1): 1-26.

Barth, M. E., W. H. Beaver, and W. R. Landsman. 1998. Relative valuation roles of equity book value and net income as a function of financial health. *Journal of Accounting and Economics* 25(1): 1–34.

Barton, J., T. Hansen, and G. Pownall. 2010. Which performance measures do investors around the world value the most and why? *The Accounting Review* 85(3): 753–789.

Bebchuk, L., and Y. Grinstein. 2005. The growth of executive pay. *Pxford Review of Economics Policy* 21(2): 283-303.

Bena, J., and K. Li. 2014. Corporate innovations and mergers and acquisitions. *Journal of Finance* 69(5): 1923–1960.

Bena, J., A. M. Ferreira, P. Matos, and P. Pires. 2017. Are foreign investors locusts? The long-term effects of foreign institutional ownership. *Journal of Financial Economics* 126(1): 122–146.

Benabou, R., D. Ticchi, and A. Vindigni. 2013. Forbidden fruits: The political economy of science, religion and growth. *Working Paper*. Princeton University.

Benabou, R., D. Ticchi, and A. Vindigni. 2015. Religion and innovation, *American Economic Review* 105(5):

346–351.

Benmelech, E., and C. Frydman. 2015. Military CEOs. *Journal of Financial Economics* 117 (1): 43–59.

Bentz, V. J. 1985. A view of the top: a thirty-year perspective of research devoted to the discovery, description and prediction of executive behavior. Paper presented at the 93rd Annual Convention of the American Psychological Association. Los Angeles.

Beyer, A., D. A. Cohen, T. Z. Lys, and B. R. Walther. 2010. The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics* 50(2): 296–343.

Bertrand, M., and A. Schoar. 2003. Managing with style: The effect of managers on corporate policy. *Quarterly Journal of Economics* 118 (4): 1169–1208.

Bhagat, S., and I. Welch. 1995. Corporate research & development investments international comparisons. *Journal of Accounting and Economics* 19(2-3): 443–470.

Bhattacharya, U., H. Daouk, and M. Welker. 2003. The world price of earnings opacity. *The Accounting Review* 78(3): 641–678.

Biddle, G. C, G. Hilary, and R. S. Verdi. 2009. How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics* 48 (2-3): 112–131.

Botosan, C. A., and M. S. Harris. 2000. Motivations for a change in disclosure frequency and its consequences: An examination of voluntary quarterly segment disclosures. *Journal of Accounting Research* 38(2): 329–353.

Bowen M. R., S. J Jollineau, S. C. Lyon, S. Malhotra, and P. Zhu. 2021. CEO-CFO compatibility and audit engagement risk. *Working paper SSRN: https://ssrn.com/abstract=3473963*

Brav, A., W. Jiang, S. Ma, and X. Tian. 2018. How does hedge fund activism reshape corporate innovation? *Journal of Financial Economics* 130(2): 237–264.

Brochet, F., L. Faurel, and S. McVay. 2011. Manager-specific effects on earnings guidance: An analysis of top executive turnovers. *Journal of Accounting Research* 49(5): 1123–1162.

Brown, L. D., and H. N. Higgins, 2005. Managers' forecast guidance of analysts: International evidence. *Journal of Accounting and Public Policy* 24(4): 280-299.

Brown, J., S. Fazzari, and B. Petersen. 2009. Financing innovation and growth: Cash flow, external equity, and the 1990s R&D boom. *Journal of Finance* 64(1): 151–185.

Brown, J., and G. Martinsson. 2019. Does transparency stifle or facilitate innovation? *Management Science* 65(4): 1600–1623.

Brown, J., G. Martinsson, and B. Petersen. 2012. Do financing constraints matter for R&D? *European Economic Review* 56(8): 1512–1529.

Brown, J., G. Martinsson, and B. Petersen. 2013. Law, stock markets, and innovation. *Journal of Finance* 68(4): 1517–1549.

Brown, J., G. Martinsson, and B. Petersen. 2017. What promotes R&D? Comparative evidence from around the world. *Research Policy* 46(2): 447–462.

Bushman, R. M., J. D. Piotroski, and A. J. Smith. 2004. What determines corporate transparency? *Journal of Accounting Research* 42(2): 207–252.

Buss, A.H., and R. Plomin. 1975. A Temperament Theory of Personality Development. *New York: Wiley-Inter-science*.

Cain, S. 2012. Quiet: The Power of Introverts in a World that Can't Stop Talking. *New York, NY: Crown Publishers.*

Cao, Y., L. Myers, A., Tsang, and Y. G. Yang. 2017. Management forecasts and the cost of equity capital: International evidence. *Review of Accounting Studies* 22(2): 791–838.

Chang, X., K. Fu, A. Low, and W. Zhang. 2015. Non-executive employee stock options and corporate innovation. *Journal of Financial Economics* 115(1): 168–188.

Chava, S., and A. Purnanandam. 2010. CEOs versus CFOs: incentives and corporate policies. *Journal of Financial Economics* 97 (2): 263–278.

Chemmanur, T., L. Kong, K. Krishnan, and Q. Yu. 2016. Top management human capital, inventor mobility, and corporate innovation. *Working Paper. Boston College.*

Chemmanur, T., L. Kong, K. Krishnan, and Q. Yu. 2018. Top management human capital, inventor mobility, and corporate innovation. *Journal of financial and Quantitative Analysis* 54(6): 2382-2422.

Chen, L., Y. Dong, J. Ng, and A. Tsang. 2019. Cross-listings and voluntary disclosure: International evidence. *Journal of Financial Reporting* 4(2): 89-113.

Chen, M. K. 2013. The effect of language on economic behavior: Evidence from savings rates, health behaviors, and retirement assets. *American Economic Review* 103(2): 690–731.

