THREE ESSAYS ON MANAGERIAL COMPENSATION

by

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ABSTRACT

GUNRATAN GAUTAM LONARE. Three Essays on Managerial Compensation. (Under the direction of DR. DAVID C. MAUER)

In the first chapter titled "CEOs' Capital Gains Tax Liabilities and Accounting Conservatism", I study whether CEOs' tax liability affect conservative accounting policy. Recent studies show that the tax-induced lock-in effect discourages CEOs' to unwind their unrestricted equity and subsequently exacerbates their risk-aversion. I investigate how CEOs' unrealized capital gains tax liabilities (tax burdens) influence financial reporting conservatism. I find that the demand for accounting conservatism decreases with CEO tax burdens. Further analyses show that the negative relation between CEO tax burden and conservatism is stronger when the firm has high leverage, high default risk, and when the CEO's incentives are more aligned with equityholders. This highlights the shareholder-creditor agency conflicts mitigation role of CEO tax burdens in reducing creditors' demand for conservatism. I exploit the Federal Taxpayer Reform Act of 1997 and staggered state-level tax cuts that significantly decreased personal capital gains tax rates as identification strategies. I find a significant increase in conservative reporting following the federal and state tax cuts in firms with higher CEO tax burdens before these tax cuts.

In the second chapter titled "Industry Tournament Incentives and Corporate Innovation Strategies", we examine how the tournament-like progression in the CEO labor market influences corporate innovation strategies. By exploiting a text-based proxy for product innovation based on product descriptions from 10-Ks, we find a positive and significant relation between industry tournament incentives (ITIs) and product innovation. We then explore the trade-off effects of ITIs on product innovation created through long-term patenting technologies and short-term product development. We discover that ITIs strengthen short-term innovation but decrease patent-based innovation. Further analyses show that the effect of ITIs on product innovation is stronger when

the product market is more competitive and when CEO characteristics indicate a higher probability of winning the tournament prize.

Lastly, my third chapter titled "Industry Tournament Incentives and Corporate Hedging Policies" studies how a tournament among CEOs to progress within the CEO labor market influences their corporate hedging policies. We employ a textual analysis of 10-Ks to generate corporate hedging proxies, finding that the likelihood and intensity of hedging grow as the CEO labor-market tournament prizes increase. We also explore the mitigating impact of corporate hedging on the adverse effects of risk-inducing industry tournament incentives (ITIs) on the cost of debt and stock price crash risk, noting that these could be possible reasons behind the relation. Additionally, we observe that the relationship between ITIs and corporate hedging is less pronounced for firms that demonstrate more financial distress and for firms whose CEOs are the founders of the company or are of retirement age. We identify a causal relation between ITIs and corporate hedging using an instrumental variable approach and an exogenous shock sourced from changes in the enforceability of non-competition agreements across states.

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I fully dedicate my dissertation work to my beloved mother and father.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This thesis consists of three essays on managerial compensation, which examines how different incentives from CEOs' compensation affect corporate innovation strategies (Chapter 1), hedging policies (Chapter 2), and conservative reporting policy (Chapter 3).

The first chapter studies whether CEOs' capital gains tax liabilities affect firms' accounting conservative policy. Jin and Kothari (2008) and Armstrong et al. (2015) document that CEOs are reluctant to sell their appreciated stock due to capital gains tax liabilities (henceforth CEO tax burdens); this phenomenon is known as the *lock-in effect*. This tax-related selling friction in CEOs' equity portfolios exacerbates CEO risk aversion, and therefore, CEO tax burdens lead to a decrease in risky corporate policies (Yost, 2018). A parallel stream of literature on accounting policies defines accounting conservatism as the practice of applying higher verifiability for recognizing good news as economic gains than for recognizing bad news as losses (Basu, 1997). The accounting conservatism literature documents how the manager-shareholder and shareholder-creditor agency conflicts influence the demand for accounting conservatism (e.g., Basu 1997; Ahmed et al., 2002; LaFond and Roychowdhury, 2008; Zhang, 2008; Nikolaev, 2010). Accounting conservatism can curb managerial overinvestment in negative net present value projects (Brockman et al., 2015; Hu and Jiang, 2019). Conservatism can also help to mitigate creditors' concern about asset substitution as early recognition of loss-making projects can enable them to take preventive actions to protect their investments. I hypothesize that, since creditors have little or no desire for risk, the risk-reducing incentives from CEO tax burdens are likely to mitigate creditors' expropriation risk and reduce manager-creditor agency conflicts. Empirically, I show that CEO tax burdens decrease the need for accounting conservatism reporting by creditors. Further analysis shows that the negative relation between CEO locked-in capital gains and conservatism is more pronounced in firms with higher default risk. Additionally, this relation strengthens when the CEO's incentives are more aligned with equityholders, as proxied by lower CEO relative inside debt and CEO non-entrenchment. This finding is robust to using various alternative measures of conservatism. Overall, my study contributes to the literature by showing that CEO's unrealized capital gains tax liabilities play an important role in governing conservative financial reporting policy.

The second chapter studies how CEO labor market tournament influence corporate innovation strategies. CEOs compete for the highest compensation within an industry. This can be considered an external job market tournament setting in which the winner of the tournament earns the difference between the highest compensation in the industry and her original compensation as a tournament prize. Coles et al. (2018) find that industry tournament incentives (ITIs), measured as the pay differential between the firm's CEO and the highest-paid CEO within the same industry, improve firm performance and overall risk. This paper examines how ITIs affect corporate innovation strategies. Following Coles et al. (2018), we measure ITIs as the pay gap between a firm's CEO and the second-highest-paid CEO in a firm operating in the same industry, where the industry is based on Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classifications. We develop a novel measure of product innovation using textual analysis of product descriptions reported in 10-K statements. Specifically, we exploit the changes in the product market vocabulary of a firm over time to gauge its product innovation outputs. Employing the ordinary least squares (OLS) and two-stage least squares (2SLS) regression models, we find a positive relation between ITIs and product innovation, suggesting that the higher status, increased visibility, and larger compensation provided by winning the tournament prize encourage CEOs to engage in more product innovation activities. Product innovations could arise from long-term innovation and/or short-term product development. Innovations through patents act as long-term innovation activities as they require a long time, substantial investments, and managerial effort (Aghion & Tirole, 1994; Manso, 2011). Thus, firms motivate CEOs to undertake long-term patent-based innovations by providing long-term incentives in the form of stock options and restricted stocks (e.g., Lerner & Wulf, 2007; Mao & Zhang, 2018). On the other hand, short-term product innovation is the introduction of a product that is similar to the existing product line of a firm, which can easily draw market attention (Levinthal & March, 1993). It provides greater and more certain benefits in the short run, improving present returns (March, 1991). Because of career concerns, CEOs may strategically focus on short-term innovation activities that can quickly draw market attention and boost firm profitability, and forgo long-term innovation activities that take years to develop. Therefore, we further explore the trade-off effects of ITIs on product innovation created through patenting technologies (long-term innovation) and short-term product innovation. Empirically, we find that ITIs negatively affect patent-based innovation (long term) and positively affect short-term product innovation.

Lastly, the third chapter studies whether Industry Tournament Incentives (ITIs), i.e., Pay Gap in CEO labor market, influence corporate hedging policies. There are two opposing competing hypotheses for this relation. Our risk incentive hypothesis suggests that tournament incentives are negatively related to corporate hedging. The literature has documented that risk incentives of options pay, that is CEO Vega, encourage CEOs to hedge less. Tournament incentives also represent risk inducing incentives that provide an option like convex payoffs. Therefore, the risk incentives of CEO labor market tournament may discourage CEOs from hedging. On the other hand, according to our risk management hypothesis, there could be many reasons why CEOs facing tournament incentives may motivate them to pursue corporate hedging. First, CEO may hedge more to improve market's perceptions about her ability. Second, Hedging also makes it possible to pursue high-risk high-return projects. Third, hedging relieves the cost of external financing and decreases stock price crash risk. So overall, CEOs might hedge more to buffer against unpredicted adverse shocks from risk inducing incentives of the tournament. We use textual analysis of 10-Ks filed on SEC Edgar to measure corporate hedging. Specifically, we use keyword lists for foreign exchange (FX), interest rate (IR), and commodity (CMD) hedging and set up a binary variable for likelihood to hedge and word count for hedging intensity. Empirically, in line with our *risk management hypothesis*, we find that ITIs positively influence both the likelihood that a CEO will hedge and the hedging intensity. This finding indicates that ITIs motivate CEOs to engage in corporate hedging. We then explore possible reasons for the positive relation between ITIs and corporate hedging, finding that corporate hedging alleviates the amplifying impact of ITIs on the cost of debt and stock price crash risk. This effect can encourage CEOs to hedge. Additionally, we show that the association between ITIs and corporate hedging is less pronounced for firms that are in greater financial distress, and that this association causes the likelihood of a CEO moving up in the tournament to soar. Overall, our analysis illustrates that the compensation gaps among CEOs are important incentive mechanisms that can be used to motivate them to influence their corporate hedging policies.

Chapter1: CEOs' Capital Gains Tax Liabilities and Accounting Conservatism

1. Introduction

The literature examining investor-level taxes documents that investors are reluctant to sell appreciated assets due to taxes on their capital gains. This reluctance is known as the *lock-in effect* (e.g., Feldstein et al., 1980; Poterba, 1987; Burman and Randolph, 1994; Dammon et al., 2004; Dai et al., 2008). The recent work on taxes on CEO wealth documents that this lock-in effect discourages CEOs from selling shares from their vested stock portfolio, resulting in the accumulation of equity ownership in the firm (Jin and Kothari, 2008; Armstrong et al., 2015). The accumulated ownership over time because of the lock-in effect may increase capital gains tax burdens upon unwinding of the equity. Yost (2018) argues that these selling frictions due to capital gains taxes overexpose CEOs to their firm-specific risk, encouraging them to reduce firm risk.[1] Consistent with the risk-reducing incentives of CEO tax burdens, Kubick et al. (2021) find that the lock-in effect appeases creditors, and thereby decreases the cost of debt.[2] This study examines how this lock-in effect arising from tax-related selling frictions in CEOs' own-firm equity portfolios shapes the demand for accounting conservatism.

Accounting conservatism is the practice of applying higher verifiability for recognizing good news as economic gains than for recognizing bad news as losses (Basu, 1997). The accounting conservatism literature documents how the manager-shareholder and shareholder-creditor agency conflicts influence the demand for accounting conservatism (e.g., Basu 1997; Ahmed et al., 2002; LaFond and Roychowdhury, 2008; Zhang, 2008; Nikolaev, 2010). Managerial

[1] Specifically, Yost (2018) finds that high CEOs' capital gains tax burdens are associated with lower stock return volatility, volatility of ROA, R&D expense, and financial leverage.
[2] Specifically, they show that CEOs' capital gains tax burdens decrease loan spreads and the restrictiveness of non-price loan features. Additionally, they find that these tax burdens increase the number of lenders in the loan syndicate and decrease the fees levied to the borrower by the syndicate.

risk-taking incentives have been shown to be an essential factor that influences demand for conservatism by shareholders as well as by creditors. LaFond and Watts (2008) show that higher asymmetry of information between managers and shareholders leads to higher demand for conservatism. Accounting conservatism can curb managerial overinvestment in negative net present value projects (Brockman et al., 2015; Hu and Jiang, 2019). Recognizing losses in a timely manner helps the identification of loss-making projects at an early stage and provides early warning signals to shareholders and creditors. Early warning signals about deteriorating projects can help facilitate shareholders to take actions that can restrain opportunistic managerial behavior concerning risky investment decisions. Similarly, conservatism can also help to mitigate creditors' concern about asset substitution as early recognition of loss-making projects can enable them to take preventive actions to protect their investments.

Considering the impact of managerial incentives on demand for conservatism and noting that a vast portion of managerial pay stems from equity compensation, it is important to examine whether the CEOs' unrealized capital gains tax burdens influence financial reporting conservatism. Two parties, shareholders and creditors, can influence the demand for accounting conservatism for CEOs experiencing capital gains tax burdens. On the one hand, from shareholders' perspective, the accumulated stock ownership due to the selling frictions arising from capital gains taxes may facilitate manager-shareholder alignment and thereby reduce the need for conservatism by shareholders. However, the lock-in effect of CEO tax burdens exacerbates CEOs' risk aversion and has been shown to encourage them to reduce firm risk through less risky investment policies (Yost, 2018). Therefore, on the other hand, shareholders may increase demand for conservatism because the lock-in effect could lead to the detriment of shareholders due to underinvestment in risky positive net present value projects. From creditors' perspective, the risk-reducing incentives of CEO tax burdens may appease creditors and reduce their need for conservatism. However, as accounting conservatism complements the efficiency of debt contracting, the shareholder-creditor alignment as a result of the lock-in effect may not be adequate to reduce conservatism. Because of these differing perspectives, it is an interesting question whether CEO tax burdens shape the demand for accounting conservatism, and if yes, then which party (shareholders or creditors) influences this demand. The first question is whether locked-in capital gains decrease or increase the demand for conservatism. The second question is which stakeholder, equity or debt, has the greater influence.

Following Yost (2018), I construct my primary independent variable as the unrealized CEO capital gains tax burden measured as the tax liability from the sale of all vested stock divided by the total value of the CEO's vested and unvested stock and option holdings. This measure of CEOs' capital gains tax liability is a function of the combined federal and state personal capital gains tax rates, accumulated unrealized gains (losses) on CEO's equity holdings, and her total equity ownership in the firm. I follow the accounting conservatism literature and use the widely employed Basu (1997) earnings-return model to measure accounting conservatism. This measure captures higher verification standards for recognizing good news versus bad news, commonly referred to as conditional conservatism (e.g., Ball and Shivakumar, 2005). I empirically find that the demand for accounting conservatism is decreasing in the size of the CEO tax burden. This relation is also economically significant and robust to other conservatism measures.

Although my results are strong, I cannot completely rule out the possibility that my results suffer from endogeneity issues. First, there could be a potential reverse causality of accounting conservatism causing CEO tax burdens. Firms that engage in less conservative practices may have higher profits. This may appreciate the stock price and lead to higher CEO equity compensation, thereby causing an increase in CEO tax burdens. Thus, a reverse causality concern indicates that the CEO of a firm that has reported higher profits because of less conservative accounting practices is more likely to have a higher unrealized tax burden. Second, unobservable firm heterogeneity, such as firms' information environment, and CEO characteristics, such as personal risk aversion, could be correlated with both CEO tax burdens and accounting conservatism, and could cause omitted variable bias. To address these endogeneity concerns, I exploit federal and staggered state-level personal capital gains tax cuts that arguably have an exogenous influence on CEO tax burdens. Specifically, I examine changes in accounting conservatism around these tax cuts conditional on the level of CEO tax burden before these tax cuts.

First, I use the reduction in the federal individual capital gains tax rate resulting from the enactment of the Taxpayer Relief Act of 1997 (TRA97).[3] The quasi-exogenous shock of TRA97 causes a reduction in the federal capital gains tax rate but does not directly impact either accumulated unrealized gains on CEO's equity holdings or her total equity ownership in the firm.[4] Kubick et al. (2021) document that reductions in CEO tax burdens caused by TRA97 encouraged CEOs to unwind a significant amount of stocks from their portfolio. Although TRA97 simultaneously affects all CEOs, Yost (2018) shows that the reduction in selling frictions due to this tax cut differentially prompted equity selling by CEOs based on the level of their tax burdens before the tax cut. Thus, the differential shock of TRA97 to CEO tax burdens offers an identification test. My results using this identification strategy show that CEOs with higher tax burdens (i.e., CEOs who are more locked-in) before TRA97 experience an increase in demand for conservatism after the tax cut, which supports a causal interpretation for my results.

[3] TRA97 reduced the maximum capital gains tax rate from 28% to 20%.

[4] As discussed earlier, the CEO tax burden measure is a function of combined federal and state capital gains tax rates, accumulated unrealized gain on CEO's equity holdings, and her total equity ownership in the firm.

Second, I further sharpen my identification by utilizing state-level capital gains tax rate cuts. State-level tax cuts are smaller in magnitude relative to the federal tax cut, but they are staggered over time and offer an explicit counterfactual group of CEOs from unaffected states. Similar to TRA97, I expect the state-level tax cuts to have a more significant effect on accounting conservatism for CEOs with higher pre-cut tax burdens relative to lower pre-cut tax burdens. I find that CEOs with higher tax burdens before a state-level tax cut experience a higher demand for conservatism than the control group of CEOs from unaffected states in the post-tax cut period. Overall, the results from these quasi-natural experiments yield strong support for a causal negative relation between CEO tax burden and conservatism.

Prior research has emphasized the importance of the need for financial reporting conservatism by both shareholders and creditors (e.g., Ahmed et al., 2002; LaFond and Watts, 2008). The higher managerial ownership created through the lock-in effect may mitigate shareholder-manger agency conflicts and thus reduce shareholders' demand for accounting conservatism (LaFond and Roychowdhury, 2008). However, as locked-in capital gains overexpose CEOs to firm-specific risk, CEO tax burdens could exacerbate CEO risk aversion to the detriment of shareholders. This could offset the managerial ownership alignment view of CEO tax burden and could even lead to an increase in the need for conservative reporting by shareholders. Empirically, I find that the significantly negative effect of CEO tax burdens on conservatism does not exist in unlevered firms.[5] This evidence suggests that the lock-in effect of CEO tax burden does not influence shareholder demand for accounting conservatism.

In contrast, firms that use leverage exhibit a significantly negative association between CEO tax burden and accounting conservatism, and this relation is more pronounced for high

[5] I also show that this negative effect is less pronounced for low leverage firms.

leveraged firms. This result indicates that greater risk-aversion engendered by CEO tax burdens attenuates shareholder-creditor agency conflicts and decreases creditors' demand for conservatism. Further, I show that high default risk accentuates the impact of CEO tax burden on lessening creditor demand for conservatism.

The literature documents that CEO inside debt provides a channel that aligns the interests of CEOs with those of creditors (e.g., Wei and Yermack, 2011; Anantharaman et al., 2014). Additionally, more entrenched CEOs are likely to make policy choices that appease creditors (e.g., Klock et al., 2005; Chava et al., 2009). As such, any meaningful role of locked-in capital gains to mitigate agency cost of debt is likely more valuable when CEOs are more aligned with shareholders than with creditors. Consistent with this argument, I find that the significantly negative effect of CEO tax burdens on conservatism is concentrated in firms with lower CEO inside debt and non-entrenched CEOs, respectively.

My study makes two key contributions to the literature. First, my study adds to the accounting conservatism literature that examines how manager-shareholder and shareholder-creditor agency conflicts influence the demand for conservatism. This literature examines how managerial ownership (LaFond and Roychowdhury, 2008), legal liability coverage (Chung and Wynn, 2008), overconfidence (Ahmed and Duellman, 2013), gender (Ho et al., 2015), inside debt (Wang et al., 2018), and compensation risk (Brockman et al., 2015; Hu and Jiang, 2019) shape demand for conservatism. The literature also examines how creditors influence financial reporting conservatism; for example, conservatism is beneficial to creditors as it restricts excessive dividend payments to shareholders and facilitates transferring decision rights to creditors (Ahmed et al., 2002; Watts, 2003a; Ball and Shivakumar, 2005). Further, stronger antitakeover provisions decrease creditor demand for conservatism by reducing agency costs of debt (Cheng et al., 2017).

I complement this stream of literature by showing that CEO tax burdens decrease demand for conservatism.

Second, my study contributes to the growing literature on how a manager's personal taxes influence corporate policies. Jin and Kothari (2008) and Armstrong et al. (2015) document that unrealized capital gains tax burdens create selling frictions in a CEO's equity portfolio. These selling frictions create the lock-in effect that exacerbates CEO risk aversion (Yost, 2018). The risk-reducing incentives provided by the lock-in effect are recognized by debt markets and result in a lower cost of debt and a less restrictive debt contract (Kubick et al., 2021). My study adds to this emerging research on CEO tax burdens and helps to understand its potential impact on accounting policies.

The rest of this paper is organized as follows. In Section 2, I discuss some related literature and present my testable hypotheses. In Section 3, I discuss my sample and variable construction. In Section 4, I describe my empirical strategies and discuss the results. Section 5 provides additional validity tests, and Section 6 concludes.

2. Literature review and hypotheses development

2.1. CEO tax burdens and demand for conservatism from shareholders' perspective

Agency problems between managers and shareholders can arise from the separation of ownership and control (Jensen and Meckling, 1976). Research suggests that shareholders demand accounting conservatism because it can mitigate agency problems in several ways (Ball, 2001; Watts, 2003a). Specifically, conservatism can help shareholders identify negative NPV projects in a timely manner, which could, in turn, mitigate managers' ability to overinvestment (Ball and Shivakumar, 2005). Consistent with agency problems creating a demand for conservatism, LaFond and Watts (2008) find that higher information asymmetry between managers and shareholders leads to higher demand for conservatism. LaFond and Roychowdhury (2008) argue that higher managerial ownership mitigates manager-shareholder conflicts and reduces the need for conservatism. Ahmed and Duellman (2013) contend that overconfident managers overestimate future cash flows from their firms' investments by delaying loss recognition, which encourages less conservative accounting. Chung and Wynn (2008) find that an increase in managers' legal liability coverage influences their strategic choice to relax conservative reporting practices.

The tax-based lock-in effect (i.e., selling frictions due to unrealized capital gains tax liabilities) discourages CEOs from selling vested equity in their portfolio, and over time CEOs accumulate higher own-firm stock ownership (Jin and Kothari, 2008; Armstrong et al., 2015). The higher managerial ownership due to the accumulated stock may enhance manager-shareholder alignment and mitigate agency conflicts between these two parties (Jensen and Meckling, 1976; Demsetz, 1983; McConnell and Servaes, 1990). Moreover, the literature documents that optimum CEO stock ownership is essential for better firm performance (Morck et al., 1988; Core and Larcker, 2002). The lock-in effect may provide a channel through which CEOs with below-equilibrium stock ownership maintain their optimum ownership levels, consequently reducing manager-shareholder agency problems. Therefore, from shareholders' perspective, an increase in managerial ownership because of CEO tax burdens may help mitigate manager-shareholder agency conflicts and thereby reduce demand for conservatism.[6]

However, there are a couple of reasons to doubt the manager-shareholder alignment view of CEO tax burden as easing shareholder demand for conservatism. Managers are generally more risk-averse than shareholders due to their undiversified wealth and human capital, concern for their reputations, and private benefits of control; hence, they are encouraged to take less risky projects

[6] This argument is consistent with the findings of LaFond and Roychowdhury (2008).

(Amihud and Lev, 1981; Hirshleifer and Thakor, 1992; John et al., 2008). Over time, accumulated stock ownership because of the lock-in effect may induce high wealth-performance sensitivity that overexposes CEOs to firm-specific risk (Yost, 2018). This overexposure to firm risk could exacerbate CEO risk aversion leading to investment in diversifying but negative NPV projects, e.g., diversifying mergers. Shareholders could increase demand for conservatism to identify such less risk but negative NPV projects in a timely manner. Overall, it is an empirical question whether, from shareholders' perspective, CEO tax burdens increase or decrease demand for conservatism.

2.2. CEO tax burdens and demand for conservatism from creditors' perspective

A parallel stream of research argues that creditors demand accounting conservatism due to information asymmetry between creditors and managers (shareholders). Since creditors have little or no desire for risk, the risk-taking incentives induced by managerial equity compensation exacerbate shareholder-creditor agency conflicts (e.g., Jensen and Meckling 1976; Billett et al., 2010). Accordingly, creditors have shown higher demand for financial reporting conservatism when CEOs have higher vega compensation (Brockman et al., 2015; Hu and Jiang, 2019).[7] On the other side, Wang et al. (2018) find that firms with higher CEO inside debt (pensions and deferred compensation) need less conservatism as inside debt can deter CEO risk-taking incentives and alleviate creditor expropriation concerns.

Yost (2018) shows that CEOs with higher tax burdens are encouraged to pursue risk-reducing corporate policies. Additionally, Kubick et al. (2021) find that creditors recognize the risk-reducing incentives of CEO tax burdens and charge a lower cost of debt and impose less restrictive debt contracts. Therefore, due to the agency cost of debt mitigation role of CEO tax

[7] This finding is consistent with the well know theory that risk-taking incentives induced by equity compensation amplify shareholder-creditor conflict (Jensen and Meckling 1976; John and John 1993; Billett et al. 2010). Specifically, higher CEO vega incentives have been shown to encourage CEOs to pursue riskier investment policies and implement more aggressive debt policy choices (Coles, Daniel, and Naveen, 2006).

burdens, debt markets may have a lower demand for accounting conservatism as CEO tax burdens increase.

In contrast, another view posits that the debt alignment benefit of CEO tax burdens may not be sufficient for creditors to reduce the need for conservatism. Conservative reporting understates firms' net assets and cumulative earnings, thereby constraining overpayments to shareholders (Ahmed et al., 2002). Timely loss recognition and high verifiability requirement for economic gains enhance the efficiency of debt contracting by triggering covenant violations (Watts 2003a). Additionally, conservatism facilitates the ability of creditors to acquire control rights when firms experience adverse economic conditions and discourage managers from taking opportunistic actions against creditors in distress situations (Zhang, 2008; Nikolaev, 2010). Therefore, the demand for conservative financial reporting represents an important mechanism to fortify creditors from future usurpation concerns, and thus CEO tax burdens may not reduce creditor demand for conservatism.

This discussion leads to my main testable hypothesis:

Hypothesis 1: CEO capital gains tax burdens decrease demand for accounting conservatism.

Research has shown that managerial risk-related incentives influence creditors' demand for conservatism (Brockman et al., 2015; Hu and Jiang, 2019). CEO tax burdens represent risk-reducing incentives, and creditors may value this incentive over shareholders to shape conservative reporting policies. Also, the literature argues that accounting conservatism is shaped more by creditors than by shareholders (e.g., Ball et al., 2008). Therefore, I propose my second hypothesis:

Hypothesis 2: The effect of CEO tax burden on accounting conservatism is primarily shaped by creditor demand.

If CEO tax burdens negatively influence accounting conservatism, I expect firms' default risk to influence this effect. Shareholder-creditor agency problems intensify with an increase in a firm's default risk as creditors face higher expropriation risk. As such, the shareholder-creditor agency conflicts mitigating role of CEO tax burdens for shaping accounting conservatism should be accentuated as default risk increases. Moreover, conservative accounting practices lead to lower earnings and lower asset valuations on the balance sheet. Due to this systematic understatement of net worth, conservative reporting could magnify firms' default risk (Ahmed et al., 2002; Franzen et al., 2005; Frankel and Roychowdhury, 2006; Kao and Sie, 2016). Therefore, creditors may more highly value how CEO tax burdens help to moderate default risk through less conservative accounting practices. This suggests the following hypothesis:

Hypothesis 3: The negative relation between CEO tax burden and conservatism is stronger in firms with higher default risk.

The existing creditor-manager alignment mechanism may also shape the role of CEO tax burdens on accounting conservatism. CEO inside debt has been shown to mitigate the agency costs of debt as debt-like compensation dampens managers' risk-taking incentives (e.g., Wei and Yermack, 2011; Anantharaman et al., 2014). Further, research documents that the interests of entrenched CEOs are more aligned with those of creditors (Klock et al., 2005; Chava et al., 2009; Ji et al., 2020).[8] This implies that non-entrenched CEOs and CEOs with lower inside debt are likely more aligned with shareholders than creditors. Therefore, the agency cost of debt mitigation role of CEO tax burdens may be more important when the interests of CEOs are more aligned with those of shareholders. This discussion leads to my final testable hypothesis:

[8] Klock et al. (2005) find that antitakeover governance provisions, defined by the Gompers et al. (2003) G-Index, lower the cost of debt. Chava et al. (2009) document that banks charge lower credit spreads for firms with higher takeover defenses (represented by the G-Index). Ji et al. (2020) show that entrenched managers in diversified firms are more aligned with creditors.

Hypothesis 4: The negative effect of CEO tax burden on conservatism is more pronounced when the CEO has less inside debt or is not entrenched.

3. Sample and descriptive statistics

Since data coverage on Standard & Poor's ExecuComp database begins in 1992, my sample period starts from 1993 to have available information on lagged values of CEO tax burden. I use CRSP data for stock returns and Compustat data for firm characteristics. Following the literature, I exclude financial (SIC codes 6000–6999) and utility (SIC codes 4900–4999) firms as they have a unique reporting environment and financial structure.[9] My final sample consists of 2,386 unique firms (23,258 firm-year observations) for the period 1993–2018.

3.1. Variables

3.1.1 CEO capital gains tax burden

The idea is to capture variation in the lock-in effect arising from unrealized capital gains tax burden that is discouraging CEOs to sell stock in their equity portfolio. Following Yost (2018), I measure the capital gains tax burden as taxes that could have owed if the CEO sold her entire vested equity, which is held more than a year, at any given point in time. I then divide this tax burden by the total value of the CEO's stock and option holdings (vested and unvested). Specifically, it is computed as

$$TAX\_BURDEN_t = \frac{\sum_{n=1}^{t} N_n \times (P_t - P_n) \times \tau_{F_t+S_t}}{Total\ Equity_t}, \quad (1)$$

where N_n is the number of vested shares held by the CEO at the end of year *t* that were obtained in year n; P_t is the firm's stock price at the end of year *t*; P_n is the firm's stock price at the end of year n (i.e., the price at which the CEO is assumed to have received the shares obtained in year n);

[9] The results are similar if I include financial and utility firms (6,686 firm-years).

τ_{F+S} is the maximum federal plus state capital gains tax rate for individuals in year *t*; and $Total\ Equity_t$ is the value of the CEO's holdings of all vested and unvested stock and options held at the end of year t.[10]

Following the literature (Jin and Kothari, 2008; Yost, 2018; Kubick et al., 2021), I assume CEOs are likely to be in the top federal and state capital gains tax brackets.[11] To assign a state-level tax rate, I assume that a CEO is a resident of the state where the firm is headquartered. As Compustat backfills state headquarters based on the most recent business address, I use the Loughran-McDonald augmented 10-X header data to identify a firm's headquarter state in a given fiscal year.[12]

As noted by Yost (2018), a measure of unrealized capital gains tax liability at any given time should reflect variation in unrealized capital gains taxes on CEO's vested equity holdings. Accordingly, the capital gains tax liability measure in equation (1) is a function of three parameters at the end of fiscal year *t*: i) unrealized gains (losses) on CEO's vested equity holdings ($\sum_{n=1}^{t} N_n \times (P_t - P_n)$), ii) the combined federal and state personal capital gains tax rates ($\tau_{F_t+S_t}$), and iii) her total equity value in the firm ($Total\ Equity_t$). The numerator in the equation reflects the dollar value of unrealized tax burden. By scaling it with the CEO's total equity value (value of vested and unvested stock and options) better captures the relative importance of the tax burden (Yost, 2018).[13] Therefore, it is plausible to assume that Yost's (2018) measure provides a conservative estimate of the CEOs' unrealized capital gains tax liabilities.

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[10] Due to the lack of detailed information in ExecuComp, I assume that all transactions, including selling and vesting, in CEO equity portfolio during a fiscal year occurred at the end of the fiscal year, with the fiscal-year-end stock price as the transaction price.

[11] I use the maximum federal and state capital gains tax rates compiled by Feenberg and Coutts (1993) for the period 1977–2018, available at http://users.nber.org/~taxsim/state-rates.

[12] This data is available at https://sraf.nd.edu/data/augmented-10-x-header-data.

[13] In sensitivity analysis, my results are robust to scaling tax burden by the value of vested equity, as used in Jin and Kothari (2008).

3.1.2. Measure of conservatism

My primary measure of accounting conservatism is based on Basu's (1997) earnings-return model. This is the most widely used measure of accounting conservatism in the literature (e.g., Roychowdhury and Watts, 2007; LaFond and Watts, 2008; Ramalingegowda and Yu, 2012).[14] Basu (1997) interprets accounting conservatism as measuring accountants' tendency to require a higher degree of verification for recognizing "good news" than "bad news" in financial statements. Under the accounting conservatism principle, "bad news" is incorporated into earnings in a timely manner, while "good news" is recognized gradually over time, also known as conditional conservatism. Ball, Kothari, and Robin (2000) define Basu's (1997) measure of conditional conservatism as "the extent to which current-period accounting income asymmetrically incorporates economic losses, relative to economic gains."

Basu's (1997) model uses positive (negative) stock returns to capture good (bad) economic news and is estimated as follows:

$$NI_{i,t} = \beta_0 + \beta_1 RET_{i,t} + \beta_2 NEG_{i,t} + \beta_3 RET_{i,t} \times NEG_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where *t* refers to fiscal year, *i* denotes firm, NI is net income before extraordinary items divided by the beginning-of-period market value of equity, RET is the market-adjusted stock return computed as the 12-month compound buy-and-hold stock returns (beginning nine months before and ending three months after the end of the fiscal year) minus the value-weighted market return over the same period, and NEG is an indicator variable set equal to one if RET is negative, and zero otherwise. NEG represents bad cash flow news.

In equation (2), β_1 captures the sensitivity of earnings to positive returns (i.e., the timeliness with which good news is recognized in earnings or timely gain recognition). The coefficient ($\beta_1 +$

[14] I show robustness of my main result by employing several alternative measures of conservatism, discussed in Section 5.

β_3) captures the sensitivity of earnings to negative returns (i.e., the timeliness with which losses are recognized in earnings or timely loss recognition). The main focus is on β_3, which denotes the incremental timeliness with which economic losses are recognized in earnings relative to economic gains (i.e., the asymmetric timeliness). β_3 is used as a measure of conditional conservatism, with $\beta_3 > 0$ indicating that earnings incorporate bad news in a more timely manner than good news. For my analysis, I augmented the baseline Basu (1997) model by including the CEO tax burden variable and controls, which I discuss in Section 4.1.

In light of the ongoing debate on the biases arising from using a specific measure of conservatism, I also employ several alternative measures of conditional and unconditional conservatism in my robustness tests. Specifically, my alternative measures of accounting conservatism are (i) asymmetric timeliness of earnings due to operating accruals (Hsu et al., 2012; Collins et al., 2014), (ii) the earnings-change measure of conditional conservatism (Basu, 1997), (iii) the negative magnitude of average non-operating accruals (e.g., Givoly and Hayn, 2000; Ahmed and Deullman, 2007), and (iv) the difference between cash flows and earnings skewness (e.g., Givoly and Hayn, 2000; Beatty et al., 2008). A discussion of these measures and results is in Section 5.

3.1.3. Controls

Following research on accounting conservatism, I control for four firm characteristics in my empirical analyses: firm size (*MV*), leverage (*LEV*), market-to-book (*MTB*), and litigation risk (*LIT*). *MV* is the market value of equity, *MTB* is the market value of equity divided by book value of equity, *LEV* is the ratio of long-term debt plus debt in current liabilities to total assets, and *LIT* is a dummy variable set equal to one if a firm belongs to one of the four industries with a high incidence of litigation: biotechnology (SIC codes 2833-2836 and 8731-8734), computers (SIC codes 3570-3577 and 7370-7374), electronics (SIC codes 3600-3674), and retailing (SIC codes 5200-5961) (Francis et al., 1994). Additionally, I control for CEO vega (the sensitivity of CEO's wealth to stock price volatility), delta (the sensitivity of CEO's wealth to stock price), and ownership. *VEGA* is the dollar change in CEO wealth associated with a 0.01 change in the standard deviation of the firm's returns scaled by total compensation, *DELTA* is the dollar change in CEO wealth associated with a 1% change in the firm's stock price scaled by total compensation, and *OWN* is the number of vested shares held by the CEO divided by the total number of shares outstanding in the market.[15]

I control for firm size as larger firms are likely to be more mature and therefore are likely to have a better information environment, which reduces demand for conservative reporting (Khan and Watts, 2009). Higher market-to-book serves as a buffer against having to record subsequent losses, lowering conditional conservatism (Roychowdhury and Watts, 2007; LaFond and Watts, 2008). I include the leverage ratio to control for creditors' demand for conservative financial reporting (e.g., Watts, 2003a; Ahmed et al., 2002). Finally, firms that face higher litigation risk may use more conservative accounting to mitigate these risks (e.g., Basu, 1997; Watts, 2003a).[16]

I control for CEO delta and vega incentives as they have been found to influence demand for conservatism (Brockman et al., 2015; Hu et al., 2019). Managerial ownership negatively affects demand for conservatism, as higher managerial ownership likely proxies for lower information asymmetry (Lafond and Roychowdhury, 2008). Finally, to control for information incorporated in lagged earnings and to address a correlated omitted variable problem, I include firm and year fixed effects in all my empirical specifications (Ball et al., 2013).

[15] Following Liu et al. (2014), I scaled CEO delta and vega incentives by total CEO compensation. In a sensitivity test, the results are qualitatively similar if I use a log transformation of these variables.

[16] The literature argues that in order to reduce litigation risk managers are encouraged to incorporate bad news in earnings announcements earlier than good news (Skinner, 1994; Basu, 1997; Watts, 2003a).

3.2. Summary statistics

Panel A of Table 1 reports summary statistics of all the variables used in my analyses. I define all variables in Appendix A. The mean (median) of CEO tax burden, *TAX_BURDEN*, is 3.8% (3.0%), with a standard deviation of 8.5%.[17] The mean (median) of net income scaled by beginning-of-period market value of equity, *NI*, is 2% (4.8%), and the mean (median) of market-adjusted buy-and-hold stock return, *RET*, is 3.5% (–1.3%). The mean equity value in my sample is $7.86 billion, the mean market-to-book ratio is 2.08, and the mean leverage is 23%. About 27.9% of the firm-year observations are classified in high litigation industries. Statistics for the remainder of the variables are similar to those reported in the literature.

Panel B provides Pearson correlations among the main variables. As shown in the table, *TAX_BURDEN* is positively correlated with firm earnings, equity value, and market-to-book ratio, and negatively related to market-adjusted buy-and-hold stock returns, leverage, and litigation risk. Also, CEO tax burden is significantly positively correlated with CEO ownership and CEO delta. These correlations denote the importance of controlling for these factors while examining the association between CEO tax burden and accounting conservatism.

4. Results

4.1. CEO tax burden and accounting conservatism

I estimate the following augmented Basu (1997) model:

$$\begin{aligned} NI_{i,t} = {} & \beta_1 RET_{i,t} + \beta_2 NEG_{i,t} + \beta_3 RET_{i,t} \times NEG_{i,t} \\ & + (\beta_4 + \beta_5 RET_{i,t} + \beta_6 NEG_{i,t} + \beta_7 RET_{i,t} \times NEG_{i,t}) \times TAX\_BURDEN_{i,t-1} \\ & + (\beta_8 + \beta_9 RET_{i,t} + \beta_{10} NEG_{i,t} + \beta_{11} RET_{i,t} \times NEG_{i,t}) \times Controls_{i,t-1} \\ & + \beta_{Firm} + \beta_{Year} + \varepsilon_{i,t}. \end{aligned} \tag{3}$$

[17] Yost (2018) reports a mean (median) of 3% (1%) and a standard deviation of 9% for his CEO tax burden variable in a sample over the period 1993 to 2014.

In equation (3), the coefficient β_5 on $RET \times TAX\_BURDEN$ captures the effect of CEO tax burden on timely gain recognition (TGR). The sum of the coefficients on $RET \times TAX\_BURDEN$ and $RET \times NEG \times TAX\_BURDEN$ (i.e., $\beta_5 + \beta_7$) captures the effect of CEO tax burden on timely loss recognition (TLR). The key coefficient of interest is β_7, the three-way interaction term of $RET \times NEG$ and TAX_BURDEN, which measures the association of loss recognition asymmetric timeliness (AT), also known as conditional conservatism, with CEO tax burden. A negative value of β_7 indicates that higher CEO tax burdens are associated with lower conditional conservatism.

The theory of accounting conservatism in Watts (2003a) points out that conservatism varies with debt contracts, compensation contracts, litigation, taxation, and regulation. Following the literature, I attempt to control for these factors by including CEO risk incentives, CEO ownership, firm size, growth options, leverage, and litigation risk in my specification. By including all the interaction terms with the controls, my regression specification also captures variations in TGR, TLR, and AT associated with the controls. Specifically, the coefficients on the three-way interaction terms control for variation in asymmetric timeliness stemming from the control variables.

Table 2 reports the OLS estimation of equation (3) with standard errors clustered by executive and fiscal year. In column (1), I control for firm characteristics. In column (2), I add CEO delta, vega, and ownership variables. The coefficient on $RET \times NEG$ is significantly positive, which indicates that, on average, accounting is conditionally conservative (Basu,1997). Moving towards the key variable, the coefficient on $RET \times NEG \times TAX\_BURDEN$ is statistically negative at the 1% level in all specifications. Consistent with my *Hypothesis 1*, this result indicates that higher CEO tax burdens are associated with lower demand for conservatism. Economically, the coefficient of –0.883 on $RET \times NEG \times TAX\_BURDEN$ in column (2) reflects that a one-standard-deviation increase in CEO tax burden is associated with a 23% percent decrease in average conservatism (i.e., [–0.883*0.085]/0.331).[18] In an alternate approach following LaFond and Roychowdhury (2008), I compare variation in average conservatism (i.e., the coefficient on $RET \times NEG$) as CEO tax burden increases from the bottom decile to the top decile. For each year, I rank TAX_BURDEN into deciles and estimate Basu (1997) specification for the subsample in the bottom decile rank of CEO tax burden and for the subsample in the top decile rank, separately.[19] In untabulated results, the coefficient on conditional conservatism (i.e., $RET \times NEG$) for the bottom decile sample is 0.261 and for the top decile sample is 0.192. Thus conservatism decreases by 26% from the bottom decile to the top decile of CEO tax burden (i.e., (0.192–0.261)/ 0.261), which is close to my estimate of 23% computed for a one standard deviation. The overall analysis suggests that change in CEO tax burden has economically significant negative impact on accounting conservatism.

As seen in the table, the significantly positive coefficient (at the 5% level in column 2) on $RET \times TAX\_BURDEN$ suggests that, as CEO tax burden increases, earnings become timelier in recognizing good news. I therefore test whether the sum of the coefficients on $RET \times TAX\_BURDEN$ and $RET \times NEG \times TAX\_BURDEN$ (i.e., –0.746 = 0.137–0.883), is significantly different from zero. An untabulated test result confirms the significantly negative combined coefficient of $RET \times TAX\_BURDEN + RET \times NEG \times TAX\_BURDEN$, which implies a significant decrease in overall (and not just asymmetric) timely loss recognition with higher CEO tax burden. Turning to the controls, the coefficients on firm-level controls are generally consistent with prior

[18] The standard deviation of TAX_BURDEN is 0.085 and the coefficient of 0.331 on $RET \times NEG$ indicates average conditional conservatism.
[19] For these regressions, I only include firm-level controls in the Basu (1997) model without CEO tax burden and incentives variables.

research (e.g., Ramalingegowda and Yu, 2012).[20] The coefficients on the three-way interaction terms of CEO delta, vega, and ownership are generally insignificant at conventional levels.[21]

4.2. Identification tests

My results so far could be influenced by endogeneity. First, a reverse causality concern suggests that the CEO of a firm that has reported higher profits due to less conservative financial reporting is more likely to receive higher compensation, resulting in a higher tax liability. Second, omitted variable bias suggests that there exist some unobservable firm factors and CEO characteristics that could be correlated with both CEOs' tax liabilities and accounting conservatism. To enhance identification, I examine the changes in accounting conservatism around federal and state-level tax cuts, respectively, which plausibly *exogenously* alter CEOs' tax liabilities. The assumption is that tax cuts cause CEOs to sell their vested equity, and this alters their sensitivity to firm-specific risk.

4.2.1. The federal Taxpayer Relief Act of 1997

The enactment of the Taxpayer Relief Act of 1997 (TRA97) reduced the maximum federal long-term capital gains tax rate from 28% to 20% (around a 29 percent drop), effective for asset

[20] For example, the coefficient on $RET \times NEG \times \text{Ln}(MV)$ is negative, which indicates that due to lower information asymmetry, larger firms reduce demand for conservatism (Khan and Watts, 2009). The coefficient on $RET \times NEG \times MTB$ confirms the negative relation between market-to-book and accounting conservatism documented in other studies. Moreover, the positive coefficients on the triple interaction term with LEV and LIT indicate that firms with higher leverage and higher litigation risk demand more conservatism.