Chen, Y., E. J. Podolski, S. G. Rhee, and M. Veeraraghavan. 2014. Local gambling preferences and corporate innovative success. *Journal of Financial and Quantitative Analysis* 49(1): 77–161.

Chen, Y., E. J. Podolski, and M. Veeraraghavan. 2015. Does managerial ability facilitate corporate innovation success*? Journal of Empirical Finance* 34: 313–326.

Chen, S., K. Huang, and B. Lao. 2015. Is Earnings guidance associated with less firm innovation? *Working paper. SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2546827*.

Cheng, L., and Z. Lei. 2015. Does the expansion of Chinese state0owned enterprises affect the innovation behavior of private enterprises? *Asia-Pacific Journal of Accounting and Economics, 22(1): 24-54.*

Cheng, M., K. R. Subramanyam, and Y. Zhang. 2005. Earnings guidance and managerial myopia. *Working Paper. SSRN: https://ssrn.com/abstract=851545.*

Cheng, L., H. Cheng, and Z. Zhuang. 2019. Political connections, corporate innovation and entrepreneurship: Evidence from the China Employer-Employee Survey (CEES). *China Economic*

Review 54: 286-305.

Cho, C., J. T. Halford, S. Hsu, and L. Ng. 2016. Do managers matter for corporate innovation? *Journal of Corporate Finance* 36: 206-229.

Choi, J. H., L. Myers, Y. Zang, and D. Ziebart. 2010. The roles that forecast surprise and forecast error play in determining management forecast precision. *Accounting Horizons* 24(2): 165-188.

Clement, M., R. Frankel, and J. Miller. 2003. Confirming management earnings forecasts, earnings uncertainty, and stock returns. *Journal of Accounting Research* 41(4): 653–679.

Coller, M., and T. L. Yohn. 1997. Management forecasts and information asymmetry: An examination of bid-ask spreads. *Journal of Accounting Research* 35(2): 181–191.

Cobb-Clark, D., and S. Schurer. 2012. The stability of big-five personality traits. *Economics Letters* 115 (1): 11–15.

Costa, P., and R. McCrae. 1997. Personality trait structure as a human universal. *The American Psychologist* 52 (5): 509–516.

Cotter, J., I. Tuan, and P. Wysocki. 2006. Expectations management and beatable targets: How do analysts react to public earnings guidance? *Contemporary Accounting Research* 23(3): 593-624.

Custo´dio, C., and D. Metzger. 2013. How do CEOs matter? The effect of industry expertise on acquisition returns. *Review of Financial Studies* 26 (8): 2008–2047.

Custódio, C., M. A. Ferreira, and P. P. Matos. 2017. Do general managerial skills spur innovation? *Management Science* 65(2): 459–954.

Dai, Z., L. Markoczy, S. Radhakrishnan, and W. Zhang. Are young and female CEOs more forthcoming with earnings forecasts? *Working paper. University of Texas at Dallas.*

Davis, A., W. Ge, D. Matsumoto, and J. Zhang. 2015. The effect of manager-specific optimism on tone of earnings conference calls. *Review of Accounting Studies* 20 (2): 639–673.

DeFond, M., M. Hung, and R. Trezevant. 2007. Investor protection and the information content of annual earnings announcements: International evidence. *Journal of Accounting and Economics* 43(1): 37–67.

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

Diamond, D., and R. Verrecchia. 1991. Disclosure, liquidity, and the cost of capital. *Journal of Finance* 46(4): 1325–1359.

Dong, L., G. Lui, and B. Wong-On-Wing. 2017. Unintended consequences of forecast disaggregation: A multi-period perspective. *Contemporary Accounting Research* 34(3): 1580–1595.

Dutta, S., and F. Gigler. 2002. The effect of earnings forecasts on earnings management. *Journal of Accounting Research* 40(3): 631–655.

Dyreng, S., M. Hanlon, and L. Maydew. 2010. The effects of executives on corporate tax avoidance. *The Accounting Review* 85(4): 1163–1189.

Ederer, F., and G. Manso. 2011. Incentives for innovation: Bankruptcy, corporate governance, and compensation systems. *In R. E. Litan Ed.: Handbook of law, innovation, and growth (Cheltenham: Edward Elgar Publishing)*.

Ederer, F., and G. Manso. 2013. Is pay for performance detrimental to innovation? *Management Science* 59(7):1496–1513.

Edmans, A., X. Gabaix, and A. Landier. 2009. A multiplicative model of optimal CEO incentives in market equilibrium. *Review of Financial Studies* 22 (12): 4881–4917.

Evans, J., and S. Sridhar. 2002. Disclosure-disciplining mechanisms: Capital markets, product markets, and shareholder litigation. *The Accounting Review* 77(3): 595–626.

Faleye, O., R. Hoitash, and U. Hoitash. 2011. The costs of intense board monitoring. *Journal of Financial Economics* 101(1): 160–181.

Faleye, O., T. Kovacs, and A. Venkateswaran. 2014. Do better-connected CEOs innovate more? *Journal of Financial and Quantitative Analysis* 49(5-6): 1201–1225.

Fang, L. H., J. Lerner, and C. Wu. 2017. Intellectual property rights protection, ownership, and innovation: Evidence from China. *Review of Financial Studies* 30(7): 2446–2477.

Feist, G. 1998. A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review* 2(4): 290–309.

Ferreira, D., G. Manso, and A. C. Silva. 2014. Incentives to innovate and the decision to go public or private. *Review of Financial Studies* 27(1): 256–300.

Field, L., M. Lowry, and S. Shu. 2005. Does disclosure deter or trigger litigation? *Journal of Accounting and Economics* 39(3): 487–507.

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

Francis, J., D. Philbrick, and K. Schipper. 1994. Shareholder litigation and corporate disclosures. *Journal of Accounting Research* 32(2): 137–164.