[21] One possible reason for some insignificant and opposite signs on these variables, compared to Lafond and Roychowdhury (2008) and Brockman et al. (2015), could be the high correlations among these variables as well as with CEO tax burden. Note that Lafond and Roychowdhury (2008) do not control for CEO delta and vega in their models while examining the effect of CEO ownership on conditional conservatism. They find a negative relation between CEO ownership and loss recognition asymmetric timeliness (AT). Brockman et al. (2015), investigate an association between CEO risk-incentives (delta and vega) and conservatism, control for CEO ownership and find a significantly positive (at marginal level) coefficient on AT term with CEO ownership. Additionally, compared to their sample period (between 1992–2007), my sample extends to 2018.

sales after May 6, 1997. As discussed in Dai et al. (2008), TRA97 was unexpected.[22] Yost (2018) argues that the enactment of TRA97 is an exogenous shock to federal capital gains tax rates and shows that it encouraged CEOs to unwind a significant amount of their equity holdings. As discussed earlier, the CEO tax burden variable is a function of combined federal and state personal capital gains tax rates, accumulated unrealized gains on her equity holdings, and total CEO equity ownership in the firm. The provisions in TRA97 only affect the federal personal capital gains tax rate parameter in this variable, and thus TRA97 plausibly provides an exogenous shock to the tax burden. Accordingly, TRA97 provides a quasi-natural experiment to study how an abrupt decrease in CEO tax liabilities affects accounting conservatism.

As the tax cut of TRA97 affects all CEOs simultaneously, following Yost (2018) and Kubick et al. (2021), I utilize variation in CEO tax burden before these tax cuts to identify potential treatment and control groups. Kubick et al. (2021) show that CEO stock sales after the enactment of TRA97 are more pronounced for CEOs with high pre-TRA97 tax burdens as they have the most to gain due to this tax cut. I therefore conjecture that, if the change in CEOs' tax burdens as a result of the TRA97 affects accounting conservatism, then firms with high pre-TRA97 tax burdens (high impact CEOs) should experience a larger *increase* in the demand for conservatism than firms with low pre-TRA97 tax burdens (low impact CEOs). To facilitate this experiment, I estimate the following specification:

[22] The TRA97 consisted of several tax cut provisions aimed at particular categories of taxpayers, income, and activities (e.g., families with children, capital gains, saving and investment, education) along with a couple of smaller and more narrow revenue-raising provisions, such as the extension and modification of aviation-related excise taxes.

$$
\begin{aligned}
NI_{i,t} = {} & \beta_1 RET_{i,t} + \beta_2 NEG_{i,t} + \beta_3 RET_{i,t} \times NEG_{i,t} \\
& + (\beta_4 + \beta_5 RET_{i,t} + \beta_6 NEG_{i,t} + \beta_7 RET_{i,t} \times NEG_{i,t}) \times POST\_CUT_t \\
& + (\beta_8 + \beta_9 RET_{i,t} + \beta_{10} NEG_{i,t} + \beta_{11} RET_{i,t} \times NEG_{i,t}) \times POST\_CUT_t \times PRE\_TAX\_BURDEN_i \\
& + (\beta_{12} + \beta_{13} RET_{i,t} + \beta_{14} NEG_{i,t} + \beta_{15} RET_{i,t} \times NEG_{i,t}) \times Controls_{i,t-1} \\
& + \beta_{Firm} + \varepsilon_{i,t}.
\end{aligned} \tag{4}
$$

For this analysis, I restrict my sample period to 1994–2000, which evenly encompasses the pre- and post-TRA97 eras. Since TRA97 became effective beginning May 6, 1997, I exclude fiscal year 1997 data to avoid ambiguous information in this transitory year.[23] The indicator variable $POST\_CUT$ takes the value of one for the post-TRA97 period (i.e., 1998–2000) and zero for the pre-TRA97 period (i.e., 1994–1996). For each firm, PRE_TAX_BURDEN is set equal to the CEO's tax burden at the end of 1996 (i.e., the most recent year before the enactment of TRA97).[24] Panel A of Figure 1 graphically demonstrates the timeline used in this experiment. My specification in equation (4) excludes PRE_TAX_BURDEN and its interactions with RET, NEG, and $RET \times NEG$ as they are subsumed by firm fixed effects. I require each CEO-firm pair to have at least one observation in the pre- and post-TRA97 periods. I predict a significantly positive value of β_{11}, which indicates that CEOs with higher tax burdens prior to the tax cut have a larger subsequent increase in demand for conservatism relative to low-tax-burden CEOs.

Table 3 reports the results of estimating equation (4) in columns 1 (with firm controls) and 2 (with a full set of controls). As predicted, I observe a significantly positive (at the 1% level) coefficient on $RET \times NEG \times POST\_CUT \times PRE\_TAX\_BURDEN$, which suggests that CEOs with higher tax burdens prior to the tax cut experience a significantly higher demand for conservatism

[23] Yost (2018) and Kubick et al. (2021) use the sample period of 1995–2000 and include year 1997 in the post period for their TRA97 analysis. In untabulated analysis, my results are robust to using the sample period of 1995–2000 and including observations for year 1997.
[24] My results are qualitatively similar if I use the mean of the CEO's tax burden in pre-TRA97 period instead of the tax burden at the end of 1996.

after the tax cut.[25] To analyze the economic significance of this result, I estimate specification in equation (4) by replacing PRE_TAX_BURDEN with an indicator variable which is set equal to one (zero) if a firm has above-median (below-median) of PRE_TAX_BURDEN. The coefficient on the four-way interaction term of $RET \times NEG \times POST\_CUT$ and this indicator variable is 0.081, representing an incremental increase in conservatism for high tax burden CEOs by 29% in the post-TRA97 period.[26] This result suggests that the demand for conservative accounting increases in light of a reduction in CEO tax burdens for the CEOs that are the most impacted by this tax cut and thus provides a likely causal negative association between CEO tax burden and conservatism.

4.2.2. State tax cuts analysis

So far, my results suggest a causal negative relation between CEO tax burdens and accounting conservatism. To further sharpen identification, following Yost (2018), I exploit state-level capital gains tax rate cuts which allow for staggered rate cuts over time. For a tax cut in a state, the CEOs in the other states represent the unaffected group, thereby providing an explicit counterfactual.[27] Similar to the TRA97 analysis, I expect that CEOs with higher tax burdens before state-level tax cuts experience an increase in demand for accounting conservatism following a state capital gains tax cut.

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[25] Apart from TRA97, there is another capital gains tax cut in my sample period arising from the enactment of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). JGTRRA reduced the maximum long-term individual capital gains tax rate from 20% to 15%. The other major provisions of JGTRRA included a decrease in maximum dividend tax rate from 39.6% to 15%, decrease in the maximum ordinary income tax rate from 38% to 35%, and enactment of bonus depreciation incentives to encourage corporate investment. JGTRRA offers a noisy setting for my identification test as its other provisions can confound identification due to their potentially direct influence on both CEO capital gains tax liabilities as well as accounting conservatism. For example, payout and investment policies can shape the demand for accounting conservatism (e.g., Ahmed et al., 2002; Balakrishnan et al., 2016). Nonetheless, in untabulated analysis, I run the same experiment using JGTRRA as a federal tax cut instead of TRA97 and find a positive but insignificant coefficient on $RET \times NEG \times POST\_CUT \times PRE\_TAX\_BURDEN$.

[26] The economic significance is computed as the coefficient of 0.081 divided by the accounting conservatism level in the pre-TRA97 period, represented by the coefficient of 0.282 on $RET \times NEG$.

[27] For the analysis, I assume that a CEO resides in the state where the firm is headquartered.

To run this experiment, I set up my parameters as follows. An event occurs if there is a reduction in a state's capital gains tax rate from *t*–1 to *t*.[28] The timeline used in this analysis is graphically depicted in Figure 1 (Panel B). $TAX\_CUT_{s,t}$ is the magnitude of the tax cut in state *s* that occurred in year *t*.[29] The same value of this magnitude is assigned to the observations for state *s* for the next three years and assigned zero for the observations three years before the event. If no event occurs in a state, it is set to zero. $PRE\_TAX\_BURDEN_i$ is set equal to the CEO's tax burden computed at the start of the event year. I estimate the following regression:

$$\begin{aligned} NI_{i,t} = {} & \beta_1 RET_{i,t} + \beta_2 NEG_{i,t} + \beta_3 RET_{i,t} \times NEG_{i,t} \\ & + (\beta_4 + \beta_5 RET_{i,t} + \beta_6 NEG_{i,t} + \beta_7 RET_{i,t} \times NEG_{i,t}) \times TAX\_CUT_{s,t} \\ & + (\beta_8 + \beta_9 RET_{i,t} + \beta_{10} NEG_{i,t} + \beta_{11} RET_{i,t} \times NEG_{i,t}) \times PRE\_TAX\_BURDEN_i \\ & + (\beta_{12} + \beta_{13} RET_{i,t} + \beta_{14} NEG_{i,t} + \beta_{15} RET_{i,t} \times NEG_{i,t}) \times TAX\_CUT_{s,t} \times PRE\_TAX\_BURDEN_i \\ & + (\beta_{16} + \beta_{17} RET_{i,t} + \beta_{18} NEG_{i,t} + \beta_{19} RET_{i,t} \times NEG_{i,t}) \times Controls_{i,t-1} \\ & + \beta_{Firm} + \beta_{Year} + \varepsilon_{i,t}. \end{aligned} \tag{5}$$

I predict β_{15} to be significantly positive.

Table 4 reports the results of this analysis. Consistent with my prediction, the coefficient on $RET \times NEG \times TAX\_CUT \times PRE\_TAX\_BURDEN$ is significantly positive (at the 5% level) in column 2. This indicates that state-level tax cuts, which exogenously decrease CEOs' tax burdens, increase demand for conservatism. This effect is magnified with the size of tax cuts and with the level of locked-in effect represented by the CEO tax burdens in the pre-period.

In order to gauge the economic significance of this experiment, I create an indicator variable, $POST\_CUT$, which takes value of one if TAX_CUT is greater than zero. Additionally, $HIGH\_PRE\_BURDEN$ is set equal to one (zero) if a firm has above (below) sample-year median

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[28] Following Yost (2018), I exclude state tax cuts of less than 0.25. My results are qualitatively similar if I consider tax cuts of all sizes.

[29] From 1994 to 2018, my sample has 76 state capital gains tax cuts in 30 states. The mean (median) of these tax cuts is 0.98% (0.5%).

PRE_TAX_BURDEN. I then estimate equation (5) by replacing the two continuous variables with these indicator variables. In untabulated result the coefficient on $RET \times NEG \times POST\_CUT \times HIGH\_PRE\_BURDEN$ is approximately 32% of the coefficient on $RET \times NEG$, which indicates an economically significant increase in demand for conservatism after tax cuts for CEOs with high-tax-burdens.

Overall, my analyses using these quasi-natural experiments provide plausibly causal evidence of a negative association between CEO tax burdens and accounting conservatism.

4.3. Cross-sectional analyses

4.3.1. Shareholder versus creditor demand for conservatism

CEO tax burdens could plausibly influence demand for conservatism by shareholders and/or creditors. To test which channel, equity or debt, has the greater influence, I run a subsample analysis with firm-year observations having zero leverage (unlevered firms) and non-zero leverage (levered firms).[30] My sample has 13% unlevered firm-year observations. Panel A of Table 5 reports estimates from the baseline specification in equation (3) separately for the subsample of levered and unlevered firms. As seen in the first two columns, the coefficient on $RET \times NEG \times TAX\_BURDEN$ is significantly negative only for levered firms. This indicates that risk-reducing incentives of CEO tax burdens facilitate more alignment of CEOs towards creditors than shareholders in order to attenuate the demand for conservatism.

To strengthen the power of my test, I also estimate the specification in equation (3) separately for the subsample of low leverage and high leverage firms, where a firm with a leverage ratio above (below) the sample year-median is placed in the high (low) leverage group. Panel B of Table 5 reports the results. Consistent with lenders perceiving a benefit from CEO tax burdens

[30] I partition my sample based on the total of long-term debt and debt in current liabilities.

compared to the perceived benefits from shareholders perspective, the absolute value of the significantly negative coefficient on $RET \times NEG \times TAX\_BURDEN$ for high leverage group (column 4) is more than four times as large as the absolute value for the low leverage group (column 3).[31]

This finding is consistent with my *Hypothesis 2* that shareholders may not value the managerial ownership alignment created through CEOs' tax burdens as the exacerbated CEO risk aversion due to the lock-in effect may negatively impact shareholders' value. On the other hand, my results suggest that creditors perceive the risk-reducing incentives of CEO tax burden as a channel to attenuate shareholder-creditor agency problems and thereby decrease the need for conservatism. Moreover, this result is consistent with the argument that accounting conservatism is shaped more by creditors than by shareholders (e.g., Ball et al., 2008).

4.3.2. Default risk

This section investigates how default risk affects creditors' assessment of the importance of CEO tax burdens. My results so far suggest that CEOs' tax liabilities play an important role in mitigating shareholder-creditor agency conflicts. To understand the dynamics of this role, I examine how the negative relation between CEO tax burden and conservatism varies across firms with different levels of default risk. Shareholder-creditor agency problems intensify with firm's default risk. As such, the agency cost of debt mitigating role of CEO tax burdens for shaping accounting conservatism should be accentuated as default risk increases.

I form two subsamples based on a firm's default risk level and estimate my baseline specification (equation (3)) separately. I use three measures of default risk: Altman Z-score

[31] As reported at the bottom of the table, a test of the equality of the coefficient estimates on $RET \times NEG \times TAX\_BURDEN$ in columns (3) and (4) is rejected at the 5% level.

(*ZSCORE*), Merton model expected default frequency (*MEDF*), and a Naïve model expected default frequency (*NEDF*). A detailed description of these measures is in Appendix B. The two subsamples using each of the default risk measures are formed based on whether a firm has below or above sample-year median default risk at the beginning of a fiscal year. *ZSCORE* is the modified Altman (1968) Z-score, where a below-median value indicates a higher likelihood of default. *MEDF* is computed following the Merton (1974) bond pricing model, and *NEDF* is computed based on the "simplified" Merton model probability of default following Bharath and Shumway (2008). The above-median values of *MEDF* and *NEDF* indicate a higher likelihood of default.

Table 6 reports the results of this subsample analysis. For all the default risk measures, the coefficients on $RET \times NEG \times TAX\_BURDEN$ is significantly negative (at the 1% level) and larger in absolute value for the high default risk groups (in columns (2), (4), and (6)). As seen in the bottom of the table, the test of coefficient equality shows that the difference in the coefficient between the high and low default risk groups is statistically different for all the default risk measures. Consistent with *Hypothesis 3,* the negative association between CEO tax burden and accounting conservatism is concentrated in firms with higher default risk. This result suggests that any meaningful role of CEO tax burden in alleviating shareholder-creditor agency conflicts, and subsequently decreasing the demand for conservatism, is more pronounced for firms with higher default risk

4.3.3. Creditor-manager alignment

This section examines how the existing creditor-manager alignment due to CEO inside debt and entrenchment influences the association between CEO tax burden and conservatism. The shareholder-creditor agency conflicts are heightened when the interests of CEOs are more aligned with those of shareholders. This is when the agency cost of debt mitigation role of CEO tax burdens should be more important

The theory of Edmans and Liu (2011) argues that when the CEO's debt-to-equity ratio is larger than the firm's debt-to-equity ratio, the CEO is incentivized to reallocate wealth from shareholders to debtholders, and this direction of wealth transfer reverses if the CEO's debt-to-equity ratio is smaller than that of the firm.[32] Therefore, CEO's with their debt-to-equity ratio higher than that of the debt-to-equity ratio of their respective firms are more aligned with creditors than with shareholders (e.g., Jensen and Meckling, 1976; Sundaram and Yermack, 2007; Wei and Yermack, 2011).

Following the CEO inside debt literature, I compute the CEO-firm relative debt-to-equity ratio, *RELEV*, as the CEO's debt-to-equity ratio divided by the firm's debt-to-equity ratio (e.g., Sundaram and Yermack, 2007; Wei and Yermack, 2011; Liu et al., 2014). The CEO's debt-to-equity ratio is computed as the CEO-year inside debt divided by CEO equity value, where inside debt is the sum of the accumulated value of pension benefits and the aggregate deferred compensation at the end of the fiscal year. CEO equity value is the sum of value of the CEO's common stock holdings in the firm and the Black-Scholes value of option holdings. The firm's debt-to-equity ratio is the ratio of the book value of total debt to the market value of total equity, measured at the fiscal year-end. The sample starts in 2006 as the Securities and Exchange Commission (SEC) required detailed disclosure of CEO pensions and deferred compensation beginning from 2006.[33] I then partition my sample into two subsamples and place CEOs with *RELEV* above one in high CEO relative inside debt group and place the rest of the sample in low CEO relative inside debt group. The high CEO relative inside debt group represents a sample of CEOs that are more aligned with creditors.

[32] When these ratios are equal, CEOs are indifferent to this wealth transfer in either direction.
[33] I also exclude observations when the firm is unlevered.

To estimate CEO entrenchment, I use a combination of two governance variables. First, I construct the entrenchment index, *EINDEX*, of Bebchuk et al. (2009), which is the sum of indicator variables for six anti-takeover provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, supermajority requirements for mergers, and charter amendments.[34] Second, I use a dummy variable for CEO duality, *DUALITY*, which is equal to one if the CEO is the only insider on the board of directors and serves as the chairman of the board as well as president of the company, and zero otherwise. Information to construct these variables is obtained from Institutional Shareholder Services (formerly RiskMetrics). I then form two subsamples at the beginning of a fiscal year and assign a firm to the high entrenchment group if the CEO has *EINDEX* above the sample year-median and has *DUALITY* = 1; otherwise, a firm is assigned to the low entrenchment group.

Table 7 reports estimates from the baseline specification in equation (3) for CEO inside debt (Panel A) and entrenchment (Panel B) groups, respectively. As seen in Panel A, the coefficient on $RET \times NEG \times TAX\_BURDEN$ is significantly negative (at the 1% level) only for the low CEO relative inside debt group. Similarly, Panel B reports that the significant negative relation between CEO tax burden and accounting conservatism is only present in the group of firms with low CEO entrenchment level. Overall, these results support *Hypothesis 4*, which predicts that CEO tax burdens influence demand for conservatism when CEOs are more likely to be aligned with shareholders than with creditors, as proxied by lower CEO relative inside debt and non-entrenched CEO.

[34] Following the literature, I assume that a firm's entrenchment index remains the same between reporting dates before 2007.

5. Additional tests

5.1. The influence of auditors

The literature documents that auditors demand conservative reporting due to their legal liability exposure to clients' risk (e.g., Cahan and Zhang, 2006; Francis and Krishnan, 1999; Basu, 1997). The risk-reducing incentives of CEO tax burdens may alleviate auditors' litigation risk, thereby decreasing auditors' demand for conservatism. Therefore, my results could be driven by auditors, as opposed to creditors.

To rule out this confounding effect, I re-estimate the baseline specification for firms with different levels of audit risk. If auditors were to influence conservative reporting due to CEO tax burdens, I expect this effect to vary across firms with different levels of audit risk. For instance, risk-reducing incentives of CEO tax burdens could be more valuable for auditors when their clients possess high audit risk. I proxy auditor risk using measures of litigation and misstatement risk. First, I compute the probability of auditor litigation using the parameters from Shu's (2000) logit model and firm-level variables from my sample. Second, I estimate misstatement risk following Lobo and Zhao (2013). For each of these two audit risk measures, I form two subsamples based on whether it is above (high risk) or below (low risk) the sample year-median. Panel A of Table 8 reports results on the subsample of high versus low litigation risk, and Panel B reports results on misstatement risk.[35] In both the panels, the coefficients on $RET \times NEG \times TAX\_BURDEN$ do not statistically differ between low and high audit risks. Therefore, this analysis suggests that the effect of CEO tax burden on conservatism is not influenced by auditors.

[35] I also control for whether a firm uses Big 4 auditor since Big 4 auditors might influence demand for conservatism (Francis and Wang, 2008).

5.2. Controlling for economy-wide changes in conservatism

The level of conservative reporting has increased over the years (e.g., Ryan and Zarowin, 2003; Holthausen and Watts, 2001; Basu, 1997). My results could be biased due to time varying demand for conservatism. For robustness, in addition to year fixed effects, I re-estimate my main model of Table 2 by including $Year\ FE \times RET$, $Year\ FE \times NEG$, and $Year\ FE \times RET \times NEG$. The coefficients on $Year\ FE \times RET \times NEG$ capture any economy-wide changes in conditional conservatism over time. The results are reported in column 1 of Table 9. The statistically negative coefficient on $RET \times NEG \times TAX\_BURDEN$ is robust to controlling for any time trend change in conservatism.

The passage of the Sarbanes-Oxley Act of 2002 (SOX) has changed the financial reporting environment significantly. Indeed, the literature has documented that firms adopt more conservative reporting in the post-SOX era (e.g., Chen et al., 2014; Lobo and Zhou, 2006). In column 2 of Table 9, my main results remain unchanged when I restrict my sample period to the post-SOX period.

5.3. The effect of CEO tax burden and conservatism in the financial sector

The reporting environment is unique to financial firms compared to nonfinancial firms. Timely loss recognition could be an essential mechanism to deter excessive risk-taking in the financial sector (e.g., Bushman and Williams, 2012). Therefore, I re-estimate my baseline analysis separately for the sample of financial firms. In unreported table, the coefficient on $RET \times NEG \times TAX\_BURDEN$ is statistically negative. This analysis confirms that my baseline results also hold for financial firms.

5.4. Asymmetric timeliness of earnings due to operating accruals and operating cash flows

Since earnings are the sum of accruals and cash flow, asymmetric timeliness of earnings (or differential verification standards for recognizing economic gains versus losses) can arise from accruals and cash flow (e.g., Basu, 1997; Hsu et al., 2012). Among these two components of earnings, the accruals component encompasses expected future cash flows, and thus accrual asymmetric timeliness is more likely to capture the difference in recognizing unrealized gains versus unrealized losses. On the other hand, cash flow asymmetry does not stem from differential verification standards for acknowledging gains versus losses in realized cash flows. Ball and Shivakumar (2005, p. 93) have highlighted this point stating that "timely gain and loss recognition is based on *expected* not realized cash flows, and therefore is accomplished through accruals." Hsu et al. (2012) and Collins et al. (2014) argue that only the asymmetric timeliness arising from accruals reflects conservatism, while the asymmetric timeliness of cash flow does not.