Francis, B. B., I. Hasan, Q. Wu, and M. Yan. 2014. Are female CFOs less tax aggressive? Evidence from tax aggressiveness. *The Journal of the American Taxation Association* 36 (2): 171-202.

Frankel, R., M. McNichols, and G. Wilson. 1995. Discretionary disclosure and external financing. *The Accounting Review* 70(1): 135–150.

Fuller, J., and M. C. Jensen. 2002. Just say no to Wall Street: Putting a stop to the earnings game. *Journal of Applied Corporate Finance* 14(4): 41–46.

Furman, J. L., E. M. Porter, and S. Stern. 2002. The determinants of national innovative capacity. *Research*

Policy 31(6): 899–933.

Gabaix, X., and A. Landier. 2008. Why had CEO pay increased so much? *Quarterly Journal of Economics* 123 (1): 49–100.

Galasso, A., and T. S. Simcoe. 2011. CEO overconfidence and innovation. *Management Science* 57(8):1469–1484.

Gao, H., and W. Zhang, 2017. Employment non-discrimination acts and corporate innovation. *Management science* 63(9): 2773-3145.

Ge, W., D. Matsumoto, and J. Zhang, J. 2011. Do CFOs have style? An empirical investigation of the effect of individual CFOs on accounting practices. *Contemporary Accounting Research* 28 (4): 1141–1179.

Geiger, M., and D. North. 2006. Does hiring a new CFO change thing? An investigation of changes in discretionary accruals. *The Accounting Review* 81 (4): 781–809.

Goldman, J., and J. Peress. 2016. Firm R&D and financial analysis: How do they interact? *Working paper, University of Toronto.*

Goldberg, L. R. 1990. An alternative "description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology* 59 (6): 1216–1229.

González-Uribe, J., and M. Xu. 2015. Corporate innovation cycles and CEO contracts. *Working paper, London School of Business.*

Gow, I., S. Kaplan, D. Larcker, and A. Zakolyukina. 2016. CEO personality and firm policies. *Working paper. Harvard University.*

Graham, J. R., C. R. Harvey, and M. Puri. 2014. A Corporate Beauty Contest. *Management Science* 63(9): 3044-3056.

Graham, J., C. R. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40(1-3): 3–73.

Green, T., R. Jame, and B. Lock. 2019. Executive extraversion: Career and firm outcomes. *The Accounting Review* 94 (3): 177–204.

Griliches, Z., A. Pakes, and H. B. Hall. 1986. The value of patents as indicators of inventive activity. *Working Paper, National Bureau of Economic Research.*

Guadalupe, M., O. Kuzmina, and C. Thomas. 2012. Innovation and foreign ownership. *American Economic Review* 102(7): 3594–3627.

Guan, Y., G. J. Lobo, A. Tsang, and X. Xin. 2020. Societal trust and management earnings forecast. *The Accounting Review* 95(5):149-184.

Gupta, B. 2008. Role of personality in knowledge sharing and knowledge acquisition behavior. *Journal of Indian Academy of Applied Psychology* 34(1):143-149.

Hall, B., and J. Liebman. 1998. Are CEOs really paid like bureaucrats? *The Quarterly Journal of Economics*

116(1): 229-259.

Hall, B., and H. R. Ziedonis. 2001. The patent paradox revisited: an empirical study of patenting in the US semiconductor industry, 1979-1995. *Rand Journal of Economics* 32(1): 101–128.

Hall, B., and J. Lerner. 2010. The financing of R&D and innovation. *In B. Hall, and N. Rosenberg eds: Handbook of the Economics of Innovation (North Holland: Elsevier).*

Hall, B., A. Jaffe, and M. Trajtenberg. 2005. Market value and patent citations. *RAND Journal of Economics* 36(1): 16–38.

Hackman, J. R., and C. G. Morris. 1975. Group tasks, group interaction process and group performance outcomes: A review and proposed integration. *Advances in Experimental and Social Psychology. Academic Press, New York.*

Hambrick, C., and P. Mason. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review* 9 (2): 193–206.

He, J. J., and X. Tian. 2013. The dark side of analyst coverage: The case of innovation. *Journal of Financial Economics* 109(3): 856–878.

He, J. J., and X. Tian. 2018. Finance and corporate innovation: a survey. *Asia-Pacific Journal of Financial Studies* 47(2): 165–212.

Healy, P., A. Hutton, and K. Palepu. 1999. Stock performance and intermediation changes surrounding sustained increases in disclosure. *Contemporary Accounting Research* 16(3): 485–520.

Healy, P., A. and K. Palepu. 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31(1-3): 405–440.

Hribar, P., and H. Yang. 2016. CEO overconfidence and management forecasting. *Contemporary Accounting Research* 33 (1): 204–227.

Hirst, D. E., L. Koonce, and S. Venkataraman. 2007. How disaggregation enhances the credibility of management earnings forecasts. *Journal of Accounting Research* 45(4):811–837.

Hirst, D. E., L. Koonce, and S. Venkataraman. 2008. Management earnings forecasts: A review and framework. *Accounting Horizons* 22(3): 315–338.

Hirshleifer, D., A. Low, and S. H. Teoh. 2012. Are overconfident CEOs better innovators? *Journal of Finance* 67(4): 1457–1498.

Holmstrom, B. 1989. Agency costs and innovation. *Journal of Economic Behavior and Organization* 12(3): 305–327.

Hrazdil, K., J. Novak, R. Rogo, C. Wiedman, R. Zhang. 2019a. Measuring executive personality using machine-learnings algorithms: A new approach and audit fee-based validation tests. *Journal of Business Finance & Accounting* 47 (3-4): 1-26.