I conduct a test to validate that my baseline results stem from accrual asymmetric timeliness. I estimate my baseline specification in equation (3) by replacing the dependent variable *NI* with either accrual (*ACCRU*) or cash flows (*OCF*). *ACCRU* is computed as net income before extraordinary items minus operating cash flows, and *OCF* is operating cash flows, both scaled by beginning-of-period market value of equity. As shown in Table 10, the coefficient on $RET \times NEG \times TAX\_BURDEN$ is significantly negative for *ACCRU* and not significantly different from zero for *OCF*. This result validates that the negative relation between CEO tax burden and conservatism is fully driven by accrual-based conditional conservatism.

5.5. The earnings-change measure of conservatism

In this section, I investigate the robustness of my results to another widely used measure of conditional conservatism that does not rely on stock returns: Basu's (1997) earnings-change model.[36]

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[36] This model is used by several accounting conservatism studies for robustness, e.g., Ball and Shivakumar (2005) and Ramalingegowda and Yu (2012).

According to the conditional conservatism principle, losses are recognized in a timely manner and thus are more likely to be recognized in the current period. Therefore, firms with negative earnings (or negative earning changes) in the current period are likely to show mean-reversion (or generate positive earnings) in the future. Alternatively, gains require higher verification to be recognized in the current time period, and therefore are more likely to persist in the future until the related cash flows are realized. Thus, firms with positive earnings (or positive earnings changes) in the current period are more likely to have positive earnings changes in the following periods.[37] According to these arguments, Basu (1997) specifies the earnings-change model of conditional conservatism as follows:

$$\Delta NI_{i,t+1} = \beta_0 + \beta_1 \Delta NI_{i,t} + \beta_2 NEGI_{i,t} + \beta_3 \Delta NI_{i,t} \times NEGI_{i,t} + \varepsilon_{i,t}, \tag{6}$$

where ΔNI is the change in net income before extraordinary items divided by beginning-of-period total assets and *NEGI* is an indicator variable set equal to one if ΔNI is negative, and otherwise set to zero. In equation (6), β_1 captures the sensitivity of future earnings changes to current positive earnings changes, $(\beta_2 + \beta_3)$ reflects the sensitivity to current negative earnings changes, and β_3 denotes the differential sensitivity of future earnings changes with respect to negative current earnings changes (bad news) versus positive current earnings changes (good news).

To examine the effect of CEO tax burdens on the earnings-change model of conservatism, I estimate the following augmented specification:

$$\begin{aligned} \Delta NI_{i,t+1} = {} & \beta_1 \Delta NI_{i,t} + \beta_2 NEGI_{i,t} + \beta_3 \Delta NI_{i,t} \times NEGI_{i,t} \\ & + \left(\beta_4 + \beta_5 \Delta NI_{i,t} + \beta_6 NEGI_{i,t} + \beta_7 \Delta NI_{i,t} \times NEGI_{i,t}\right) \times TAX\_BURDEN_{i,t-1} \\ & + \left(\beta_8 + \beta_9 \Delta NI_{i,t} + \beta_{10} NEGI_{i,t} + \beta_{11} \Delta NI_{i,t} \times NEGI_{i,t}\right) \times Controls_{i,t-1} \\ & + \beta_{Firm} + \beta_{Year} + \varepsilon_{i,t}. \end{aligned} \tag{7}$$

[37] As documented in Basu (1997), these arguments are hypothesized based on the finding that negative earnings shocks exhibit higher mean-reversion than positive earnings shocks (Brooks and Buckmaster, 1976; Elgers and Lo, 1994).

I use the same controls in equation (7) as in my baseline specification in equation (3). As negative earnings changes have a greater tendency for mean-reversion in the following periods than positive earnings changes, higher conservatism predicts a negative coefficient on $\Delta NI \times NEGI$. The coefficient on $\Delta NI \times NEGI \times TAX\_BURDEN$ (i.e., β_7) represents an association of CEO tax burden with conservatism. I expect $\beta_7 > 0$, which would indicate that an increase in CEO tax burden decreases demand for conservatism.

Table 11 reports the results for the estimation of equation (7). Consistent with Basu (1997), the coefficient on $\Delta NI \times NEGI$ is significantly negative, suggesting that negative earnings changes are more likely to reverse in the next period than positive earnings changes. More importantly, I find that the coefficient on $\Delta NI \times NEGI \times TAX\_BURDEN$ is significantly positive in all specifications, which indicates that firms with higher CEO tax burdens display less need for conservatism. Overall, consistent with my main hypothesis *Hypothesis 1*, the negative relation between CEO tax burdens and conservatism is robust to using a measure of conservatism based on the earnings-change model.

5.6. Unconditional conservatism measures

This section examines robustness of my main result by employing three measures of unconditional conservatism following prior research (e.g., Givoly and Hayn, 2000; Ahmed et al., 2002; Beatty, Weber et al., 2008; Ahmed and Deullman, 2007). The first measure, $NONOPACCRU$, is non-operating accruals ($(NI + DP - OANCF + RECCH + INVCH + APALCH + TXACH)/AT$), which is averaged over the previous five years and multiplied by negative one.[38] The second measure, $SKEWNESS$, is the difference between skewness in cash flow ($OANCF/AT$) and skewness in earnings (NI/AT) developed by Givoly and Hayn (2000). I measure skewness of cash

[38] I require at least 3 years of observation to compute the average.

flow (earnings) using a maximum of 5 years and a minimum of 3 years of data prior to year *t*. The third measure, $UCRANK$, is a composite measure of $NONOPACCRU$ and $SKEWNESS$, computed as the summation of decile ranks of these two variables. To compute the decile ranks of each variable, I first annually rank observations into ten groups from 1 to 10, where the bottom decile rank represents the least conservative accounting. Higher values of $NONOPACCRU$, $SKEWNESS$, and $UCRANK$ indicate greater unconditional conservatism.

The results are reported in Table 12. In addition to the previous firm controls, following Ahmed and Deullman (2007), I also control for sales growth ($SGRWOTH$), R&D and advertising expenditure ($RDADV$), operating cash flows (OCF), and sales volatility ($SALESVOL$). As seen in the table, the coefficients on the CEO tax burden variable are significantly negatively for all three measures of unconditional conservatism, which supports the hypothesis that CEO tax burdens decrease demand for conservatism.

6. Conclusions

CEOs are reluctant to sell appreciated stock due to capital gains tax liabilities (CEO tax burdens); this phenomenon is known as the *lock-in effect*. This tax-related selling friction in CEOs' equity portfolios exacerbates CEO risk aversion and leads to a decrease in risky corporate policies (Yost, 2018). This study investigates whether CEO tax burdens influence demand for conservative financial reporting. I find a negative association between CEO tax burden and accounting conservatism. This finding is robust to using various alternative measures of conservatism. Additionally, quasi-natural experiments using the federal Taxpayer Relief Act of 1997 and state-level capital gains tax cuts confirm a causal negative effect of CEO tax burden on conservatism.

The demand for financial reporting conservatism is shaped by both creditors and shareholders. From shareholders' perspective, CEO locked-in capital gains can perform a shareholder-manager alignment role due to the increase in managerial ownership. However, this alignment effect could be nullified by the intensification of CEO risk-aversion caused by CEOs' tax liabilities, which could decrease shareholder value. My analysis suggests that CEO tax burdens are not important for shareholders in terms of altering their demand for accounting conservatism. In contrast, I find that CEO tax burdens provide a channel that decreases the need for accounting conservatism by mitigating creditors' expropriation risk. Further analysis shows that the negative relation between CEO locked-in capital gains and conservatism is more pronounced in firms with higher default risk. Additionally, this relation strengthens when the CEO's incentives are more aligned with equityholders, as proxied by lower CEO relative inside debt and CEO non-entrenchment.

Overall, my study contributes to the literature by showing that CEO's unrealized capital gains tax liabilities play an important role in governing conservative financial reporting policy.

Appendix A: Variable definitions

Variable	Definition
CEO tax burden and incentives variables	
TAX_BURDEN	Following Yost (2018), the CEO's capital gains tax burden measure is computed as: $$TAX\_BURDEN_t = \frac{\sum_{n=1}^{t} N_n \times (P_t - P_n) \times \tau_{F_t+S_t}}{Total\ Equity_t}$$ where N_n is the number of vested shares held by the CEO at the end of year *t* that were obtained in year n; P_t is the firm's stock price at the end of year *t*; P_n is the firm's stock price at the end of year n (i.e., the price at which the CEO is assumed to have received the shares obtained in year n); τ_{F+S} is the maximum federal plus state long-term capital gains tax rate for individuals in year *t*; and $Total\ Equity_t$ is the value of the CEO's holdings of all vested and unvested stock and options held at the end of year *t*. (ExecuComp)
VEGA	Dollar change in CEO wealth associated with a 0.01 change in the standard deviation of the firm's returns, scaled by CEO total compensation. (ExecuComp)
DELTA	Dollar change in CEO wealth associated with a 1% change in the firm's stock price, scaled by CEO total compensation. (ExecuComp)
OWN	The number of vested shares held by the CEO divided by the total number of shares outstanding in the market. (ExecuComp)
Accounting conservatism variables	
NI	Net income before extraordinary items (item *IB*) divided by the beginning-of-period market value of equity. The market value of equity is common share price (item *PRCC_F*) multiply by common shares outstanding (item *CSHO*). (Compustat)
RET	Market-adjusted stock return computed as buy-and-hold stock return over the fiscal year (beginning with the third month of fiscal year *t* and ending in the second month of fiscal year *t*+1) minus the value-weighted market return over the same period. (CRSP)
NEG	A dummy variable set equal to one if market-adjusted stock return (*RET*) is negative, otherwise set to zero. (CRSP)
ACCRU	Accruals computed as net income before extraordinary items (item *IB*) minus operating cash flows (item *OANCF*) divided by the beginning-of-period market value of equity. (Compustat)
OCF	Operating cash flows (item *OANCF*) divided by the beginning-of-period market value of equity. (Compustat)

NONOPACCRU	Non-operating accruals ((*NI* + *DP* – *OANCF* + *RECCH* + *INVCH* + *APALCH* + *TXACH*)/*AT*) averaged over the previous 5 years (I require at least 3 years of observation to compute the average) and multiplied by negative one. (Compustat)
SKEWNESS	The difference between skewness in cash flow and skewness in earnings developed by Givoly and Hayn (2000), where skewness of cashflow (earnings) is computed using a maximum of 5 years and a minimum of 3 years of data prior to year *t*. (Compustat)
UCRANK	Composite measure of *NONOPACCRU* and *SKEWNESS*, computed as the summation of decile ranks of these two variables. (Compustat)
Firm controls	
MV	Market value of equity computed as common share price (item *PRCC_F*) multiply by common shares outstanding (item *CSHO*). (Compustat)
MTB	Market value of equity divided by the book value of equity (Compustat)
LEV	The ratio of long-term debt plus debt in current liabilities to total assets. (Compustat)
LIT	A dummy variable set equal to one if a firm belongs to the industry with four-digit codes of 2833–2836, 3570–3577, 7370–7374, 3600–3674, or 5200–5961. (Compustat)
SGRWOTH	Sales growth measures as sales (item *SALE*) in the current year minus previous year sales divided by previous year sales. (Compustat)
RDADV	Research and development expense (item *XRD*) plus advertising expense (item *XAD*) scaled by total assets (item *AT*). (Compustat)
SALESVOL	Sales volatility measured as the standard deviation of revenues (item *SALE*/*AT*) over the previous five years. (Compustat)
Default risk measures	
ZSCORE	Modified Altman's (1968) ZSCORE computed as 1.2 × (ACT − LCT)/AT + 1.4 × RE/AT + 3.3 × OIADP/AT + 0.6 × PRCC_F × CSHO/(DLTT + DLC) + 0.999 × SALE/AT. (Compustat)
MEDF	The Merton's expected default frequency (*EDF*) computed using the Merton (1974) bond pricing model, estimated following Bharath and Shumway (2008). (Compustat, CRSP)
NEDF	The Naïve expected default frequency (*EDF*) computed based on the "simplified" Merton model probability of default documented in Bharath and Shumway (2008). (Compustat, CRSP)

CEO inside debt and entrenchment variables	
RELEV	CEO-firm relative debt-to-equity ratio computed as the CEO's debt-to-equity ratio divided by the firm's debt-to-equity ratio. The CEO's debt-to-equity ratio is computed as the CEO-year inside debt divided by CEO equity value, where inside debt is the sum of the accumulated value of pension benefits and the aggregate deferred compensation at the end of the fiscal year. CEO equity value is the sum of the value of the CEO's common stock holdings in the firm and the Black-Scholes value of option holdings. The firm's debt-to-equity ratio is the ratio of the book value of total debt to the market value of total equity, measured at the fiscal year-end. (ExecuComp, Compustat)
EINDEX	Entrenchment index of Bebchuk et al. (2009) computed as the sum of indicator variables for six anti-takeover provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, supermajority requirements for mergers, and charter amendments. (ISS)
DUALITY	Indicator variable set equal to one if the CEO is the only insider on the board of directors and serves as the chairman of the board as well as president of the company, and zero otherwise. (ISS)

Appendix B: Default risk measures

Modified Altman's (1968) Z-score: It is computed as

$$ZSCORE = \left(1.2 \times \frac{Working\ capital}{Assets}\right) + \left(1.4 \times \frac{Retained\ earnings}{Assets}\right) + \left(3.3 \times \frac{EBIT}{Assets}\right) + \left(0.6 \times \frac{Market\ value}{Liabilities}\right) + \left(0.999 \times \frac{Sales}{Assets}\right) \quad \text{(B1)}$$

A lower value of modified Altman's *ZSCORE* indicates a higher likelihood of default.

Merton's expected default frequency: The Merton's expected default frequency measure is computed using the Merton (1974) bond pricing model. Merton's model assumes that the total value of a firm follows a geometric Brownian motion,

$$dV = \mu V dt + \sigma_V V dW, \quad \text{(B2)}$$

where V is the value of the firm, μ is the expected continuously compounded return on V, σ_V is the volatility of firm value and dW is a standard Weiner process. Additionally, it assumes the firm has issued only one discount bond with a maturity of T periods. Merton's expected default frequency is computed by the following three-steps procedure.

Step 1: The following two equations are solved numerically for V and σ_V:

$$E = VN(d_1) - e^{-rT} FN(d_2), \quad \text{(B3)}$$

and

$$\sigma_E = \left(\frac{V}{E}\right) N(d_1) \sigma_V, \quad \text{(B4)}$$

where E is the market value of equity, F is the face value debt, r is assumed to be constant risk-free rate, $N(.)$ is the cumulative standard normal distribution function, d_1 is given by

$$d_1 = \frac{ln\left(\frac{V}{F}\right) + (r + 0.5\sigma_V^2)T}{\sigma_V \sqrt{T}}, \quad \text{(B5)}$$

and $d_2 = d_1 - \sigma_V \sqrt{T}$.

Step 2: After obtaining a numerical solution for *V* and σ_V, the distance to default is computed as

$$DD = \frac{ln\left(\frac{V}{F}\right) + (\mu - 0.5\sigma_V^2)T}{\sigma_V\sqrt{T}}, \tag{B6}$$

where μ is the expected annual returns.

Step 3: The implied probability of default or the Merton expected default frequency (EDF) is computed as

$$MEDF = N(-DD). \tag{B7}$$

I set the inputs to the above procedure following the literature (Vassalou and Xing, 2004; Sundaram and Yermack, 2007; Bharath and Shumway, 2008; Kubick, Lockhart, Mauer, 2020). μ is set as EBITDA scaled by book value of total assets, σ_E is the annualized standard deviation of returns over the previous year, F is measured as (debt in current liabilities + 1.5 * long-term debt), *E* is measured as the end of the year common share price multiply by common shares outstanding, r is the one-year Treasury Constant Maturity Rate (obtained from the Federal Reserve Board's website: http://www.federalreserve.gov), and T is assumed as 1 year.

Naïve expected default frequency: The Naïve expected default frequency measure is computed based on the "simplified" Merton model probability of default documented in Bharath and Shumway (2008). This procedure assumes the firm's market value of debt equal to its face value of debt (i.e., *D* = *F*) and the volatility of debt as $\sigma_D = 0.05 + 0.25 \times \sigma_E$. The total volatility of the firm's value is then estimated as

$$\sigma_V = \frac{E}{E+F}\sigma_E + \frac{E}{E+F}\sigma_D. \tag{B8}$$

The naïve distance to default is then computed as

$$Naive\ DD = \frac{ln\left(\frac{E+F}{F}\right) + (\mu - 0.5\sigma_V^2)T}{\sigma_V\sqrt{T}} \tag{B9}$$

and the naïve expected default frequency is computed as

$$NEDF = N(-Naive\ DD). \tag{B10}$$

Higher values of *MEDF* and *NEDF* indicate a higher likelihood of default.

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Table 1.1: Descriptive statistics and correlations for the sample

This table presents the descriptive statistics of all the variables (Panel A) and Pearson correlations (Panel B) for ExecuComp firms (excluding financials and utility firms) that have the necessary information for the empirical tests. The sample period is from 1993 to 2018. All the variables are defined in Appendix A. Panel B reports Pearson's correlation coefficients where signs ***, **, * indicate significance of the correlation coefficients at the 1%, 5%, and 10% levels, respectively. All continuous variables are winsorized at the 1% and 99% levels of the distribution.

Panel A: Descriptive statistics

	N	Mean	Standard deviation	25th percentile	50th percentile	75th percentile
CEO tax burden and incentives variables						
TAX_BURDEN	23,258	0.038	0.085	0.002	0.030	0.084
VEGA	23,258	0.027	0.034	0.006	0.017	0.035
DELTA	23,258	0.331	1.115	0.034	0.069	0.157
OWN	23,258	0.024	0.055	0.001	0.004	0.016
Accounting conservatism variables						
NI	23,258	0.020	0.135	0.018	0.048	0.070
RET	23,258	0.035	0.425	-0.221	-0.013	0.214
NEG	23,258	0.517				
ACCRU	23,258	-0.084	0.163	-0.097	-0.042	-0.014
OCF	23,258	0.104	0.115	0.051	0.086	0.138
NONOPACCRU	23,258	0.027	0.043	0.004	0.017	0.038
SKEWNESS	23,258	0.214	0.913	-0.392	0.194	0.837
Firm controls						
MV ($000,000)	23,258	7 ,856	20,116	580	1,611	5,091
MTB	23,258	2.087	1.513	1.245	1.652	2.363
LEV	23,258	0.230	0.217	0.059	0.210	0.339
LIT	23,258	0.279				
SGRWOTH	23,258	0.093	0.223	-0.008	0.071	0.165
RDADV	23,258	0.049	0.069	0.000	0.022	0.070
SALESVOL	23,258	0.148	0.131	0.064	0.108	0.186
Default risk measures						
ZSCORE	23,207	4.613	4.584	2.210	3.520	5.466
MEDF (%)	19,586	0.168	0.972	0.000	0.000	0.000
NEDF (%)	19,586	0.148	0.844	0.000	0.000	0.000

Panel B: Correlations

		1	2	3	4	5	6	7	8	9	10
1	*TAX_BURDEN*	1.00									
2	*VEGA*	-0.01*	1.00								
3	*DELTA*	0.24***	0.14***	1.00							
4	*OWN*	0.21***	-0.04***	0.60***	1.00						
5	*NI*	0.27***	0.05***	0.02***	0.00	1.00					
6	*RET*	-0.09***	-0.02*	-0.01*	0.01	0.16***	1.00				
7	*NEG*	0.03***	-0.01	0.01	0.00	-0.14***	-0.72***	1.00			
8	*Ln(MV)*	0.27***	0.20***	0.08***	-0.17***	0.23***	-0.07***	-0.00	1.00		
9	*MTB*	0.30***	0.07***	0.22***	0.07***	0.09***	-0.04***	0.03***	0.26***	1.00	
10	*LEV*	-0.15***	-0.01	-0.10***	-0.11***	-0.06***	0.01	-0.01	0.08***	-0.31***	1.00
11	*LIT*	-0.02**	0.05***	0.01	-0.02*	-0.06***	0.02**	0.01	0.01	0.19***	-0.14***

Table 1.2: CEO tax burden and conservatism

This table presents OLS estimates for the effect of CEOs' tax burden on accounting conservatism. The dependent variable is *NI* (scaled net income). All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent var = NI_t	(1)		(2)	
	Coef.	*t*-stat.	Coef.	*t*-stat.
RET_t	0.018	(0.65)	0.011	(0.43)
NEG_t	0.009	(0.57)	0.002	(0.12)
RET_t * NEG_t	0.345***	(4.90)	0.331***	(4.40)
TAX_BURDEN_{t-1}	0.112***	(3.55)	0.125***	(3.55)
RET_t * TAX_BURDEN_{t-1}	0.151***	(2.83)	0.137**	(2.32)
NEG_t * TAX_BURDEN_{t-1}	-0.019	(-0.50)	-0.031	(-0.72)
RET_t * NEG_t * TAX_BURDEN_{t-1}	**-0.837*** **	(-5.55)	**-0.883*** **	(-5.74)
$VEGA_{t-1}$			0.066*	(2.03)
RET_t * $VEGA_{t-1}$			0.208**	(2.54)
NEG_t * $VEGA_{t-1}$			-0.058	(-1.07)
RET_t * NEG_t * $VEGA_{t-1}$			-0.413*	(-1.78)
$DELTA_{t-1}$			-0.004***	(-3.47)
RET_t * $DELTA_{t-1}$			-0.004	(-1.27)
NEG_t * $DELTA_{t-1}$			-0.002	(-1.14)
RET_t * NEG_t * $DELTA_{t-1}$			0.011*	(1.79)
OWN_{t-1}			0.002	(0.04)
RET_t * OWN_{t-1}			0.072	(0.69)
NEG_t * OWN_{t-1}			0.095	(1.49)
RET_t * NEG_t * OWN_{t-1}			0.256	(1.53)
Ln(MV_{t-1})	0.032***	(7.73)	0.031***	(7.49)
RET_t * Ln(MV_{t-1})	0.003	(0.82)	0.003	(0.95)
NEG_t * Ln(MV_{t-1})	0.000	(0.09)	0.001	(0.61)
RET_t * NEG_t * Ln(MV_{t-1})	-0.023**	(-2.56)	-0.020**	(-2.18)
MTB_{t-1}	-0.002	(-0.95)	-0.001	(-0.66)
RET_t * MTB_{t-1}	-0.002	(-0.96)	-0.002	(-0.85)
NEG_t * MTB_{t-1}	-0.003*	(-1.75)	-0.003	(-1.62)
RET_t * NEG_t * MTB_{t-1}	-0.032***	(-3.93)	-0.034***	(-4.16)
LEV_{t-1}	0.022	(1.35)	0.024	(1.46)
RET_t * LEV_{t-1}	-0.037	(-1.09)	-0.037	(-1.11)
NEG_t * LEV_{t-1}	0.013	(0.76)	0.012	(0.73)
RET_t * NEG_t * LEV_{t-1}	0.169**	(2.36)	0.173**	(2.47)
LIT_{t-1}	-0.003	(-0.31)	-0.002	(-0.21)
RET_t * LIT_{t-1}	-0.006	(-0.53)	-0.007	(-0.62)
NEG_t * LIT_{t-1}	0.005	(0.76)	0.005	(0.69)
RET_t * NEG_t * LIT_{t-1}	0.019	(0.70)	0.019	(0.73)
Firm and year fixed effects	Yes		Yes	
Observations	22,928		22,928	
Adjusted R-squared	0.346		0.348	