Hrazdil, K., J. Kim, and J. Novak. 2019b. Managerial risk aversion and the structure of executive compensation. *Working paper Simon Fraser University.*

Hrazdil, K., F. Mahmoudian, J. Nazari. 2019c. How do big five personality traits related to corporate social responsibility performance? *Working paper Simon Fraser University.*

Hribar, P., and H. Yang. 2016. CEO overconfidence and management forecasting. *Contemporary Accounting Research* 33(1): 204–227.

Hsieh, T.-S., J. Bedard, and K. Johnstone. 2014. CEO overconfidence and earnings management during shirting regulatory regimes. *Journal of Business Finance & Accounting* 42 (9-10): 1243–1268.

Hsieh, H, J. Hsieh, and I. Wang. 2011. Linking personality and innovation: the role of knowledge management. *World Transactions on Engineering and Technology Education* 9(1): 38-44.

Hsu, P., X. Tian, and Y. Xu. 2014. Financial development and innovation: Cross-country evidence. *Journal of Financial Economics* 112(1): 116–135.

Huang, S., J. Ng, T. Ranasinghe, and M. Zhang, 2021. Do innovative firms communicate more? Evidence from the relation between patenting and management guidance. *The Accounting Review* 96 (1): 273-297.

Hughes, J., and S. Pae. 2004. Voluntary disclosure of precision information. *Journal of Accounting and Economics* 37(2): 261–289.

Hutton, A. P., G. S. Miller, and D. J. Skinner. 2003. The role of supplementary statements with management earnings forecasts. *Journal of Accounting Research* 41(5): 867–890.

Jaggi, B., and A. Sannella. 1995. The association between the accuracy of management earnings forecasts and discretionary accounting changes. *Journal of Accounting, Auditing and Finance* 10 (1): 1–21.

Jia, N., X. Tian, and W. Zhang. 2016. The holy grail of teamwork: Management team synergies and firm innovation. *Working Paper. Tsinghua University.*

Jennings, R. 1987. Unsystematic security price movements, management earnings forecasts, and revisions in consensus analyst earnings forecasts. *Journal of Accounting Research* 25(1): 90–110.

Judge, T., and C. Zapata. 2015. The person-situation debate revisited: Effect of situation strength and trait activation on the validity of the big five personality traits in predicting job performance. *Academy of Management Journal* 58 (4): 1149–1179.

Judge, T., J. Bono, R. Ilies, and M. Gerhardt. 2002. Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology* 87 (4): 765–780.

Karamanou, I., and N. Vafeas. 2005. The association between corporate boards, audit committees, and management earnings forecasts: An empirical analysis. *Journal of Accounting Research* 43(3): 453–486.

Kasznik, R., 1999. On the association between voluntary disclosure and earnings management. *Journal of*

Accounting Research 37(1): 57–81.

Kasznik, R., and B. Lev. 1995. To warn or not to warn: Management disclosures in the face of an earnings surprise. *The Accounting Review* 70(1): 113–134.

Kato, K., D. Skinner, and M. Kunimura. 2009. Management forecasts in Japan: An empirical study of forecasts that are effectively mandated. *The Accounting Review* 84(5): 1575–1606.

Kerr, W. 2013. High-skilled immigration, domestic innovation, and global exchanges. *NBER Reporter, National Bureau of Economic Research (NBER)* 4:13–16.

Kerr, W., and R. Nanda. 2015. Financing innovation. *Annual Review of Financial Economics* 7: 445–462.

King, R., G. Pownall, and G. Waymire. 1990. Expectations adjustment via timely expectations forecast disclosure: Review, synthesis, and suggestions for future research. *Journal of Accounting Literature* 9: 113–144.

Kichuk, L. S., and H. W. Wiesner. 1997. The big five personality factors and team performance: implications for selecting successful product design teams. *Journal of Engineering and Technology Management* 14(3-4):195-221.

Kim, T. 2017. Does a firm's political capital affect its investment and innovation? *Working paper*

Kitchell, S. 1995. Corporate culture, environmental adaption, and innovation adoption: A qualitative / quantitative approach. *Journal of the Academy of Marketing Science* 23(3): 195-205.

Kleinknecht, A. 1989. Firm size and innovation. *Small Business Economics* 1(3): 215–222.

Koh, P. S., and M. D. Reeb. 2015. Missing R&D. *Journal of Accounting and Economics* 60(1): 73–94.

Kortum, S., and J. Lerner. 2000. Assessing the contribution of venture capital to innovation. *RAND Journal of Economics* 31(4): 674–692.

Kramer, A., and D. T. Johnson. 2014. Personality and group performance: the importance of personality composition and work tasks. *Personality and Individual Differences* 58:132-137.

Krishnan, G. V., M. Pevzner, and P. Sengupta. 2012. How do auditors view managers' voluntary disclosure strategy? The effect of earnings guidance on audit fees. *Journal of Accounting and Public Policy* 31(5): 492–515.

Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics, 115(2)*, 304-29.

Lansford, B., B. Lev, and J. W. Tucker. 2007. Why do firms issue disaggregated earnings guidance? The archival evidence. *Working paper, Northwestern University.*

Lee, C.H., and M. F. Lin. 2008. The Study of the Interrelation between Knowledge Sharing and Organizational Performance from Personality and Organizational Culture in High Technology Industry. *Diwan J. of Management* 3(1):18-37.

Lee, S., S. R. Matsunaga, and C. W. Park. 2012. Management forecast accuracy and CEO turnover. *The*

Accounting Review 87(6): 2095–2122.

Lerner, J. 2009. The empirical impact of intellectual property rights on innovation: Puzzles and clues. *American Economic Review* 99(2): 343–348.

Leuz, C., and R. Verrecchia. 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 38(Supplement): 91–124.

Leuz, C., D. Nanda, and P. Wysocki. 2003. Earnings management and investor protection: An international comparison. *Journal of Financial Economics* 69(3): 505–527.