Table 1.3: CEO tax burden and conservatism: Taxpayer Relief Act of 1997

This table presents OLS estimates to analyze the effect of CEOs' tax burden on conservatism around the enactment of the Taxpayer Relief Act of 1997 (TRA97). The reported estimates are from the specification in equation (4), where the sample consists of observation for the pre-TRA97 period (i.e., 1998–2000) and for the post-TRA97 period. *POST_CUT* is an indicator variable set equal to one if the fiscal year is in the post-TRA97 period and set to zero otherwise. For each firm, *PRE_TAX_BURDEN* is set equal to the CEO's tax burden computed at the end of fiscal year 1996 (i.e., the most recent year before the enactment of TRA97). The timeline used for this analysis is demonstrated in Figure 1. Each CEO-firm pair should have at least one observation in the pre- and post-TRA97 periods to be included in the sample. The dependent variable is *NI* (scaled net income). Firm controls include the natural logarithm of firm size (*MV*), market-to-book (*MTB*), leverage (*LEV*), and litigation risk dummy (*LIT*). All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at the executive level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent var = NI_t	(1)		(2)	
	Coef.	*t*-stat.	Coef.	*t*-stat.
RET_t	-0.011	(-0.32)	-0.028	(-0.70)
NEG_t	-0.006	(-0.30)	-0.012	(-0.45)
RET_t * NEG_t	0.248***	(3.76)	0.291***	(3.77)
$POST\_CUT_t$	-0.022***	(-2.83)	-0.023***	(-2.91)
RET_t * $POST\_CUT_t$	0.008	(0.59)	0.008	(0.60)
NEG_t * $POST\_CUT_t$	-0.005	(-0.41)	-0.008	(-0.66)
RET_t * NEG_t * $POST\_CUT_t$	-0.041	(-1.40)	-0.050*	(-1.70)
$POST\_CUT_t$ * *PRE_TAX_BURDEN*	-0.091*	(-1.75)	-0.078	(-1.50)
RET_t * $POST\_CUT_t$ * *PRE_TAX_BURDEN*	-0.089*	(-1.67)	-0.104*	(-1.74)
NEG_t * $POST\_CUT_t$ * *PRE_TAX_BURDEN*	0.170***	(2.59)	0.188***	(2.73)
RET_t * NEG_t * $POST\_CUT_t$ * *PRE_TAX_BURDEN*	**0.502*** **	**(3.43)**	**0.565*** **	**(3.65)**
$VEGA_{t-1}$			0.124	(1.45)
RET_t * $VEGA_{t-1}$			-0.090	(-0.64)
NEG_t * $VEGA_{t-1}$			0.019	(0.13)
RET_t * NEG_t * $VEGA_{t-1}$			0.546	(1.12)
$DELTA_{t-1}$			-0.003	(-1.45)
RET_t * $DELTA_{t-1}$			-0.002	(-0.72)
NEG_t * $DELTA_{t-1}$			-0.002	(-1.19)
RET_t * NEG_t * $DELTA_{t-1}$			0.006	(0.79)
OWN_{t-1}			0.056	(0.64)
RET_t * OWN_{t-1}			0.116	(1.44)
NEG_t * OWN_{t-1}			0.029	(0.56)
RET_t * NEG_t * OWN_{t-1}			-0.350*	(-1.69)
Firm Controls$_{t-1}$	Yes		Yes	
RET_t * *Firm Controls*$_{t-1}$	Yes		Yes	
NEG_t * *Firm Controls*$_{t-1}$	Yes		Yes	
RET_t * NEG_t * *Firm Controls*$_{t-1}$	Yes		Yes	
Firm fixed effects	Yes		Yes	
Observations	3,047		3,047	
Adjusted R-squared	0.441		0.443	

Table 1.4: CEO tax burden and conservatism: staggered state-level tax cuts

This table presents OLS estimates to analyze the effect of CEOs' tax burden on conservatism around state capital gains tax rate cuts. The dependent variable is *NI* (scaled net income). The timeline used for this analysis is demonstrated in Figure 1. *TAX_CUT* is the absolute value of state tax cut which is assigned to the next three years of observations for the firms headquartered in the state of capital gain tax rate cut in the current year, otherwise set equal to zero. *PRE_TAX_BURDEN* is the CEO's tax burden in the previous year of state tax rate cut and is assigned to the observations of the firm for the next three years, including the current year. Firm controls include the natural logarithm of firm size (*MV*), market-to-book (*MTB*), leverage (*LEV*), and litigation risk dummy (*LIT*). All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent var = NI_t	(1)		(2)	
	Coef.	*t*-stat.	Coef.	*t*-stat.
RET_t	0.001	(0.03)	-0.007	(-0.25)
NEG_t	0.003	(0.18)	-0.003	(-0.18)
RET_t * NEG_t	0.358***	(4.76)	0.359***	(4.52)
TAX_CUT_t	0.004	(0.86)	0.004	(0.87)
RET_t * TAX_CUT_t	0.010	(0.76)	0.010	(0.73)
NEG_t * TAX_CUT_t	-0.007	(-1.00)	-0.007	(-0.93)
RET_t * NEG_t * TAX_CUT_t	-0.060*	(-1.90)	-0.058*	(-1.84)
PRE_TAX_BURDEN	0.081**	(2.74)	0.091***	(2.93)
RET_t * *PRE_TAX_BURDEN*	0.105*	(1.84)	0.091	(1.53)
NEG_t * *PRE_TAX_BURDEN*	-0.026	(-0.64)	-0.037	(-0.85)
RET_t * NEG_t * *PRE_TAX_BURDEN*	-0.757***	(-4.80)	-0.794***	(-4.95)
TAX_CUT_t * *PRE_TAX_BURDEN*	-0.063	(-1.25)	-0.063	(-1.22)
RET_t * TAX_CUT_t * *PRE_TAX_BURDEN*	-0.059	(-0.58)	-0.061	(-0.57)
NEG_t * TAX_CUT_t * *PRE_TAX_BURDEN*	0.061	(0.97)	0.053	(0.83)
RET_t * NEG_t * TAX_CUT_t * *PRE_TAX_BURDEN*	**0.544****	**(2.44)**	**0.523****	**(2.32)**
$VEGA_{t-1}$			0.045	(1.41)
RET_t * $VEGA_{t-1}$			0.274***	(3.26)
NEG_t * $VEGA_{t-1}$			-0.020	(-0.38)
RET_t * NEG_t * $VEGA_{t-1}$			-0.315	(-1.37)
$DELTA_{t-1}$			-0.003**	(-2.80)
RET_t * $DELTA_{t-1}$			-0.004	(-1.35)
NEG_t * $DELTA_{t-1}$			-0.002	(-0.78)
RET_t * NEG_t * $DELTA_{t-1}$			0.020**	(2.76)
OWN_{t-1}			0.015	(0.35)
RET_t * OWN_{t-1}			0.088	(0.88)
NEG_t * OWN_{t-1}			0.078	(1.34)
RET_t * NEG_t * OWN_{t-1}			0.056	(0.32)
Firm Controls$_{t-1}$	Yes		Yes	
RET_t * *Firm Controls*$_{t-1}$	Yes		Yes	
NEG_t * *Firm Controls*$_{t-1}$	Yes		Yes	
RET_t * NEG_t * *Firm Controls*$_{t-1}$	Yes		Yes	
Firm and year fixed effects	Yes		Yes	
Observations	21,254		21,254	
Adjusted R-squared	0.330		0.332	

Table 1.5: CEO tax burden and conservatism: shareholder versus creditor influence

This table presents OLS estimates for the effect of CEO tax burden on conservatism that varies with the firms' leverage. In Panel A, two subsamples are formed based on whether a firm-year observation has zero *LEV* (unlevered firms) or non-zero *LEV* (levered firms), where *LEV* is the long-term debt plus debt in current liabilities scaled by total assets, measured at t–1. Panel B groups the sample by whether the firm has high or low leverage, where a firm is assigned to the high leverage group if *LEV* has an above the sample year-median value; otherwise, it is assigned to the low leverage group. The dependent variable is *NI* (scaled net income). All the variables are defined in Appendix A. All the specifications are included with t-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Levered versus unlevered firms				*Panel B: High leverage versus low leverage firms*			
Dependent var = NI_t	(1)		(2)		(3)		(4)	
	Unlevered firms		Levered firms		Low leverage firms		High leverage firms	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
RET_t	-0.021	(-0.29)	0.006	(0.19)	0.012	(0.35)	-0.034	(-0.56)
NEG_t	-0.010	(-0.20)	-0.002	(-0.13)	-0.016	(-0.82)	-0.014	(-0.51)
$RET_t * NEG_t$	0.320**	(2.49)	0.332***	(3.81)	0.219**	(2.30)	0.421***	(3.33)
TAX_BURDEN_{t-1}	0.036	(0.59)	0.138***	(3.61)	0.058	(1.52)	0.170***	(3.41)
$RET_t * TAX\_BURDEN_{t-1}$	0.082	(0.89)	0.155**	(2.75)	0.075	(1.13)	0.248**	(2.56)
$NEG_t * TAX\_BURDEN_{t-1}$	0.013	(0.14)	-0.021	(-0.44)	0.019	(0.36)	-0.039	(-0.53)
$RET_t * NEG_t * TAX\_BURDEN_{t-1}$	**-0.380**	(-1.46)	**-0.920*****	(-5.04)	**-0.319****	(-2.65)	**-1.371*****	(-4.84)
$VEGA_{t-1}$	-0.075	(-0.67)	0.066	(1.56)	-0.004	(-0.11)	0.140**	(2.24)
$RET_t * VEGA_{t-1}$	0.346	(1.48)	0.229*	(1.97)	0.257***	(2.85)	-0.046	(-0.23)
$NEG_t * VEGA_{t-1}$	0.150	(0.89)	-0.074	(-1.19)	0.033	(0.53)	-0.117	(-1.60)
$RET_t * NEG_t * VEGA_{t-1}$	-0.780	(-1.55)	-0.400	(-1.66)	-0.479*	(-1.95)	0.166	(0.42)
$DELTA_{t-1}$	-0.002	(-0.63)	-0.004**	(-2.66)	-0.002	(-1.63)	-0.005	(-1.60)
$RET_t * DELTA_{t-1}$	-0.007	(-1.38)	-0.003	(-0.50)	-0.004	(-1.28)	0.003	(0.31)
$NEG_t * DELTA_{t-1}$	-0.002	(-0.60)	-0.002	(-0.61)	-0.003**	(-2.51)	-0.001	(-0.27)
$RET_t * NEG_t * DELTA_{t-1}$	0.017	(1.69)	0.010	(1.26)	0.001	(0.17)	0.009	(0.43)
OWN_{t-1}	-0.027	(-0.40)	-0.010	(-0.18)	-0.001	(-0.03)	0.119	(1.34)
$RET_t * OWN_{t-1}$	0.109	(0.90)	0.055	(0.36)	0.127*	(1.79)	-0.176	(-0.74)
$NEG_t * OWN_{t-1}$	0.077	(0.82)	0.067	(0.82)	0.101**	(2.21)	0.045	(0.40)
$RET_t * NEG_t * OWN_{t-1}$	-0.115	(-0.40)	0.259	(1.43)	0.105	(0.39)	0.673*	(1.83)
$\text{Ln}(MV_{t-1})$	0.024***	(2.85)	0.032***	(6.90)	0.018***	(6.26)	0.038***	(5.53)
$RET_t * \text{Ln}(MV_{t-1})$	0.011	(1.12)	0.003	(0.78)	0.003	(0.86)	0.007	(1.16)
$NEG_t * \text{Ln}(MV_{t-1})$	0.001	(0.09)	0.002	(0.79)	0.003	(1.10)	0.002	(0.80)

$RET_t * NEG_t * \text{Ln}(MV_{t-1})$	-0.038*	(-1.98)	-0.018*	(-1.78)	-0.014	(-1.09)	-0.023*	(-1.79)
MTB_{t-1}	0.002	(0.48)	-0.001	(-0.56)	0.002	(0.65)	0.003	(1.14)
$RET_t * MTB_{t-1}$	-0.008	(-1.48)	-0.002	(-0.76)	-0.003	(-1.23)	-0.001	(-0.12)
$NEG_t * MTB_{t-1}$	0.001	(0.21)	-0.004*	(-1.94)	-0.002	(-1.21)	-0.006*	(-1.95)
$RET_t * NEG_t * MTB_{t-1}$	0.000	(0.01)	-0.043***	(-4.64)	-0.021***	(-3.10)	-0.062***	(-4.33)
LEV_{t-1}			0.027	(1.60)	0.013	(0.66)	0.067**	(2.56)
$RET_t * LEV_{t-1}$			-0.023	(-0.66)	0.017	(0.33)	0.037	(0.65)
$NEG_t * LEV_{t-1}$			0.019	(1.17)	0.030	(0.70)	0.046	(1.53)
$RET_t * NEG_t * LEV_{t-1}$			0.168**	(2.11)	0.111	(0.62)	0.028	(0.20)
LIT_{t-1}	0.016	(0.91)	-0.004	(-0.37)	0.002	(0.17)	-0.004	(-0.31)
$RET_t * LIT_{t-1}$	-0.023	(-1.19)	-0.003	(-0.25)	-0.016*	(-2.01)	0.002	(0.10)
$NEG_t * LIT_{t-1}$	-0.011	(-1.06)	0.007	(0.91)	0.002	(0.41)	0.012	(0.95)
$RET_t * NEG_t * LIT_{t-1}$	0.019	(0.54)	0.019	(0.65)	0.020	(0.87)	0.048	(1.10)
Firm and year fixed effects	Yes		Yes		Yes		Yes	
Test of coefficient equality					(3) versus (4)			
p-value:					0.020			
Observations	2,911		19,843		11,353		11,271	
Adjusted R-squared	0.431		0.345		0.370		0.375	

Table 1.6: CEO tax burden and conservatism conditioned on default risk

This table presents OLS estimates for the effect of CEO tax burden on conservatism varies across firms with different levels of default risk. The sample is grouped in two subsamples based on whether a firm has below or above sample-year median Altman Z-score (*ZSCORE*), Merton model expected default frequency (*MEDF*), and Naïve model expected default frequency (*NEDF*) at the beginning of a fiscal year. *ZSCORE* is the modified Altman (1968) Z-score, where a below-median value indicates a higher likelihood of default (High default risk). *MEDF* is computed following the Merton (1974) bond pricing model, and *NEDF* is computed based on the "simplified" Merton model probability of default following Bharath and Shumway (2008). The above-median values of *MEDF* and *NEDF* indicate a higher likelihood of default (High default risk). The dependent variable is *NI* (scaled net income). The full set of controls is used as in column 2 of Table 2. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	ZSCORE		MEDF		NEDF	
Dependent var = NI_t	(1)	(2)	(3)	(4)	(5)	(6)
	Low default risk	High default risk	Low default risk	High default risk	Low default risk	High default risk
RET_t	0.072***	-0.000	0.037	0.022	0.037	0.023
	(3.38)	(-0.00)	(1.43)	(0.51)	(1.42)	(0.52)
NEG_t	0.009	-0.009	0.004	-0.003	0.004	-0.003
	(0.77)	(-0.37)	(0.28)	(-0.10)	(0.27)	(-0.09)
$RET_t * NEG_t$	0.119*	0.415***	0.082	0.357***	0.082	0.355***
	(1.82)	(4.13)	(1.03)	(2.93)	(1.03)	(2.92)
TAX_BURDEN_{t-1}	0.030	0.172***	-0.027	0.171**	-0.027	0.172**
	(1.54)	(3.08)	(-0.90)	(2.45)	(-0.90)	(2.46)
$RET_t * TAX\_BURDEN_{t-1}$	-0.067	0.186**	0.073	0.083	0.073	0.083
	(-1.70)	(2.76)	(0.73)	(1.16)	(0.73)	(1.15)
$NEG_t * TAX\_BURDEN_{t-1}$	-0.038	0.001	0.013	-0.057	0.012	-0.057
	(-1.32)	(0.01)	(0.44)	(-0.79)	(0.41)	(-0.78)
$\boldsymbol{RET_t * NEG_t * TAX\_BURDEN_{t-1}}$	**-0.233***	**-0.935*****	**-0.408****	**-0.730*****	**-0.411****	**-0.729*****
	(-2.02)	(-4.03)	(-2.22)	(-3.78)	(-2.24)	(-3.77)
$Controls_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
$RET_t * Controls_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
$NEG_t * Controls_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
$RET_t * NEG_t * Controls_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test of coefficient equality	(1) versus (2)		(3) versus (4)		(5) versus (6)	
p-value:	0.002		0.051		0.054	
Observations	11,285	11,206	9,506	9,433	9,506	9,435
Adjusted R-squared	0.348	0.386	0.316	0.353	0.314	0.353

Table 1.7: CEO tax burden and conservatism conditioned on existing creditor-manager alignment

This table presents OLS estimates for the effect of CEO tax burden on conservatism varies across firms with different levels of existing creditor-manager alignment through CEO inside debt and managerial entrenchment. In Panel A, a subsample with the CEO-firm relative debt-to-equity ratio above one is placed in high CEO relative inside debt group, and the rest of the sample is placed in low CEO relative inside debt group. The CEO-firm relative debt-to-equity ratio is the CEO's debt-to-equity ratio divided by the firm's debt-to-equity ratio. The sample period for Panel A is 2006-2018. Panel B groups firms at the beginning of a fiscal year based on whether the CEO of a firm is high or low entrenched, where a CEO is identified as high entrenched if the CEO has Bebchuk et al. (2009) entrenchment index of above sample year-median and also serves dual positions at the firm; otherwise, she is identified as low entrenched CEO. The sample period for Panel B is 1993-2018. The dependent variable is *NI* (scaled net income). The full set of controls are used as in column 2 of Table 2. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: CEO inside debt		*Panel B: CEO entrenchment*	
Dependent var = NI_t	(1)	(2)	(3)	(4)
	Low CEO relative inside debt	High CEO relative inside debt	Low entrenchment	High entrenchment
RET_t	-0.093*	0.165	0.012	0.077
	(-1.90)	(1.69)	(0.29)	(1.45)
NEG_t	-0.018	0.017	-0.015	0.048
	(-0.44)	(0.40)	(-0.79)	(0.97)
$RET_t * NEG_t$	0.572***	0.068	0.246**	0.322
	(3.15)	(0.36)	(2.77)	(1.70)
TAX_BURDEN_{t-1}	0.176**	0.124	0.120***	0.224
	(2.25)	(1.32)	(3.31)	(1.19)
$RET_t * TAX\_BURDEN_{t-1}$	0.155	0.158	0.182**	-0.310*
	(1.47)	(0.87)	(2.69)	(-1.83)
$NEG_t * TAX\_BURDEN_{t-1}$	-0.052	-0.011	0.021	-0.106
	(-0.60)	(-0.08)	(0.34)	(-0.51)
$\boldsymbol{RET_t * NEG_t * TAX\_BURDEN_{t-1}}$	**-1.171*** **	**-0.364**	**-0.740*** **	**-0.006**
	(-3.67)	(-0.65)	(-3.51)	(-0.01)
$Controls_{t-1}$	Yes	Yes	Yes	Yes
$RET_t * Controls_{t-1}$	Yes	Yes	Yes	Yes
$NEG_t * Controls_{t-1}$	Yes	Yes	Yes	Yes
$RET_t * NEG_t * Controls_{t-1}$	Yes	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes	Yes
Observations	7,791	2,628	14,788	1,472
Adjusted R-squared	0.363	0.383	0.351	0.319

Table 1.8: Robustness tests: CEO tax burdens and conservatism influenced by auditors

This table presents OLS estimates for the effect of CEO tax burden on conservatism varies across firms with different levels of audit risk. Auditor risk is proxied by litigation and misstatement risk. In Panel A, litigation risk is computed using estimated coefficients from Shu (2000) and firm-level characteristic from my sample. In Panel B, expected misstatement risk is computed following Lobo and Zhao (2013). For each of these two audit risk measure, two subsamples are formed based on whether it is above (high risk) or below (low risk) the sample year-median. The dependent variable is *NI* (scaled net income). The full set of controls are used as in column 2 of Table 2. The controls also include an indicator variable whether a firm uses Big 4 auditor. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Litigation risk		*Panel B: Misstatement risk*	
Dependent var = NI_t	(1)	(2)	(3)	(4)
	Low litigation risk	High litigation risk	Low misstatement risk	High misstatement risk
RET_t	0.079**	-0.063	0.006	-0.032
	(2.62)	(-1.03)	(0.23)	(-0.46)
NEG_t	-0.003	-0.002	-0.033	0.026
	(-0.18)	(-0.08)	(-1.58)	(1.38)
RET_t * NEG_t	0.235***	0.470***	0.260***	0.459***
	(2.85)	(2.96)	(2.98)	(3.64)
TAX_BURDEN_{t-1}	0.077*	0.212***	0.101*	0.111**
	(1.88)	(3.48)	(1.77)	(2.11)
RET_t * TAX_BURDEN_{t-1}	0.246**	0.033	0.149*	0.239
	(2.08)	(0.44)	(1.97)	(1.41)
NEG_t * TAX_BURDEN_{t-1}	0.050	-0.093	-0.035	0.017
	(0.68)	(-1.22)	(-0.52)	(0.22)
RET_t * NEG_t * TAX_BURDEN_{t-1}	**-0.817*** **	**-0.970*** **	**-1.088*** **	**-0.877*** **
	(-3.07)	(-4.29)	(-3.71)	(-3.62)
$Controls_{t-1}$	Yes	Yes	Yes	Yes
RET_t * $Controls_{t-1}$	Yes	Yes	Yes	Yes
NEG_t * $Controls_{t-1}$	Yes	Yes	Yes	Yes
RET_t * NEG_t * $Controls_{t-1}$	Yes	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes	Yes
Test of coefficient equality	(1) versus (2)		(3) versus (4)	
p-value:	0.448		0.282	
Observations	9,748	9,704	11,131	11,105
Adjusted R-squared	0.433	0.326	0.338	0.366