Lev, B., and S. H. Penman. 1990. Voluntary forecast disclosure, nondisclosure, and stock prices. *Journal of Accounting Research* 28 (1): 49–76.

Levine, R., C. Lin, and L. Wei. 2016. Insider trading and innovation. The Journal of Law and Economics 60(4).

Levy, H., R. Shalev, and E. Zur. 2017. The effect of CEO personal litigation risk on firms' disclosure and accounting choices. *Contemporary Accounting Research* 35 (1): 434–463.

Li, X., F. Moshirian, X. Tian, and B. Zhang. 2016. The real effect of financial disclosure: International evidence. *Working Paper. London School of Economics.*

Li, W., J. Ng, A. Tsang, and O. Urcan. 2019. Country-level institutions and management earnings forecasts. *Journal of International Business Studies* 50(1): 48–82.

Li, K. and N. Prabhala. 2007. 'Self-selection Models in Corporate Finance', in B. E. Eckso (ed.), Handbook of Corporate Finance: Empirical Corporate Finance (Amsterdam, The Netherlands: Elsevier Science B.V.): 37–86.

Liang, H., C. Marquis, L. Renneboog, and S. L. Sun. 2018. Future-time framing: The effect of language on corporate future orientation. *Organization Science* 29(6): 989–1236.

Liao, C., Z. San, and A. Tsang. 2021a. Corporate Governance Reforms and Voluntary Disclosure: International Evidence on Management Earnings Forecasts. *Working Paper.*

Liao, C., Z. San, and A. Tsang. 2021. Executive Extraversion and Voluntary Disclosure: Evidence from Management Earnings Forecasts. *Asia-Pacific Journal of Accounting & Economics, Forthcoming.*

Libby, R., and H. T. Tan. 1999. Analysts' reactions to warning of negative earnings surprises. Journal of Accounting Research 37 (2): 415-435.

Liu, T., Y. Mao, and X. Tian. 2016a. The role of human capital: Evidence from patent generation. *Working Paper. University of Pennsylvania.*

Liu, T., M. Sevilir, and X. Tian. 2016b. Acquiring innovation. *Working Paper. University of Pennsylvania.*

Liu, R., X. Kong, Z. San, and A. Tsang. 2018. Audited financial reporting and voluntary disclosure: International evidence on management earnings forecasts. *International Journal of Auditing* 22(2): 249–267.

Luong, H., F. Moshirian, L. H. G. Nguyen, X. Tian, and B. Zhang. 2017. How do foreign institutional investors enhance firm innovation? *Journal of Financial and Quantitative Analysis* 52:1449–1490.

Maital, S., R. Filer, and J. Simon. 1986. What do people bring to the stock market (beside money)? The economic psychology of stock market behavior, *In B. Gilad and S. Kaish (Eds.), Handbook of Behavioral Economics, Behavioral Macroeconomics, Greenwich Connecticut, JAI Press Inc:* 273-307.

Malmendier, U., and G. Tate. 2005a. CEO overconfidence and corporate investment. *Journal of Finance* 60(6): 2661–2700.

Malmendier, U., and G. Tate. 2005b. Does overconfidence affect corporate investment? CEO overconfidence measures revisited. *European Financial Management* 11(5): 649–659.

Malmendier, U., and G. Tate. 2008. Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics* 89(1): 20–43.

Malmendier, U., G. Tate, and J. Yan. 2011. Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *Journal of Finance* 66 (5): 1687–1731.

Mann, R. D. 1959. A review of the relationship between personality and performance in small groups. Psychological Bulletin 56(4):241–270.

Manso, G. 2011. Motivating innovation. *Journal of Finance* 66(5): 1823–1860.

Mao, C., and C. Zhang. 2017. Managerial risk-taking incentive and firm innovation: Evidence from FAS 123R. *Journal of Financial and Quantitative Analysis* 53(2): 867–898.

Mao, Y., X. Tian, and X. Yu. 2016. Unleashing innovation. *Working Paper. Cornell University.*

McCrae, R. R., and P. T. Costa. 1995. Trait explanations in personality psychology. *European Journal of Personality* 9(4), 231-252.

Merkley, J. K., L. S. Bamber, and T. E. Christensen. 2013. Detailed management earnings forecasts: do analysts listen? *Review of Accounting Studies* 18: 479–521.

Milfont, T., and C. Sibley. 2012. The big five personality traits and environmental engagement: Associations at the individual and societal level. *Journal of Environmental Psychology* 32(2): 187–195.

Nagar, V., D. Nanda, and P. Wysocki. 2003. Discretionary disclosure and stock-based incentives. *Journal of Accounting and Economics* 34(1-3): 283–309.

Patell, J. M. 1976. Corporate forecasts of earnings per share and stock price behavior: Empirical tests. *Journal of Accounting Research* 14(2): 246–276.

Penman, S. H. 1980. An empirical investigation of the voluntary disclosure of corporate earnings forecasts. *Journal of Accounting Research* 18(1): 132–160.

Plöckinger, M., E. Aschauer, M. Hiebl, and R. Rohatschek. 2016. The influence of individual executives on corporate financial reporting: A review and outlook from the perspective of upper echelons theory. *Journal of Accounting Literature* 37: 55–75.

Pope, F. P., and M. Walker. 1999. International differences in the timeliness, conservatism, and classification of earnings. *Journal of Accounting Research* 37(Supplement): 53–87.

Porter, M. 1992. Capital disadvantage: America's failing capital investment system. *Harvard Business Review* 70(5): 65–82.

Pownall, G., C. Wasley, and G. Waymire. 1993. The stock price effects of alternative types of management earnings forecasts. *The Accounting Review* 68(4): 896–912.

Pownell, G., and G. Waymire. 1989. Voluntary disclosure credibility and securities prices: Evidence from management earnings forecasts, 1969–73. *Journal of Accounting Research* 27(2): 227–245.

Presley, T., and L. Abbott. 2013. AIA submission: CEO overconfidence and the incidence of financial restatement. *Advances in Accounting* 29 (1): 74–84.

Qi, J. 2016. The threat of shareholder intervention and firm innovation. *Working paper, University of Minnesota.*

Robbins, S., and T. Judge. 2008. Organizational behavior. *Prentice Hall*: 100-1100.

Rohrbeck, R., and M. E. Kum. 2018. Corporate foresight and its impact on firm performance: A longitudinal analysis. *Technological Forecasting and Social Change* 129: 105–116.

Romer, P. 1986. Increasing returns and long-run growth. *Journal of Political Economy* 94(5): 1002–1037.

Rosenbaum, P., and D. Rubin. 1983. The central role of the propensity score in observational studies for casual effects. *Biometrika* 70(1): 41–55.

Rothmann, S., and E. P. Coetzer. 2013. The big five personality dimensions and job performance. *SA Journal of Industrial Psychology* 29(1): 68-74.

Sauermann, H., and W. M. Cohen. 2010. What makes them tick? Employee motives and firm innovation. *Management Science* 56(12): 2134–2153.

Schrand, C. and S. Zechman. 2012. Executive overconfidence and the slippery slope to financial misreporting. *Journal of Accounting and Economics* 53 (1-2): 311–329.

Seijts, G. H. 1998. The importance of future time perspective in theories of work motivation. *Journal of Psychology: Interdisciplinary and Applied* 132(2): 154–168.

Seru, A. 2014. Firm boundaries matter: Evidence from conglomerates and R&D activity. *Journal of Financial Economics* 111(2): 381–405.

Skinner, D. 1997. Earnings disclosures and stockholder lawsuits. *Journal of Accounting and Economics* 23 (3): 249–282.

Solow, R. 1957. Technical change and the aggregate production function. *Review of Economics and Statistics* 39(3): 312–320.

Stocken, P. C. 2000. Credibility of voluntary disclosure. *The Rand Journal of Economics* 31(2): 359–374.

Stogdill, R. 1974. Handbook of Leadership: A Survey of Theory and Research. *New York, NY: Free Press.*

Sung, S.Y., and J. N. Choi. 2009. Do big five personality factors affect individual creativity? The moderating role of extrinsic motivation. *Social Behavior and Personality* 37(**7**): 941-956.

Sunder, J., S. V. Sunder, and J. Zhang. 2017. Pilot CEOs and corporate innovation. *Journal of Financial Economics* 123(1): 209–224.

Sunder, R., 2019. Differences in US Versus European Voluntary Earnings Forecasts. *Journal of Accounting and Finance* 19(3): 142-151.

Tadesse, S. 2006. Innovation, information, and financial architecture. *Journal of Financial and Quantitative Analysis* 41(4): 753–786.

Tansuhaj, P., J. W. Gentry, J. John, L. L. Manzer, and B. J, Cho. 1991. A cross-national examination of innovation resistance. *International Marketing Review* 8(3).

Tian, X., and T. Wang. 2014. Tolerance for failure and corporate innovation. *Review of Financial Studies* 27(1): 211–255.

Toegel, G., and J. Barsoux. 2012. How to become a better leader. *MIT Sloan Management Review* 53 (3): 51–60.

Trueman, B. 1986. Why do managers voluntarily release earnings forecasts? *Journal of Accounting and Economics* 8(1): 53–71.

Tsang, A., F. Xie, and X. Xin. 2019. Foreign institutional investors and corporate voluntary disclosure around the world. *The Accounting Review* 94(5): 319–348.

Tsang, A., T. K. Wang, and N. Zhu. 2019. Corporate governance reforms around the world: the impact on firm innovation. *Working paper, The Hong Kong Polytechnic University.*

Wang, I. 2007. Private earnings guidance and its implications for disclosure regulation. *The Accounting Review* 82(5): 1299–1332.

Waymire, G. 1984. Additional evidence on the information content of management earnings forecasts. *Journal of Accounting Research* 22(2): 703–718.

Waymire, G. 1985. Earnings volatility and voluntary management forecast disclosure. *Journal of Accounting Research* 23 (1): 268–295.

Waymire, G. 1986. Additional evidence on the accuracy of analyst forecasts before and after voluntary management earnings forecasts. *The Accounting Review* 61(1): 129–142.

Williams, P. A. 1996. The relation between a prior earnings forecast by management and analyst response to a current management forecast. *The Accounting Review* 71(1): 103–115.

Yadav, M. S., Prabhu, J. C., and R. K. Chandy. 2007. Managing the future: CEO attention and innovation outcomes. *Journal of Marketing* 71(4): 84–101.

Yang, H. 2017. Institutional dual holdings and risk shifting: Evidence from corporate innovation, *Working Paper, University of Massachusetts.*

Zamora, V. 2009. Do managers benefit from superior forecasting? *Working paper, Seattle University.*

Zellner, A., and H. Theil. 1962. Three stage least squares: Simultaneous estimate of simultaneous equations. Econometrica 29: 54–78.

Zhao, X. 2009. Technological innovation and acquisitions. *Management Science* 55(7):1170–1183.

Zhong, R. I. 2018. Transparency and firm innovation. *Journal of Accounting and Economics* 66(1): 67–93.