Table 1.9: Robustness tests: controlling for economy-wide trends in conservatism

This table presents OLS estimates for the effect of CEOs' tax burden on accounting conservatism by controlling for any economy-wide changes in conditional conservatism over time. The dependent variable is NI (scaled net income). In column 1, year dummies are interacted with RET, NEG, and $RET \times NEG$ to capture any economy-wide changes in conditional conservatism over time. In column 2, the baseline specification in equation (3) is estimated for a sample in post-SOX years (i.e., after 2002). The full set of controls are used as in column 2 of Table 2. All the variables are defined in Appendix A. All the specifications are included with t-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	controlling for economy-wide trends in conservatism	Sample of post-SOX
Dependent var = NI_t	(1)	(2)
RET_t	0.127***	-0.034
	(5.20)	(-1.34)
NEG_t	0.015	-0.009
	(0.80)	(-0.53)
RET_t * NEG_t	0.125*	0.411***
	(2.04)	(5.48)
TAX_BURDEN_{t-1}	0.156***	0.142***
	(4.73)	(3.00)
RET_t * TAX_BURDEN_{t-1}	0.076	0.153*
	(1.39)	(1.90)
NEG_t * TAX_BURDEN_{t-1}	-0.040	-0.039
	(-0.87)	(-0.72)
RET_t * NEG_t * TAX_BURDEN_{t-1}	**-0.700*** **	**-1.074*** **
	(-4.18)	(-4.68)
$Controls_{t-1}$	Yes	Yes
RET_t * $Controls_{t-1}$	Yes	Yes
NEG_t * $Controls_{t-1}$	Yes	Yes
RET_t * NEG_t * $Controls_{t-1}$	Yes	Yes
Year fixed effects	Yes	Yes
Year FE * RET_t	Yes	No
Year FE * NEG_t	Yes	No
Year FE * RET_t * NEG_t	Yes	No
Firm fixed effects	Yes	Yes
Observations	22,928	15,787
Adjusted R-squared	0.361	0.383

Table 1.10: Robustness tests: asymmetric timeliness of earnings due to accruals versus cash flows

This table presents OLS estimates for the effect of CEOs' tax burden on the asymmetric timeliness of earnings due to accruals and cash flows. *ACCRU* is computed as net income before extraordinary items minus operating cash flows, and *OCF* is operating cash flows, both scaled by beginning-of-period market value of equity. The full set of controls is used as in column 2 of Table 2. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Dependent var =	$ACCRU_t$	OCF_t
RET_t	-0.075*	0.058***
	(-1.87)	(3.47)
NEG_t	0.002	-0.006
	(0.15)	(-0.58)
RET_t * NEG_t	0.300***	0.079**
	(3.69)	(2.30)
TAX_BURDEN_{t-1}	0.256***	-0.147***
	(4.84)	(-4.94)
RET_t * TAX_BURDEN_{t-1}	0.172**	-0.005
	(2.09)	(-0.15)
NEG_t * TAX_BURDEN_{t-1}	-0.092	0.046
	(-1.37)	(0.99)
RET_t * NEG_t * TAX_BURDEN_{t-1}	**-0.854*** **	**-0.141**
	(-4.25)	(-1.31)
$Controls_{t-1}$	Yes	Yes
RET_t * $Controls_{t-1}$	Yes	Yes
NEG_t * $Controls_{t-1}$	Yes	Yes
RET_t * NEG_t * $Controls_{t-1}$	Yes	Yes
Firm and year fixed effects	Yes	Yes
Observations	22,928	22,928
Adjusted R-squared	0.402	0.449

Table 1.11: Robustness tests: the earnings-change measure of conservatism

This table reports the estimates of equation (7) that examines the effect of CEO tax burdens on conservatism measured using the earnings-change model, where ΔNI is the change in net income before extraordinary items (item *IB*) divided by beginning-of-period total assets (item *AT*) and *NEGI* is an indicator variable set equal to one if ΔNI is negative, otherwise set to zero. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent var =	ΔNI_{t+1}			
	(1)		(2)	
	Coef.	*t*-stat.	Coef.	*t*-stat.
ΔNI_t	0.013	(0.69)	0.007	(0.31)
$NEGI_t$	-0.002	(-0.23)	0.000	(0.04)
$\Delta NI_t * NEGI_t$	-0.150***	(-4.37)	-0.115***	(-3.14)
TAX_BURDEN_{t-1}	-0.049**	(-2.26)	-0.048*	(-2.06)
$\Delta NI_t * TAX\_BURDEN_{t-1}$	0.020	(0.60)	0.016	(0.47)
$NEGI_t * TAX\_BURDEN_{t-1}$	0.076***	(3.06)	0.081***	(2.81)
$\Delta NI_t * NEGI_t * TAX\_BURDEN_{t-1}$	**0.297*****	(3.69)	**0.347*****	(3.96)
$VEGA_{t-1}$			-0.029	(-0.69)
$RET_t * VEGA_{t-1}$			0.051	(0.40)
$NEGI_t * VEGA_{t-1}$			0.035	(0.85)
$RET_t * NEGI_t * VEGA_{t-1}$			-0.195	(-0.93)
$DELTA_{t-1}$			0.003*	(1.76)
$RET_t * DELTA_{t-1}$			-0.003	(-1.12)
$NEGI_t * DELTA_{t-1}$			0.000	(0.02)
$RET_t * NEGI_t * DELTA_{t-1}$			0.007	(0.77)
OWN_{t-1}			-0.053**	(-2.51)
$RET_t * OWN_{t-1}$			0.070	(1.53)
$NEGI_t * OWN_{t-1}$			-0.034	(-0.89)
$RET_t * NEGI_t * OWN_{t-1}$			-0.463***	(-2.88)
$\text{Ln}(MV_{t-1})$	-0.008**	(-2.21)	-0.008**	(-2.26)
$RET_t * \text{Ln}(MV_{t-1})$	0.001	(0.38)	0.002	(0.58)
$NEGI_t * \text{Ln}(MV_{t-1})$	0.001	(0.53)	0.000	(0.23)
$RET_t * NEGI_t * \text{Ln}(MV_{t-1})$	0.018***	(3.18)	0.015**	(2.56)
MTB_{t-1}	-0.001	(-0.62)	-0.002	(-0.65)
$RET_t * MTB_{t-1}$	0.001	(0.29)	0.001	(0.33)
$NEGI_t * MTB_{t-1}$	-0.004**	(-2.11)	-0.004*	(-2.03)
$RET_t * NEGI_t * MTB_{t-1}$	-0.002	(-0.24)	-0.001	(-0.17)
LEV_{t-1}	0.009	(0.82)	0.007	(0.66)
$RET_t * LEV_{t-1}$	-0.005	(-0.29)	-0.004	(-0.22)
$NEGI_t * LEV_{t-1}$	-0.002	(-0.13)	-0.001	(-0.07)
$RET_t * NEGI_t * LEV_{t-1}$	-0.060	(-1.22)	-0.062	(-1.28)
LIT_{t-1}	0.004	(0.62)	0.004	(0.61)
$RET_t * LIT_{t-1}$	0.001	(0.11)	0.001	(0.11)
$NEGI_t * LIT_{t-1}$	-0.011**	(-2.38)	-0.011**	(-2.32)
$RET_t * NEGI_t * LIT_{t-1}$	-0.045*	(-2.04)	-0.045*	(-2.02)
Firm and year fixed effects	Yes		Yes	
Observations	22,009		22,009	
Adjusted R-squared	0.028		0.029	

Table 1.12: Robustness tests: unconditional conservatism measures

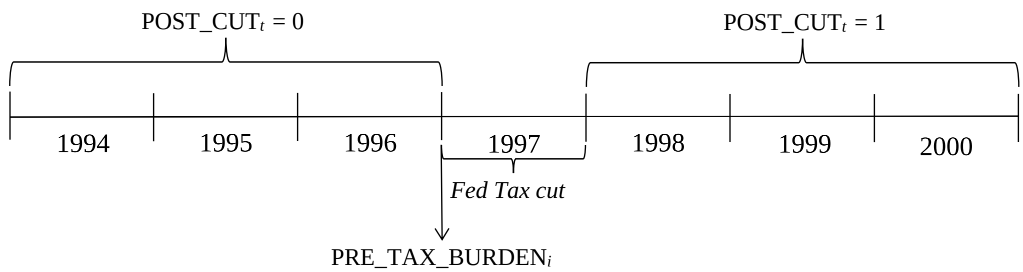
This table presents regression results of unconditional conservatism measures on CEO tax burden. *NONOPACCRU* is the non-operating accruals ((*NI* + *DP* – *OANCF* + *RECCH* + *INVCH* + *APALCH* + *TXACH*) / *AT*) averaged over the previous 5 years (I require at least 3 years of observation to compute the average) and multiplied by negative one. *SKEWNESS* is the difference between skewness in cash flow (*OANCF*/*AT*) and skewness in earnings (*NI*/*AT*) developed by Givoly and Hayn (2000). *UCRANK* is a composite measure of *NONOPACCRU* and *SKEWNESS*, computed as the summation of decile ranks of these two variables. All the variables are defined in Appendix A. All the specifications are included with *t*-statistics (in parentheses) that are computed using robust standard errors corrected for clustering of observations at executive and year level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent var =	$NONOPACCRU_t$	$SKEWNESS_t$	$UCRANK_t$
	(1)	(2)	(3)
TAX_BURDEN_{t-1}	**-0.052*** **	**-0.632*** **	**-4.110*** **
	(-6.52)	(-3.83)	(-5.96)
$VEGA_{t-1}$	-0.035***	0.171	-0.866
	(-3.62)	(0.76)	(-0.86)
$DELTA_{t-1}$	0.001	-0.018*	-0.057
	(1.45)	(-1.81)	(-1.23)
OWN_{t-1}	-0.039***	-0.716**	-4.397***
	(-3.29)	(-2.45)	(-3.30)
Ln(MV_t)	-0.003***	-0.032**	-0.185**
	(-3.15)	(-2.08)	(-2.20)
MTB_t	0.003***	-0.003	0.066*
	(5.05)	(-0.39)	(1.91)
LEV_t	0.008**	0.035	0.397
	(2.23)	(0.53)	(1.43)
LIT_t	-0.006	-0.115*	-0.655**
	(-1.64)	(-1.96)	(-2.50)
$SGRWOTH_t$	-0.003*	-0.048	-0.279
	(-1.97)	(-1.13)	(-1.70)
$RDADV_t$	0.043**	0.242	2.696*
	(2.12)	(0.85)	(1.83)
OCF_t	0.005	0.221**	0.968**
	(0.95)	(2.42)	(2.13)
$SALESVOL_t$	0.011**	-0.035	-0.465
	(2.44)	(-0.35)	(-1.25)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	22,896	22,896	22,896
Adjusted R-squared	0.524	0.157	0.263

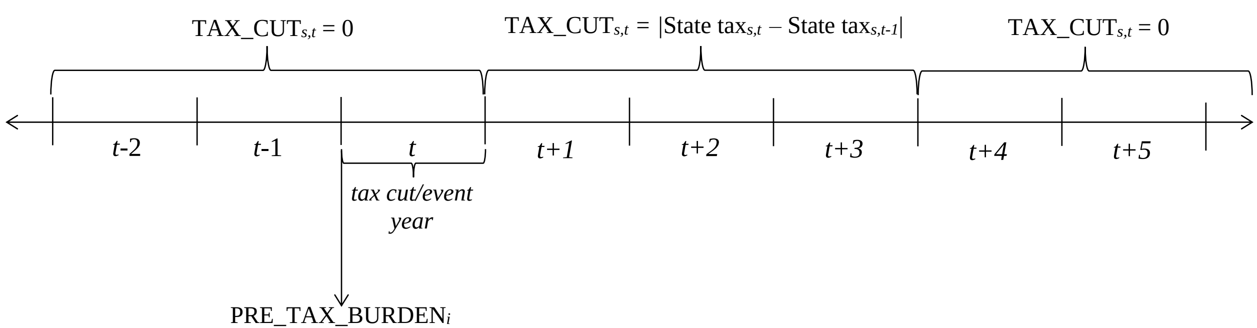
Figure 1.1: Timeline for federal and state tax cut analyses

Panel A demonstrates the timeline and important variables used for analysis on changes in accounting conservatism around the Taxpayer Relief Act of 1997. Panel B shows the creation of important variables used for analysis on staggered state-level tax cuts. A tax cut occurs when the state's capital gain tax rate for the current year is lower than the tax rate of the previous year.

Panel A: Taxpayer Relief Act of 1997



Panel B: State-level Tax Cuts



Chapter 2: Industry Tournament Incentives and Corporate Innovation Strategies

1. Introduction

The *2015 CEO Success Study* conducted by Strategy&, PwC's strategy consulting business reports that a growing number of top global companies are turning to potential outsider CEOs in their planned succession processes. This kind of talent race for CEOs and the possible mobility to the leading firms that operate in a similar product market can serve as motivation for CEOs to exert great efforts. In addition, many firms adopt relative performance measures to compensate a CEO based on how well her firm performs as compared to its peer group (Gong et al., 2011), so the CEO can earn higher compensation without an actual move.

CEOs compete for the highest compensation within an industry. This can be considered an external job market tournament setting in which the winner of the tournament earns the difference between the highest compensation in the industry and her original compensation as a tournament prize. The research conducted by Graham et al. (2005) explores surveyed managers' beliefs about the importance of managerial labor market success over their compensation structure. Researchers have taken note of these kinds of external tournament incentives in the labor market. Notably, Coles et al. (2018) find that industry tournament incentives (ITIs), measured as the pay differential between the firm's CEO and the highest paid CEO within the same industry, improve firm performance and overall risk.

Most studies find that ITIs have value-enhancing effects. For example, Burns et al. (2017) find that ITIs increase firm value based on an analysis of 14 countries. Huang et al. (2019) find that ITIs benefit the product market by strengthening the relation between cash holdings and market share gains. Tan (2021) finds that ITIs reduce agency costs and thus reduce audit fees. However, the risk-taking feature induced by tournament incentives can have some unfavorable effects. For instance, Kubick et al. (2021) show that ITIs decrease credit rating and increase the cost of debt. Huang et al. (2020) find a positive association between ITIs and financial manipulations. Kubick and Lockhart (2021) show that ITIs incentivize CEOs to withhold negative information, which increases the risk of a stock price crash. Moreover, Lonare et al. (2021b) find that CEOs engage in hedging activities to mitigate the side-effect of ITIs.

We examine how ITIs affect corporate innovation strategies. Product innovation is a major business activity for a firm.[39] The competition from rivals and discerning customers with rapidly changing preferences force firms to modify and develop their products constantly for their survival and to earn more market shares and profits. Product innovation is crucial for a firm's survival, as it builds entry barriers, maintains customer loyalty, protects against imitation, and provides market penetration (Boehe & Cruz, 2010; Clark & Guy, 1998; Soete, 1981). New technologies and improved existing technologies or product/service quality can also lead to firm growth (Coad & Rao, 2008; Corsino & Gabriele, 2010). ITIs can affect product innovation through two channels.

First, product innovation can differentiate a firm from rivals in its market and is likely to increase the firm performance and value. Firm performance is considered a major indicator of a CEO's abilities by outsiders (Fee & Hadlock, 2004). Therefore, CEOs are likely to engage in product innovation activities that have the potential to generate profitable outcomes and signal their abilities. Both Kale et al. (2009) and Coles et al. (2018) find that the promotion-based tournament incentives among managers can increase firm performance.

Second, product innovation is highly uncertain and risky. ITIs can provide convex payoffs because the winner of the job market tournament earns the gap between her original compensation

[39] Product innovation is defined as the production and subsequent launch of goods or services that are either new, or an improved version of previous goods or services.

and the compensation offered by the leading firm as the tournament prize, while others receive nothing. This "winner-takes-all" payoff structure is similar to stock options and has been shown to increase firm riskiness (Coles et al., 2006; Kini & Williams, 2012). Therefore, the option-like payoff of the tournament prize provided by the leading firm in the industry can motivate CEOs to bear the excessive risk and undertake risky product innovation activities. These two channels predict a positive relation between ITIs and product innovation.

Following Coles et al. (2018), we measure ITIs as the pay gap between a firm's CEO and the second highest-paid CEO in a firm operating in the same industry, where the industry is based on Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classifications. As CEOs are more influential than other executives in setting firm policies, they are expected to play a major role in making decisions about innovation strategies. Therefore, our study focuses on ITIs rather than firm-level (internal) tournament incentives for other executives under a CEO. Nevertheless, we control internal tournament incentives in all our empirical tests. To address endogeneity concerns, following Coles et al. (2018) and Kubick et al. (2021), we use the sum of total compensation of all other CEOs in each industry except for the highest-paid CEO and the rank of a CEO's total compensation among geographically close CEOs as instrumental variables for ITIs. To sharpen our identification, following Huang et al. (2019), we use state-level enforceability of noncompetition agreements as an exogenous shock and estimate difference-in-differences regressions.

Measuring product innovation is challenging. We focus on the final output of an innovation, which is a useful product that can be generated with or without having a patent.[40] Therefore, the product innovation we define here can be either newly invented goods/services or existing

[40] Most studies use patent-based variables to measure long-term technological innovation (e.g., Chemmanur & Tian, 2018; Fang et al., 2014; Tian & Wang, 2011).

goods/services with significant improvements in technical specifications, constituents, materials, user-friendliness, or functional aspects. We develop a novel measure of product innovation using textual analysis of product descriptions reported in 10-K statements (discussed in Section 3). Specifically, we exploit the changes in the product market vocabulary of a firm over time to gauge its product innovation outputs. Employing the ordinary least squares (OLS) and two-stage least squares (2SLS) regression models, we find a positive relation between ITIs and product innovation, suggesting that the higher status, increased visibility, and larger compensation provided by winning the tournament prize encourage CEOs to engage in more product innovation activities.[41]

Product innovations could arise from long-term innovation and/or short-term product development. Innovations through patents act as long-term innovation activities as they require a long time, substantial investments, and managerial effort (Aghion & Tirole, 1994; Manso, 2011). Thus, firms motivate CEOs to undertake long-term patent-based innovations by providing long-term incentives in the form of stock options and restricted stocks (e.g., Lerner & Wulf, 2007; Mao & Zhang, 2018). On the other hand, short-term product innovation is the introduction of a product that is similar to the existing product line of a firm, which can easily draw market attention (Levinthal & March, 1993). It provides greater and more certain benefits in the short run, improving present returns (March, 1991). Because of career concerns, CEOs may strategically focus on short-term innovation activities that can quickly draw market attention and boost firm profitability, and forgo long-term innovation activities that take years to develop. However, there are limits to the extent to which a CEO can exploit myopic innovation strategies motivated by ITIs because the job market learns about CEOs' abilities as their tenure increases (Pan et al., 2015).

[41] We also use an alternative measure of product innovation outputs, the product announcement information from LexisNexis's news database, and find a positive association between ITI and new product announcements.

Therefore, whether CEOs win the tournament prize by engaging in more short-term innovation projects is an empirical question.

We explore the trade-off effects of ITIs on product innovation created through patenting technologies (long-term innovation) and short-term product innovation. In our empirical tests, we first partial out the effect of patenting technologies from our product innovation measure and obtain a measure of short-term product innovation.[42] We then separately explore how ITIs affect patent-based innovation and short-term product innovation activities. We find that ITIs negatively affect patent-based innovation (long term) and positively affect short-term product innovation. Managers tend to find short-cut ways to enhance their reputations (Narayanan, 1985). Therefore, especially when considering CEO tenure, CEOs seeking to move up might refrain from attempting toilsome patenting activities as they require extensive managerial effort and time, and could instead opt for short-term product innovation, which might lead CEOs to gain success in a shorter period.[43] We also find that CEOs experiencing higher tournament incentives are more likely to be promoted when they pursue myopic innovation strategies in the current firm.

Our finding that ITIs encourage (discourage) short-term (long-term) innovation is also consistent with Acharya et al.'s (2016) theoretical paper that identifies a competition inefficiency in the market for a manager. In their model, managers are risk averse, and risk-neutral firms compete for scarce managerial talent. They find that if firms aggressively compete for managers' talents, managers can leave before the long-term risks associated with their projects materialize.

[42] We use four measures of patent-based innovation: number of patents, innovation efficiency, number of citations, and patent value. We regress our product innovation measure on the lagged 5 years' number of registered patents and define the error term from this regression as short-term product innovation.
[43] The median CEO tenure is 5 years in our sample. Five years may seem to be long, but tenure is determined by the CEO's activities (i.e., tenure is endogenous), especially as it relates to ITIs. To strengthen our argument, we test whether CEO tenure affects the relation between ITIs and short-term innovation. We find that the positive effect of ITIs on short-term innovation is weaker when CEO tenure is greater than the median. This result indicates that when CEO's talents are better learned by the labor market in the long run, the distortion effects of ITIs are smaller, which is consistent with Pan et al.'s (2015) model.

Because the risk materializes only in the long run, talent can be identified with certainty only if managers entrusted with skill-sensitive projects stay with their employer long enough. The model also predicts that enforcing noncompetition clauses can reduce this kind of labor market efficiency. In the context of product innovation, even though a focus on short-term innovation could be detrimental to the firm in the long run (e.g., March, 1991), if the CEO wins the tournament before the labor market realizes the CEO's true talent, what is left at the old firm does not matter for the CEO. Therefore, a CEO who aims to win the job market tournament will be motived to engage in projects that generate faster payback and to move to a more prestigious firm. In addition, we find a negative and significant impact of noncompetition agreement enforceability on the relation between ITI and product innovation. Overall, our results indicate a dark side of labor market competition.[44]

We then examine how the effect of ITIs on product innovation varies with product market competition. An increase in competition from rivals indicates more product innovation activities by the rivals. A firm has to engage in more product innovation to catch up with its rivals in terms of innovation for its survival. Additionally, increased competitive threats from rival firms can intensify the labor market competition for CEO talent (Jung & Subramanian, 2017). We use the product market fluidity measure proposed by Hoberg et al. (2014) to measure firm-level competition.[45] We find that the effect of ITIs on product innovation is more pronounced for CEOs

[44] The other side of the literature support that myopic investment by managers may reduce agency costs because of rent extraction through long-term projects. Performance signals on investments that matter for managerial incentives are noisier for long-term projects than for short-term projects (Shleifer & Vishny, 1990; Thakor, 2021). Katz (1986) points out that a manager gets efficient wages for both long- and short-term projects, but they can extract higher rents with long-term projects. Because the market possesses less information than the firm's managers about the firm's long-term projects (Bebchuk & Stole, 1993), when firms compete for managerial talent, short-termism enables firms to attract better talent (Thakor, 2021). Therefore, our results can also be seen as a channel through which firms can efficiently seek better CEOs who can signal their talent through their short-term innovation performance in the current firm.