Appendix A – Variable Definitions

Variable	Definition	Data Source
Dependent Variable		
LnPatent	The natural logarithm of one plus firm i's total number of patents filed (and eventually granted) in a year.	Orbis
LnCitation	The natural logarithm of one plus the total number of citations received on the firm's patents filed (and eventually granted) in a year.	Orbis
LnAdjPatent	The natural logarithm of one plus patent counts adjusted for truncation bias. I compute the application-grant lag distribution function (Ws) for all patents filed and granted between 2004 and 2009, and then estimate the truncation- Patent counts adjusted for truncation bias. I compute the application-grant lag distribution function (W_s) for all patents filed and granted between 2004 and 2009, and then estimate the truncation-adjusted number of patents by computing the adjusted number of patents $P_{adj} = \frac{P_{raw}}{\sum_{s=0}^{2016-t} W_s}$, where P_{raw} is the raw number of patent applications filed at year t and 2010=< t <= 2015.	Orbis
LnAdjCitation	The natural logarithm of one plus citation counts adjusted for trucation bias.	Orbis
Main Explanatory Variable		
MfIssuance	An indicator variable that equals 1 if an earnings forecast is provided by a firm in a given year, and 0 otherwise.	Capital IQ
MfFrequency	The total number of earnings forecasts provided by a firm in a given year.	Capital IQ
MfItems	The total number of performance measures forecasted in addition to earnings contained in a forecast.	Capital IQ
CMF	A self-constructed variable, *CMF*=b+c where b=1 if the total number of earnings forecasts provided by a firm in a given year is more than 1, and b=0 otherwise; c=1 if the total number of performance measures forecasted in addition to earnings contained in a forecast is more than 1, and c=0 otherwise.	Self-construct
CEO_Extraversion	The extraversion score of an CEO on his or her speech during the question-and-answer (Q&A) portion of a conference call.	Green, Jame, and Lock (2019)
CEO_Agreeableness	The weighted average call-level measure of agreeableness.	Green, Jame, and Lock (2019)
CEO_Emotion	The weighted average call-level measure of emotional stability.	Green, Jame, and Lock (2019)
CEO_Conscientious	The weighted average call-level measure of conscientiousness.	Green, Jame, and Lock (2019)
CEO_Openness	The weighted average call-level measure of openness.	Green, Jame, and Lock (2019)
Abs_Mf_CAR	The absolute value of CAR which is the two-day abnormal cumulative return during the [0, +1] day earnings forecast window, with day 0 as the management earnings forecast date, adjusted by the market return of the same period.	Capital IQ
Control Variable		
Size	The natural logarithm of total assets at the beginning of the fiscal year.	Capital IQ
Leverage	The total liability divided by total assets.	Capital IQ
MB	The ratio of market value to book value of common equity.	Capital IQ
ROA	The ratio of net income divided by total assets.	Capital IQ

Accrual	A measure of firm-level financial opacity measured by country-industry-year-adjusted total scaled accruals based on Bhattacharya et al (2003). ACCRUAL = (ΔCA - ΔCL - ΔCASH + ΔSTD - DEP + ΔTP)/lag(TA), where ΔCA is the change in total current assets, ΔCL is the change in total current liabilities, ΔCASH is the change in cash, ΔSTD is the change in the current portion of long-term debt included in total current liabilities, DEP is depreciation and amortization expense, ΔTP is the change in income taxes payable, and lag(TA) is total assets at the end of the previous year.	Capital IQ
Age	The natural logarithm of one plus the number of years.	Capital IQ
R&D	R&D capital is calculated as *RDEXPt* +0.8×*RDEXPt−1* +0.6×*RDEXPt−2* +0.4×*RDEXPt−3* +0.2×*RDEXPt-4*, where *RDEXP* is R&D expenditure in millions.	Capital IQ
CapExp	The ratio of capital expenditures to total assets.	Capital IQ
Cash	Cash holding scaled by total assets.	Capital IQ
Competition	This measure equals the Herfindahl–Hirschman index multiplied by -1, where the Herfindahl–Hirschman index is calculated as the sum of the squares of the fractional market shares of firms within each two-digit SIC industry for each country in a given year.	Capital IQ
Institution	The percentage of a firm's shares held by institutional investors at the end of each year.	Capital IQ
Insider	The total number of closely held shares as a percentage of the total number of shares outstanding.	Capital IQ
Analyst	The natural logarithm of one plus number of analysts following a firm in a given year.	Capital IQ
Loss	An indicator variable that equals to 1 if the firm reported losses in the current period, and zero otherwise.	Capital IQ
Big4	An indicator variable that equals to 1 if a firm's auditor is a Big Four auditor, and 0 otherwise.	Capital IQ
Call Extraversion	The extraversion score of an CEO based on his or her speech during the Q&A portion of a conference call.	Thomson Reuters and Seeking Appha
Ret	The return on the stock less the value-weighted market return over calendar year t.	CRSP
Surprise	The most recent earnings surprise, measured as the difference between quarterly EPS and the mean consensus analyst forecast scaled by the stock price at the beginning of the quarter.	IBES
CEO-Level Variable		
WorkExp	The number of words of the CEO biographical information for a given CEO.	Capital IQ
EduBack	The number of university or college degrees holding by a given CEO.	Capital IQ
CEO_Age	The natural logarithm of the age of CFO at a given year.	Capital IQ
CEO_Male	An indicator variable that equals to 1 if the CFO of the firm is male, and 0 otherwise.	Capital IQ
Country-level Variable		
ShareProtect	Protection of minority shareholders' interests Index with range from 1 to 7.	"Global Competiveness Index" by World Economic Forum
RegQuality	"Regulatory quality" captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	"Worldwide Governance Indicators" by World Bank

RuleLaw	"Rule of law" includes" Property Rights" (The ability to accumulate private property and wealth is understood to be a central motivating force for workers and investors in a market economy. The recognition of private property rights and an effective rule of law to protect them are vital features of a fully functioning market economy), and "Freedom from Corruption" (In the context of economic freedom, corruption can best be understood as the failure of integrity in the economic system, a distortion by which individuals or special-interest groups are able to gain at the expense of the whole).	“Index of Economic Freedom” by the Heritage Foundation and Wall Street Journal