[45] Product market fluidity captures how rival firms' products differentiate from the firm's products.

in firms exposed to high product market competition. Moreover, this effect is stronger when CEO characteristics indicate a higher probability of moving to the leading firm (when a CEO is not the founder and is not of retirement age).

Our article contributes to the literature in two ways. First, we examine the effects of CEO ITIs on corporate innovation strategies. Thus, we identify a new channel through which tournament incentives can affect firm performance and firm riskiness. Most similar to our article is Shen and Zhang (2018), who explore the effect of internal tournament incentives, measured as the pay difference between the CEO and the executives under the CEO, on the firm's innovative efficiency. In contrast, we examine the effects of tournament incentives arising from the external CEO labor market on innovation strategies. Second, we find that CEOs try to win the tournament prize by engaging more in short-term product innovation and less in long-term patent-based innovations, suggesting that ITIs might provide short-term motives for CEOs.

Although Coles et al. (2018) highlight the value-enhancing outcomes of tournament incentives, our work identifies a negative impact of ITIs. We find that ITIs provide an incentive for CEOs to engage in more short-term product innovation activities while discouraging patenting activities. These findings indicate that ITIs are not always value enhancing.[46] In this respect, our paper contributes to a strand of the literature that documents the existence of adverse impacts of ITIs (e.g., Kubick et al., 2021; Kubick & Lockhart, 2021). Last but not least, most of the managerial short-termism literature focuses on CEO compensation characteristics, contract horizon (e.g., Gryglewicz et al., 2020; Marinovic & Varas, 2019), stock market pressure (e.g., Gao et al., 2018; Stein, 1989), or takeover threat (e.g., Chemmanur & Tian, 2018; Stein, 1988). Our study

[46] Narin et al. (1987) and Hall et al. (2005) document a positive association between patents and firm value.

contributes to this literature by identifying a new motive of short-termism that arises from the external CEO labor market tournament.

2. Hypotheses development

Rank-order-based tournament theory suggests that compensating workers based on their relative position in an organization can be an optimal labor contract arrangement under certain circumstances. The large prize for the winner of the tournament motivates the contestants to exert more effort to win the contest. The theory is initiated by Lazear and Rosen (1981), who find that if it is costly to monitor workers' effort and it is hard to measure the output related to that effort, then compensation based on workers' ordinal rank is an optimal scheme. This tournament prize can provide incentives for next-level executives under a CEO position as well as the CEO herself. Although a CEO is in the highest hierarchy within a firm, the external labor market can induce the CEO to work harder to gain upward mobility. In the labor market, the pay gap between a CEO and the highest paid CEO among her peers can be viewed as the size of the tournament prize. With a large prize, a CEO has a strong incentive to work hard to achieve an upward leap in her career. In addition, many firms adopt relative performance measures or reward their CEOs based on how well the firms perform compared to their peer group when designing their executives' compensation (Gong et al., 2011). Therefore, the tournament prize can motivate a CEO to work harder even without an actual move.

Another outcome of tournament incentives is risk taking. Hvide's (2002) theoretical model shows that if a high reward in a group goes to the agent with the highest output, the agents in the group may have an incentive to take a higher risk. Goel and Thakor (2008) develop a two-period leadership selection model and find that when managers are competing to be CEO, they choose riskier projects than when they have no promotion concerns and seek only to maximize expected compensation utility. Kini and Williams (2012) test a similar hypothesis regarding incentives for senior executives and find that higher tournament incentives lead to an increase in a firm's overall risk and riskier firm policies, including higher research and development (R&D) intensity, firm focus, and leverage, and lower capital expenditure intensity. Coles et al. (2018) test the effects of ITIs and find that ITIs are positively related to firm performance and the riskiness of firm investment and financial policies. Coles et al. (2020) provide a theoretical basis for the empirical findings of Coles et al. (2018) that ITIs increase firm performance and riskiness by allowing the tournament to start with a lead in prior performance or perceived ability.[47]

Our objective is to examine whether ITIs affect corporate innovation strategies. Specifically, we explore how ITIs are related to product innovation. Product innovation is a major business activity because firms are always faced with competition from their rivals or potential new entrants and with customers' rapidly changing preferences. A firm that is capable of differentiating its product from its rivals to a large extent can reach a profitable customer segment or price at a higher markup, and thus CEOs who are engaged in product innovation are more likely to be strong candidates for the external tournament prize. Developing new products is also risky because it requires an injection of significant capital. These investments are costly and may fail. However, if a product innovation becomes successful, it will contribute to the firm's performance, which should enhance the CEO's status in the industry and make her a stronger candidate for the external labor market.

Compared with outsider shareholders, managers are less diversified and thus are exposed to more firm-specific risk. Therefore, they may eschew risky projects with positive net present values if they are risk averse (e.g., Lambert et al., 1991; Smith & Stulz, 1985). However, ITIs can provide

[47] Coles et al. (2020) extend Lazear and Rosen (1981) and Hvide (2002).

a convex payoff similar to that of options because the winner of the job market tournament earns the tournament prize and the others win nothing. As shown by Coles et al. (2018, 2020), this option-like feature leads to riskier firm policies. Therefore, the risk-taking incentives provided by ITIs may encourage CEOs to engage in product innovation activities.

Based on the preceding discussion, we posit the following:

H1: *CEOs exhibit higher product innovations when the size of the tournament prize is larger.*

An interesting question is whether managers' short-term concerns play a role in the relation between ITIs and product innovation. Concerns about career (Narayanan, 1985), short-term stock prices (Stein, 1989), generating high earnings in the short run (Ferreira et al., 2014), takeover threats (Stein, 1988), herding behavior (Zwiebel, 1995), shortness of CEO contract horizons (González-Uribe & Groen-Xu, 2017), and the sensitivity of CEO equity to stock price (Edmans et al., 2017) may compel executives to choose less revolutionary projects with a shorter time span that are more easily communicated to stock market investors. Similarly, Gao et al. (2018) find that compared to private firms, public firms' patents are less revolutionary because of the shorter investment horizon in the public stock market. Also, Drucker (1986) reports that 82% of CEOs working in US firms accuse the stock market emphasis on short-term accounting earnings of reducing long-term investment.

Product innovation involves both short-term tasks such as improvements in existing products and long-term innovation in the form of patents. Short-term product innovation is more visible to investors than long-term innovation because firms report their product development in financial reports, and new product development news is constantly covered by the media. In contrast, patent applications (measure of long-term innovation) are reported on the US Patent and Trademark

Office (USPTO) and take years to be approved.[48] Moreover, technological innovation in the form of patents is a long-term investment in intangible assets. It also requires significant managerial effort, talent, and commitment to generate patents and convert them into new products, services, or business models (Aghion & Tirole, 1994; Manso, 2011). The external job market opportunities provided by ITIs might motivate short-termism because most CEO employment contracts are within 5 years (Cziraki & Groen-Xu, 2020). To move up to the leading firms within a short time, the CEO may invest more in short-term tasks involving the development of the firm's existing products that can quickly draw market attention and boost firm profitability, which is considered as one of the major indicators of a CEO's capability by outsiders (Fee & Hadlock, 2004), instead of investing in patenting activities that take more time and need long-term managerial commitment. Similarly, Chemmanur and Tian (2018) document a tendency of managers to invest less in long-term patenting activities and be involved more in the tasks offering quicker and more certain returns when they are exposed to more short-term pressures stemming from stock markets. Moreover, managers seek short-term aims and prefer investments that have faster paybacks to improve their reputation (Narayanan, 1985). Consistent with these arguments, Huang et al. (2020) find that CEOs with larger ITIs have a higher propensity to engage in earnings manipulations such as meeting or narrowly beating consensus analyst earnings forecasts and increasing abnormal accruals. Therefore, the industry tournament prize might serve as a short-term motive to enhance the CEO's own reputation. Thus, CEOs may conduct more incremental product development to win the tournament prize so that they can move up in a shorter time. Levinthal and March (1993) allege that incremental innovation to satisfy the demands of existing customers or markets generates prompt achievement.

[48] The USPTO website is https://www.uspto.gov.

This discussion leads to the following hypotheses:

H2: *ITIs reduce (increase) long-term (short-term) innovation.*

Another interesting question is whether the effect of ITIs on product innovation is shaped by product market competition. In competitive industries, the higher number of rivals causes a fiercer tournament among CEOs. Moreover, firms in such industries have similar products, and thus CEOs may need product differentiation to gain a competitive advantage in the market, which can boost their probability of winning the tournament. Jung and Subramanian (2017) find that firms in competitive industries have a greater demand for talented CEOs who can bring in different skills and pioneering ideas to change the firm, making the labor market for CEO talent more competitive and thus increasing the mobility of CEOs. Therefore, the effect of ITIs on product innovation is expected to be stronger in firms that operate in a more competitive environment.

Furthermore, Hoberg et al. (2014) find that product market competition causes firms to hold more cash. Therefore, firms facing product market competition can use the accumulated cash to obtain product market benefits. Consistent with this view, Huang et al. (2019) find that product market competition strengthens the relation between ITIs and market share gains. Accordingly, as firms can deploy the accumulated cash for product innovation, product market competition can also potentially strengthen the relation between ITIs and product innovation.

Based on the preceding discussion, we posit the following:

H3: *The positive effect of ITIs on product innovation is more pronounced for firms facing higher product market competition.*

ITIs are supposed to have no effect on CEOs if they cannot win the tournament prize. If CEO characteristics indicate a low probability of winning the tournament prize, outsider job market opportunities are not attractive to such CEOs, and they are more inclined to stay in their current firm instead of moving. Hence, the small probability of winning the tournament prize could curtail the risk and performance motivation rooted in ITIs and therefore could attenuate the effect of ITIs on product innovation.

Accordingly, we propose the following:

H4: *The positive effect of ITIs on product innovation is less pronounced when the probability of winning the tournament prize is lower.*

3. Data and summary statistics

3.1 Data sources

The US Securities and Exchange Commission (SEC) filings began in 1994, but full coverage of public firms took 3 more years. Thus, our sample period is from 1996 to 2012. We end our sample in 2012 to address the truncation bias in patent data (Hall et al., 2001, 2005). We obtain 10-K statements from the SEC's EDGAR database to compute the textual-based product innovation measure. CEO compensation data are downloaded from the Standard & Poor's (S&P) ExecuComp database, which provides data on salary, bonus, stock awards, option grants, and total compensation for executives of US public firms. We obtain stock returns data from the Center for Research in Security Prices (CRSP) and firm characteristics from the Compustat files. Our final sample includes 1593 firms (12,806 firm-year observations) that have information on patent filings, excluding financial (SIC codes 6000–6999) and utility (SIC codes 4900–4999) firms. We discuss variable construction in the following sections.

3.2 Measures of ITIs

Following Coles et al. (2018), we measure ITIs as the pay gap between the CEO under consideration and the second highest paid CEO in the same industry using the variable

Ind_Pay_Gap. As discussed in Coles et al. (2018), considering the second highest paid CEO in the industry to compute ITIs eliminates the outlier effect associated with the abnormal highest paid CEO in the industry for a given year. Our main analysis applies the FF30 and SIC3 industry classifications.[49] Specifically, our main independent variable of interest, *Ind_Pay_Gap*, is calculated as follows:

$$\text{Ind\_Pay\_Gap} = \textit{Total compensation of the second highest paid CEO in the same industry} - \textit{Total compensation of the CEO in consideration.}$$

In robustness tests, following Coles et al. (2018) and Huang et al. (2019), we compute *Ind_Pay_Gap* based on FF30 (SIC3) size-median industry classification, where we partition each FF30 and SIC3 industry-year sample into two size-median industry groups based on firm sales.

3.3 Dependent variables

3.3.1 Product innovation

Item 101 of Regulation S-K by the SEC requires US public firms to report the significant products and services they offer to the market in their 10-K business descriptions every year.[50] In addition, product descriptions in 10-Ks, usually stated in Item 1 or Item 1A, are legally required to be accurate and current (Hoberg et al., 2014). Hoberg and Phillips (2010) and Li et al. (2019) use the logarithmic growth in the number of words in the product description section of a firm's 10-K in subsequent years to capture new product announcements. Their measure can only capture product introductions when the product description size is larger in the subsequent year. However, a firm may change product composition without increasing the size of the product description text. Also, this method does not account for changes in product composition.

[49] We use the FF30 industry classification following Coles et al. (2018) and the SIC3 industry classification following Huang et al. (2019). SIC3 industry classification represents more concentrated industry classification and is used in Faulkender and Yang (2010) who apply peer group CEO compensation metrics.
[50] Documented on the Electronic Code of Federal Regulations website at www.ecfr.gov.

We improve this measure by exploiting changes in the product market space rather than just an increase in the size of product descriptions. Our text-based product innovation measure is based on the product differentiation computed using the cosine similarity method.[51] For each firm, product differentiation is defined as the change in the use of unique words in the firm's product description from time *t* to time *t+i*. The product descriptions in 10-Ks are supposed to have sufficient information on all significant products and services, and the difference between 2 years' product descriptions is likely due to new product innovation. This text-based measure also serves as a continuous measure of product innovation because of the availability of continuous product and service changes through 10-Ks. Firms mention their important trademarks in the product description sections with special HTML tags. Our text-based measure of product innovation also captures product development through trademarks.

To compute the text-based product innovation proxy, first, we download 10-Ks from the SEC EDGAR database for our sample firms using Central Index Key (CIK) numbers.[52] We extract product descriptions (reported in the Business Description section as Item 1 or Item 1A) from 10-Ks and capture firm-specific updates in the existing products using trademark text characters. For example, Apple Inc. has "iPhone" as a trademark text character registered on USPTO, but iPhone 5, iPhone 6, and iPhone 7 are the new products associated with the trademark "iPhone." In product description text, we consider iPhone5, iPhone6, and iPhone7 as different products by eliminating space between the product and its versions. We also track revisions in trademark text characters in the product description text. For example, Apple Inc. has "OS X" and "OS X YOSEMITE" as two registered trademark characters in USPTO's trademark database. These two trademarks are also documented in the product descriptions of Apple Inc. An automated script identifies these

[51] We follow Hoberg and Phillips (2010) to calculate product differentiation.
[52] We use a software package by Lonare et al. (2021a) for downloading and parsing of 10-Ks.

revisions in the trademarks and considers them as two separate words in the product description text. Finally, we clean product description text using a standard procedure followed in the textual analysis literature.[53]

Next, we convert this cleaned product description text into a list of unique words for year *t*. We use two unique word lists generated for a firm at times *t*–1 and *t* for computing the product innovation measure. We combine the two word lists to form a main dictionary that consists of unique words from both lists. Then, we construct a binary *N-vector* separately for these two word lists where each element of the *N-vector* is set to 1 if a given word in the word list is present in the main dictionary. These two binary *N*-vectors are associated with periods *t*–1 and *t*. For each period, the binary *N-vector* is denoted by *P* and normalized to have a unit length:

$$V = \frac{P}{\sqrt{P \times P^T}}. \tag{1}$$

The product similarity for a firm at period *t* is calculated as

$$Prod\_Simi_t = V_{t-1} \times V_t^T, \tag{2}$$

and the product innovation at *t* is calculated as

$$Prod\_Innov_t = 1 - Prod\_Simi_t. \tag{3}$$

Thus, for each firm, *Prod_Innov* is the change in the product space from the previous year to the current year and is bounded between 0 and 1. It is equal to 0 for firms that experience no change in their product market space. Higher values of *Prod_Innov* denote a larger change in the firm's product space, which is equivalent to higher product innovations.[54]

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[53] First, we delete common words from product descriptions that are used by more than 25% of all the firms in the same year. Then, we remove stop words, geographical words, country names, city names, and people names and surnames (and delete numbers). Furthermore, we stem words using the Porter stemming algorithm. We omit product descriptions that have fewer than 20 unique words. Finally, we consider only nouns and proper nouns (defined by wiktionary.org) along with the trademark characters and the revisions in product names in the cleaned version of product description texts.

[54] To construct $Prod\_Innov_{t+1}$ ($Prod\_Innov_{t+2}$) over *t*+1 (*t*+2), we compare the product description of a firm at year *t* with that at year *t*+1 (*t*+2).

To illustrate the intuition behind what *Prod_Innov* measures, suppose a firm uses five words to describe its products in year *t*–1 and eight words in year *t*. Based on the information in Table 1, we obtain $Prod\_Simi_t$ as 0.79 and $Prod\_Innov_t$ as 0.21, as defined in Equations (2) and (3), respectively. We see that the firm has three new words in period *t*, which potentially represent new products or services and thereby suggests product innovation.

3.3.2 Product announcements variable

We follow Mukherjee et al.'s (2017) methodology to obtain a new product announcement variable for our sample period.[55] First, we search the LexisNexis news database for corporate news labeled under the subject "New Products" and containing new product keywords such as "Launch," "Product," "Introduce," "Begin," and "Unveil" in their headlines. We download the news based on company ticker names with relevance scores greater than 85% and then use the one-factor model to conduct event studies to obtain abnormal returns.[56] We then keep only the product announcements in a fiscal year in which the stock return exceeds its 75th percentile. This method provides a count of major new products introduced by the firm. Our sample for the new product announcement variable contains firms with the intersection of patenting firms and firms having information on product announcements. Following the innovation literature, we assign 0 to firm-year observations with missing product announcement information. We then use the natural logarithm of 1 plus the total number of product announcements by a firm in a fiscal year and denote this variable as *Prod_Announce*.

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[55] We thank Alminas Žaldokas for sharing product announcements data up to 2006. We extend these data up to 2012 following Mukherjee et al. (2017).

[56] Following Mukherjee et al. (2017), we first fit a market model over the window (−246,−30) around the announcement date to obtain the beta for the firm's stock, and we then calculate cumulative abnormal returns over a 3-day period (−1,1).

3.3.3 Patent-based innovation variables

We first obtain patent data for our sample period from Kogan et al. (2017).[57] Patent data suffer from truncation problems (Hall et al., 2001, 2005). Although we restrict our sample to 2012, we address this issue by using the adjusted number of patent-based variables, as discussed next.

Following the innovation literature, we use four variables to study patent-based technological innovation. First, we define *nPats* as the natural logarithm of 1 plus the total adjusted number of patent applications applied for by a firm (and eventually granted) in a fiscal year, and 0 if missing. This variable represents the quantity of innovation output. To compute the adjusted number of patents, following Hall et al. (2001), we divide each patent by the average number of patents in the same three-digit technology class as the patent applied for by all firms in the same year.[58] Second, we measure *InnovEff* as the natural logarithm of 1 plus the ratio of the total number of patent applications filed in a given year divided by the previous year's R&D expenditures. This variable captures the efficient use of financial resources spent on R&D activities to generate patents (Shen & Zhang, 2018). Third, we define *nCits* as the natural logarithm of 1 plus the total adjusted number of citations received for the patents applied for by a firm (and eventually granted) in a fiscal year, and 0 if missing. This variable represents the quality of innovation output. We compute the adjusted number of citations as the raw number of patent citations divided by the average number of patent citations in the year-and-technology class to which the patent belongs (Hall et al., 2001, 2005). This weighting adjustment for citations corrects for the truncation bias because patent citations are accumulated during many years after the patent is granted. Last,

[57] We thank Noah Stoffman for making patent data readily available on his personal website (https://host.kelley.iu.edu/nstoffma).

[58] On average it takes 3.27 years from the time a patent application is submitted until the time it is granted in our sample, and therefore some patents that have already been applied for may not yet appear in the sample (e.g., Hall et al., 2001, 2005). This weighting adjustment corrects for the truncation bias in patent grants.

PatValue is the natural logarithm of 1 plus total economic value generated by all patents applied for by a firm in the year (Kogan et al., 2017). This variable represents the market value generated by patents.

3.4 Control variables

In all regressions, we control for internal tournament incentives. Following Kale et al. (2009), we calculate internal tournament incentives, *Firm_Gap*, as the difference between the CEO's total compensation and the median of vice presidents' total compensation. We also include the natural logarithm of CEO delta, ln(*CEO_Delta*), and the natural logarithm of CEO vega, ln(*CEO_Vega*), in the regressions, where *CEO_Delta* is the dollar change in CEO wealth associated with a 1% change in the firm's stock price and *CEO_Vega* is the change in the value of the CEO's wealth for a 0.01 change in the annualized standard deviation of stock returns. Following Coles et al. (2006, 2013), we use the Black–Scholes option valuation model modified by Merton (1973) to account for dividends, and we use the estimates in Bettis et al. (2005) to model how the holding period of stock options varies with volatility.[59] Following Coles et al. (2018), we also control the number of CEOs in the industry. We follow the innovation literature to control for firm characteristics that could be related to a firm's product innovation abilities. The firm characteristics include measures of firm size (natural logarithm of total assets), investment in innovation (R&D expenditures scaled by total assets), profitability (return on assets [ROA]), asset tangibility (net property, plant, and equipment scaled by total assets), leverage (book leverage scaled by total assets), investment in fixed assets (capital expenditures scaled by total assets), cash holding (cash scaled by total assets), growth opportunities (Tobin's Q), product market competition (natural logarithm of product market fluidity measure), financial constraints (Kaplan & Zingales's, 1997, five-variable KZ

[59] We use the SAS code provided by Coles et al. (2013) to compute CEO delta and vega.

index), and firm age (the natural logarithm of firm age). See the Appendix for all variable definitions. In all our regression models, we include year and industry fixed effects.

3.5 Product market competition

We study whether the effect of ITIs on product innovation varies in firms with different levels of competition. We use the product market fluidity measure developed by Hoberg et al. (2014) as a proxy for product market competition. Product market fluidity, *Prodmkt_Fluid*, is a measure of firm-level product market competition, which represents how rivals' products change compared to the firm's products. A larger magnitude of product market fluidity denotes that a firm is facing more competitive threats from its rivals, in other words, that rivals are creating more new products.