Appendix B – List of Models

Model	Details
(1)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfIssuance_{i,t} + All\ Controls + YearFE$ $+ IndustyFE + CountryFE + \varepsilon_{i,t}$
(2a)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfFrequency_{i,t} + All\ Controls + YearFE$ $+ IndustyFE + CountryFE + \varepsilon_{i,t}$
(2b)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfItems_{i,t} + All\ Controls + YearFE$ $+ IndustyFE + CountryFE + \varepsilon_{i,t}$
(2c)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 CMF_{i,t} + All\ Controls + YearFE$ $+ IndustyFE + CountryFE + \varepsilon_{i,t}$
(3)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta BigFive_{i,t} + CEOChar_{i,t} + All\ Controls$ $+ YearFE + IndustyFE + \varepsilon_{i,t}$
(4)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 BigFive_{i,t} + \beta_2 CMF_{i,t} + \beta_3 BigFive_{i,t} \times CMF_{i,t}$ $+ CEOChar_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t}$
(4s)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 CEO_{Extraversion\,i,t} + \beta_2 CMF_{i,t}$ $+ \beta_3 CEO_{Extraversion\,i,t} \times CMF_{i,t} + OtherBig5Traits_{i,t} + CEOChar_{i,t} + All\ Controls$ $+ YearFE + IndustyFE + \varepsilon_{i,t}$
(5)	$Call\ Extraversion = \beta_0 + \beta_1 Ret_{it-63,t-2} + \beta_2 Ret_{it-1,t+1} + \beta_3 Ret_{it+2,t+63}$ $+ \beta_4 Earnings\ Call + \beta_5 MBE + \beta_6 Surprise + \beta_7 Loss + Qtr + \varepsilon_{i,t}$
(6)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 MfIssuance_{i,t} + \beta_2 MfFrequency_{i,t}$ $+ \beta_3 MfItems_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t}$
(7a)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 ShareProtect_{i,t} + \beta_2 CMF_{i,t}$ $+ \beta_3 ShareProtect_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE$ $+ CountryFE + \varepsilon_{i,t}$
(7b)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 RegQuality_{i,t} + \beta_2 CMF_{i,t}$ $+ \beta_3 Regquality_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE$ $+ CountryFE + \varepsilon_{i,t}$

(7c)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 RuleLaw_{i,t} + \beta_2 CMF_{i,t} + \beta_3 RuleLaw_{i,t} \times CMF_{i,t}$ $+All\ Controls\ +\ YearFE +\ IndustyFE\ +\ CountryFE +\ \varepsilon_{i,t}$
(8)	$Abs_{Mf_{CAR}i,t} = \beta_0 + \beta_1 Extraversion_{i,t} + OtherBig5Traits_{i,t}\ + CEOChar_{i,t}$ $+All\ Controls +\ YearFE +\ IndustyFE +\ \varepsilon_{i,t}$
(9)	$D_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 MB_{i,t} + \beta_4 ROA_{i,t} +\ \beta_5 Accrual_{i,t} +\ \beta_6 Age_{i,t}$ $+\beta_7 R\&D_{i,t} + \beta_8 CapExp_{i,t} + \beta_9 Cash_{i,t} + \beta_{10} Competition_{i,t} +\ \beta_{11} Institution_{i,t}$ $+\ \beta_{12} Insider_{i,t} +\ \beta_{13} Analyst_{i,t} + YearFE + IndustyFE + CountryFE + \varepsilon_{i,t}$
(10a)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 WorkExp_{i,t} + \beta_2 CMF_{i,t}$ $+\beta_3 WorkExp_{i,t} \times CMF_{i,t}\ +All\ Controls + YearFE +\ IndustyFE +\ \varepsilon_{i,t}$
(10b)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 EduBack_{i,t} + \beta_2 CMF_{i,t}$ $+\beta_3 EduBack_{i,t} \times CMF_{i,t} + All\ Controls + YearFE +\ IndustyFE + \varepsilon_{i,t}$
(11a)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Big4_{i,t} + \beta_2 CMF_{i,t}\ +\beta_3 Big4_{i,t} \times CMF_{i,t}$ $+All\ Controls + YearFE +\ IndustyFE +\ \varepsilon_{i,t}$
(11b)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Institution_{i,t} + \beta_2 CMF_{i,t}$ $+\beta_3 Institution_{i,t} \times CMF_{i,t} + All\ Controls + YearFE + IndustyFE + \varepsilon_{i,t}$
(12)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 R\&D_{i,t} + \beta_2 CMF_{i,t}\ + \beta_3 R\&D_{i,t} \times CMF_{i,t}$ $+All\ Controls + YearFE +\ IndustyFE +\ \varepsilon_{i,t}$
(13)	$LnPatent_{i,t+x}(LnCitation_{i,t+x}) = \beta_0 + \beta_1 Loss_{i,t} + \beta_2 CMF_{i,t}\ + \beta_3 Loss_{i,t} \times CMF_{i,t}$ $+All\ Controls + YearFE +\ IndustyFE +\ \varepsilon_{i,t}$

Note: *i* denotes the firm, *t* denotes the year, and x = 0, 1, 2, or 3. All variables are defined in Appendix A

Appendix C – Example of Disaggregated Management Earnings Forecast

Company Name: Max's Group, Inc. (PSE: MAXS)

- Date: July 2, 2008
- Source: PR Newswire
- Max's Group, Inc. has provided earnings guidance for the year 2008. The company expects that ***net income*** may hit PHP 60 million to PHP 90 million, or almost 43% over a year ago with consolidated ***revenues*** reaching PHP 1.8 to PHP 2.1 billion, or 31.25% higher year on year. Systemwide ***sales*** would reach PHP 2.2 billion to PHP 2.6 billion by year-end. The company has earnings before interest, taxes, depreciation and amortization of PHP 330 million.