3.6 Instrumental variables

There might be a reverse causality between ITIs and product innovation. It is possible that innovative firms set their CEOs' compensation to motivate them to invest in riskier projects. Therefore, we follow Coles et al. (2018) and Kubick et al. (2021) to use the sum of total compensation of all other CEOs in each industry except for the highest paid CEO, *Ind_CEO_Comp*, and the rank of a CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*, as instrumental variables for ITI. The rank variable is normalized to have values between 0 and 1. Coles et al. (2018) demonstrate that the average pay level of an industry and the compensation level of geographically close firms are expected to be correlated with the industry pay gap. Consistent with prior studies (e.g., Coles et al., 2018; Kubick et al., 2021), we expect to find a positive (negative) relation between the industry-level total CEO compensation (the rank of a CEO's pay) and ITIs. The positive relation for industry-level total CEO compensation is due to the industry's ability to pay, and the negative relation for the rank of a CEO's pay is due to local compensation applications on firms' pay policies. However, these industry- and geographic-wide pay level variables are unlikely to affect firm-level product innovation directly.

3.7 Summary statistics

Table 2 reports summary statistics for our main variables. We present summary statistics for all variables in Panel A and a Pearson correlation matrix for key variables in Panel B.

As shown in Panel A of Table 2, the mean value of the text-based product innovation measure, *Prod_Innov,* is 0.14 (SD = 0.09) with the 75th percentile of 0.18. Also, the means (medians) of the product announcement variable, *Prod_Announce;* number of patents, *nPats*; innovative efficiency, *InnovEff;* number of citations, *nCits;* and patent value, *PatValue*, are 0.38 (0.00), 0.85 (0.30), 0.07 (0.03), 1.56 (0.72), and 0.10 (0.02), respectively. The mean (median) of our first measure of the industry pay gap, *Ind_Pay_Gap*, using the second highest CEO pay within FF30 industry classifications as the benchmark, is $25.16 million ($17.95 million). The magnitude of *Ind_Pay_Gap* is much larger than that of *Firm_Gap*, which has a mean (median) value of $3.10 million ($1.91 million). We also report summary statistics for *Ind_Pay_Gap* measured on the basis of SIC3 industry classifications. These values are similar to those reported in Coles et al. (2018). The means (medians) of *CEO_Delta* and *CEO_Vega* are $791,810 ($202,615) and $136,128 ($56,927), respectively, and the magnitudes are similar to those in Coles et al. (2013).[60]

[60] We use *SHROWN_EXCL_OPTIONS* in ExecuComp to measure the number of stock grants, which include both restricted and unrestricted shares. We use the Black–Scholes model to compute the values of stock options. Following Core and Guay (1999) and Coles et al. (2006, 2013), we separately compute the option deltas and vegas for the existing options and new option grants. For the existing unvested options, we use the exercise date and the fiscal year to compute the maturity. The maturity of vested options is assumed to be 3 years less than that of unvested options. We assume that the newly granted options have the same maturity as the unvested options. If the maturity is longer than 10 years, we assume that it is equal to 10 years. The risk-free rate is the yield for Treasury constant maturities and is from the Federal Reserve Bank of St Louis website (https://fred.stlouisfed.org/categories/115). The estimated dividend yields and volatilities are given in ExecuComp. The vega for stock grants is 0, so we use only the option portfolios to calculate vega. Finally, CEO delta is the dollar change in CEO wealth associated with a 1% change in the firm's stock price, and CEO vega is the change in CEO wealth associated with a 0.01 change in the standard deviation of the firm's returns.

Panel B of Table 2 presents a Pearson correlation matrix for the validity of our text-based product innovation variable. Our text-based product innovation proxy, *Prod_Innov*, is positively correlated with *nPats*, *nCits*, *PatValue*, *R&D*, and *Prod_Announce*. *CEO_Vega* is also positively correlated with *Prod_Innov*, which is consistent with the view that the larger sensitivity of CEO wealth to stock volatility induces risk-taking behavior (Coles et al., 2006). The correlation between *Prod_Innov* and *Prodmkt_Fluid* is positive and significant. This positive correlation is consistent with Le et al. (2021) who find that firms facing high product market threats exhibit higher innovation activities. Overall, these results provide validity for our text-based product innovation measure.

4. Empirical results

4.1 ITIs and product innovation

In this section, we analyze the effects of ITIs on product innovation using OLS regression as well as 2SLS approach. We cluster standard errors by firms to address serial correlation and heterogeneity in the idiosyncratic errors in all regressions, and include year and industry fixed effects to eliminate heterogeneity by year and industry.

First, we employ OLS regression to test whether ITIs influence product innovation. The estimated OLS model is:

$$\begin{gathered} Prod\_Innov_{i,t+j} = \alpha_i + \beta_1 \ln(Ind\_Pay\_Gap)_{i,t} + \beta_2 \ln(Firm\_Gap)_{i,t} \\ +\beta_3 \ln(CEO\_Delta)_{i,t} + \beta_4 \ln(CEO\_Vega)_{i,t} + \gamma Controls_{i,t}, \end{gathered} \tag{4}$$

where *i* indexes firms, *t* indexes years, and *j* ranges from 1 to 2. The dependent variable *Prod_Innov* measures product innovation based on the difference between the current year's product description and the previous year's description.[61] The details for computing *Prod_Innov* measure are discussed in Section 3. See the Appendix for detailed information on all other variables.

We next consider the scenario in which the relation between ITIs and product innovation may be endogenous. We use 2SLS estimation to test whether ITIs influence product innovation. The first-stage regression used to compute predicted values for ITIs is

$$\begin{aligned}\ln(Ind\_Pay\_Gap)_{i,t} = \alpha_i + \theta_1 \ln(Ind\_CEO\_Comp)_{i,t} + \theta_2 \ln(Geo\_Pay\_Rank)_{i,t} \\ + \delta_1 \ln(Firm\_Gap)_{i,t} + \delta_2 \ln(CEO\_Delta)_{i,t} + \delta_3 \ln(CEO\_Vega)_{i,t} \\ + \gamma Controls_{i,t}.\end{aligned} \quad (5)$$

The instruments used for the endogenous variable *Ind_Pay_Gap* in our analyses are *Ind_CEO_Comp*, which is the sum of total compensation for all other CEOs in each industry except the highest paid CEO, and *Geo_Pay_Rank*, which is the rank of the CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm.

We report our main findings regarding OLS and 2SLS regressions in Table 3. Models 1–4 present results obtained using the FF30 industry classifications and Models 5–8 present results using the SIC3 industry classification. Models 1 and 5 present results for OLS regressions and Models 3–4 (7–8) present results for 2SLS regressions in FF30 (SIC3) industry classifications. The Hausman exogeneity tests reject the null hypothesis of exogeneity, which confirms the endogeneity of the variable ln(*Ind_Pay_Gap*). The significant coefficients on ln(*Ind_CEO_Comp*) and *Geo_Pay_Rank* variables, and the statistically significant *F*-statistics in the first stages of 2SLS regressions imply that the instrumental variables satisfy the relevance criterion. Overidentification test statistics (Hansen's *J*-test) suggest that the two instruments used are unlikely to affect firm-level product innovation directly.

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[61] To construct *Prod_Innov* over t+1 (t+2), we compare the product description of a firm at year t with year t+1 (t+2). The results are similar when we examine product innovation from year t to year t+3.

The coefficients on ln(*Ind_Pay_Gap*) are positive and statistically significant in the OLS regression (Model 1) and in the second stage of 2SLS regressions (Models 3–4 and 7–8). In terms of economic significance, the second stage of 2SLS indicates that an increase of 1 SD in *Ind_Pay_Gap* around its mean results in a 16.75% (25.29%) SD increase in $Prod\_Innov_{t+1}$ for FF30 (SIC3) industry classification.[62] These results are consistent with Hypothesis H1 that the level of product innovation increases with the size of the industry tournament prize. The sign of the coefficient on ln(*CEO_Delta*) is not clear ex ante. On the one hand, as the sensitivity of CEOs' wealth to the firm's stock price becomes larger, CEOs are more aligned with shareholders who have an affinity for risk, and thus the CEOs might innovate their products more aggressively. On the other hand, larger delta exposes the CEOs to more firm-specific risk, and risk aversion might induce CEOs to be more conservative and thus to engage in fewer product innovation activities. The negative coefficients on ln(*CEO_Delta*) in both OLS and 2SLS regressions show that the latter effect dominates. This argument is consistent with Smith and Stulz (1985) and Guay (1999), who assert that risk aversion can discourage executives from risky investments when their wealth depends highly on firm performance. The coefficients on ln(*CEO_Vega*) are all positive.[63]

Among other control variables in the second stage of 2SLS regressions, the coefficients on ln(*Firm_Gap*) are positive, but the magnitudes are much smaller than those on ln(*Ind_Pay_Gap*). This confirms our conjecture that CEOs play a more important role than other executives in setting product innovation policies. We also find a positive relation between *R&D* and *Prod_Innov*, which means that more R&D expenditures lead to more product innovation. Additionally, larger firms,

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[62] We use the following method to compute economic significance: [ln(mean of *Ind_Pay_Gap* + 0.5std) − ln(mean of *Ind_Pay_Gap* − 0.5std) × coefficient on ln(*Ind_Pay_GapstdProd_Innov*)] divided by std(*Prod_Innov*).

[63] CEO vega (sensitivity of managerial wealth to firm stock volatility) is documented to provide convexity to CEOs' payoffs and motivates them to carry riskier investment and financing policies (e.g., Coles et al., 2006; Mao & Zhang, 2018; Rajgopal & Shevlin, 2002).

firms with less profitability, firms facing fiercer product market competition, and older firms tend to produce higher product innovations. The coefficients on the control variables for our text-based product innovation measure are often consistent with the innovation literature. This also provides validity to our measure of product innovation.

Overall, the findings are consistent with our null hypothesis that when the industry tournament prize is high, CEOs have larger incentives to undertake more innovative product activities that have the potential to increase their probability of moving up.

4.2 Trade-off effects of ITIs on short-term versus long-term innovation activities

In this section, we investigate how ITIs influence long-term versus short-term innovation strategies. Product innovations could arise from long-term patent-based innovation and/or short-term product innovation. A firm can use its existing granted patents to produce new goods and services or improve existing ones. In addition, the firm may innovate its products through short-term product innovation activities that do not need any patenting technologies. In this section, we separate the effect of patenting technologies, the long-term innovation effect, from our main text-based product innovation measure to obtain variation in the product innovation through short-term product development activities, the short-term innovation effect. We then separately analyze how ITIs affect long-term versus short-term innovation. We report a 3-year gap between ITIs and patent-based variables following the literature (e.g., Chemmanur & Tian, 2018; Fang et al., 2014).

Table 4 reports the results regarding patent-based variables (measures of long-term innovation). We perform analyses under FF30 and SIC3 industry classifications in Panels A and B, respectively. The coefficients on ln(*Ind_Pay_Gap*) in the second stage of Models 2–5 are negative and significant at the 1% level. The negative effect of ITIs on patent-based innovation is also economically significant. Under FF30 industry classifications, a 1 SD increase in ln(*Ind_Pay_Gap*) is associated with a 13.23% (0.137 × 0.965) decrease in *nPats*, 1.93% (0.020 × 0.965) decrease in *InnovEff*, 22.40% (0.232 × 0.965) decrease in *nCits*, and 1.74% (0.018 × 0.965) decrease in *PatValue* in subsequent years.[64]

Next, we explore the effect of ITIs on short-term product innovation. We partial out the effect of patenting technologies (as a measure of long-term innovation) from our product innovation measure and obtain a measure of short-term product innovation activities. To do so, we first run an OLS regression with the text-based product innovation measure as a dependent variable and the natural logarithm of 1 plus the number of patents applied for by the firm (and eventually granted) in the last 5 years as an independent variable. We use the following OLS specification using Newey–West standard errors with five lags:

$$Prod\_Innov_{i,t} = \alpha_i + \beta_1 \ln\left(1 + \sum_{s=1}^{5} \#Patents_{i,t-s}\right) + \varepsilon_{i,t}. \tag{6}$$

We then obtain the error terms from this regression and define them as a measure for short-term product innovation activities, denoted as *NonPat_ProdDev*, as this variable excludes patenting technologies. We then run 2SLS models similar to Table 3 with this measure of short-term product innovation as our dependent variable.

Table 5 reports the results. We obtain positive and significant coefficients on ln(*Ind_Pay_Gap*) in all the models under FF30 and SIC3 industry classifications at conventional significance levels. These results suggest that ITIs increase product innovation that does not stem from patents. In terms of economic significance, the second stage of 2SLS indicates that a 1 SD increase in *Ind_Pay_Gap* around its mean results in an 11.02% (18.49%) standard deviation increase in *NonPat_ProdDev* for FF30 (SIC3) industry classification.[65]

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[64] The standard deviation of ln(*Ind_Pay_Gap*) is 0.965.

[65]The standard deviation of *NonPat_ProdDev* is 0.093.

The results in Tables 4 and 5 suggest that CEOs motivated by ITIs tend to engage in short-term product innovation activities and avoid long-term patenting activities. These results are parallel to Hypothesis H2. Although ITIs have an option-like convex payoff motivating risky product innovation activities, they are more likely to induce short-term product innovation activities, which generate a faster payoff than long-term patenting activities. These results indicate that short-termism plays an important role in the incentive effects of industry tournaments.

4.3 Effect of ITIs on product innovation conditional on product market competition

In this section, we test how the effect of tournament incentives on product innovation is affected by product market competition faced by a firm. We separate our sample into two subsamples based on the median values of product market fluidity and run separate 2SLS regressions for these two subsamples.[66]

Table 6 reports the results. The coefficients on ln(*Ind_Pay_Gap*) in Models 2 and 4 are much larger and more statistically significant than those in Models 1 and 3, indicating that the effect of ITIs on product innovation is stronger for the subsample with the higher *Prodmkt_Fluid*. Consistent with Hypothesis H3, this result suggests that the positive effect of ITIs on product innovation is more pronounced for firms facing higher product market competition.

4.4 Effect of ITIs on product innovation conditional on CEO characteristics

Table 7 reports the results of the effect of ITIs on product innovation conditional on two important CEO characteristics: whether the CEO is (1) the founder and (2) of retirement age. Panels A and B report the results based on FF30 and SIC3 industry classifications, respectively. When a CEO is the founder of the firm (Model 1), the coefficients on ln(*Ind_Pay_Gap*) are insignificant in both

[66]Product market fluidity captures how rival firms' products differentiate relative to a firm's products (Hoberg et al., 2014).

panels, which indicates that external tournament incentives are not effective for the founder CEO. The possible reasons are that the founder CEO is likely to be powerful, has a high status, and experiences greater commitment to the firm. Also, the human capital of a founder CEO is more bounded to the firm than that of a nonfounder CEO. Therefore, the outside opportunities are not expected to be attractive to a founder CEO. As expected, for the retiring CEO subsample (Model 3), the coefficients on ln(*Ind_Pay_Gap*) are also insignificant in both panels, indicating that the outside labor market may not be attractive to a retiring CEO who might want to enjoy a quiet life near retirement. These results are consistent with Hypothesis H4, suggesting that the probability of winning the industry tournament as proxied by CEO characteristics plays an important role in the effectiveness of ITIs on product innovation.

4.5 Myopic innovation strategy and CEO turnover

In this section, we examine whether CEOs who focus more on short-term product innovation strategies do indeed win the tournament prize, or in other words, move to another firm. Table 8 reports the effects of myopic innovation strategy on CEO turnover, which is equal to 1 if the current CEO moves to another ExecuComp firm in the next 3 years, and 0 otherwise. In Column 1, the independent variable is short-term product innovation (*NonPat_ProdDev)*. In Column 2, we use a dummy variable *High_Myopic_Innov* equal to 1 (0) if a firm has *NonPat_ProdDev* above (below) its year-industry median. In Column 3, we interact this dummy variable with the industry pay gap. As shown in Columns 1 and 2, the coefficients on *NonPat_ProdDev* and *High_Myopic_Innov* are all positive and significant, suggesting that CEOs with more myopic product innovation strategies are more likely to move to another firm. In Column 3, the coefficient on the interaction between the high myopic innovation dummy and industry pay gap is positive and significant. This suggests that CEOs experiencing higher tournament incentives are more likely to be promoted when they pursue higher myopic innovation strategies in the current firm.[67]

4.6 Market inefficiency

The literature indicates that short-term innovation can be detrimental to the firm in the long run (March, 1991). Therefore, one might think that CEOs are essentially misleading the market by pursuing nonoptimal and value-destroying behavior. Our hypothesis and results can be supported by Acharya et al.'s (2016)'s theoretical paper, which identifies an inefficiency in managerial labor market competition. They find that if firms aggressively compete for managers' talents, managers can leave before the long-term risks associated with their projects materialize. A CEO who aims to win the job market tournament will be motived to engage in projects that generate faster payback and move to a more prestigious firm. If the CEO wins the tournament, what is left at the old firm does not matter for him.

The mean (median) CEO tenure in our sample is 7.57 (5.42) years, which seems long but tenure is determined by the CEO's activities (i.e., tenure is endogenous), especially as it relates to tournament incentives. We test whether CEO tenure affects the relation between ITIs and short-term innovation. The results are shown in Table 9. We find that the positive effect of industry tournament incentives on short-term innovation is weaker when CEO tenure is larger than its median. This result indicates that when CEO's talents are better learned by the labor market in the long run, the distortion effects of ITIs are smaller, which is consistent with Acharya et al.'s (2016) model.

[67] We acknowledge that our empirical design has potential pitfalls. Because of data availability, we can identify turnovers only within S&P 1500 firms. During our sample period, S&P 1500 firms had only 49 turnovers. Because of the infrequency of CEO turnovers and for the statistical significance, we do not restrict the CEOs' original firm and new firm to be within the same industry or CEOs earning higher compensation in the new firm.

5. Robustness and additional tests

First, we use a quasi-natural experiment as a shock to the relation between ITIs and product innovation. Specially, we exploit state-level enforceability of noncompetition agreements. Under these agreements, employees (usually top managers) agree not to enter into or start a similar business that competes against the current company. CEOs who work in firms located in states that enforce these agreements are likely to have a lower motivation to move to rival firms; thus, the external job market is less likely to affect their product innovation policies. Therefore, the change in the enforceability of noncompetition agreements provides a shock to ITIs, but it is unlikely to affect product innovation policies directly. We obtain data regarding changes in state-level enforceability up to 2012 from Huang et al. (2019).[68] Following Huang et al. (2019), we perform difference-in-differences tests for subsamples with number of in-state competitors greater than the 25th, 50th, and 75th percentiles. This is because the effect of noncompetition agreement enforceability on the labor market can differ with the number of in-state competitors. Garmaise (2011) claims that when the number of competitors is larger within a state, the noncompetition agreements are more effective, and thus this makes industry tournaments less effective. Table 10 reports the results. As expected, we find a negative and significant impact of noncompetition agreement enforceability on the relation between ITIs and product innovation, and this negative impact improves with an increase in the number of in-state competitors.

Next, our product innovation measure using 10-Ks business description may be susceptible to window dressing when firms cannot produce patent-based innovation. Therefore, we examine our main hypothesis using another proxy for product innovation, the number of new product announcements (Mukherjee et al., 2017). The new product announcement variable,

[68] We use firms' historical headquartered state information from 10-K headers.

Prod_Announce, is the natural logarithm of 1 plus the total number of product announcements by a firm in a fiscal year. This variable is likely to be less prone to window dressing. Using this measure as a dependent variable, we run 2SLS regressions similar to those in Table 3. Table 11 reports the results. The coefficients on ln(*Ind_Pay_Gap*) are positive and significant for both FF30 and SIC3 industry classifications.[69] These results imply that as external job market tournament incentives increase, CEOs are inclined to announce more new products.

We conduct several robustness checks (untabulated). First, we run our main model specifications for the impacts of ITIs on product innovation (Table 2) and patent-based innovation (Table 3) with year and firm fixed effects. Second, we use FF30 (SIC3) size-median industry classifications to compute ITIs measures so that a peer group can comprise of firms with similar sizes. Last, we scale ITIs by CEO's total compensation to account for the relative importance of the pay gap in total compensation and we repeat the analyses in Tables 2 and 3. The positive effect of ITIs on product innovation and the negative effect of ITIs on patent-based innovation remain significant using these robustness checks. The results are available upon request.

6. Conclusion

We examine how ITIs influence innovation strategies. Previous studies find positive effects of tournament incentives on firm performance, firm risk, and the riskiness of investment policies (e.g., Coles et al., 2018; Kale et al., 2009; Kini & Williams, 2012). We argue that the motivation to transfer to a leading firm in the industry induces CEOs to exert greater innovation effort because innovation has a potentially profitable outcome and is highly uncertain and risky.

[69] These results are also economically significant. A 1 SD increase in ln(*Ind_Pay_Gap*) is associated with a 7.82% (9.17%) increase in new product announcements in the subsequent year for FF30 (SIC3) industry classification.

Motivated by Hoberg and Philips (2010), we use textual analysis of product descriptions reported in 10-Ks to measure product innovation. Specifically, we exploit changes in the product market vocabulary of a firm over time to gauge its product innovation output. We take advantage of the rich and continuous information in the product description disclosure in 10-K. Using this text-based measure of innovation outcome, we find that ITIs influence product innovation positively. This effect is more pronounced for CEOs facing higher product market competition and having a higher probability of moving to the leading firm within the industry.

Furthermore, we explore the trade-off effects of ITIs on product innovation created through patenting technologies (long-term innovation) versus short-term product innovation. We show that CEOs motivated by moving up to the leading firm are discouraged from patenting innovation as it takes a long time to generate income for the firm, but they are encouraged for short-term product innovation activities that can improve their reputation in a short time.

Overall, our analyses indicate that the external job market motivates CEOs to promote product innovation. However, the short-term nature of industry tournaments induces CEOs to conduct short-term product innovation activities and reduce long-term patent-based innovation.

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Appendix: Variable Definitions

Variable	Definition (source)
Text-based product innovation and product announcement variables	
Prod_Innov	For each firm, this variable indicates the change in the product space from the previous year to the current year. It is computed using a cosine similarity method based on the use of unique words in the firm's product descriptions in the two periods. Details of how the text-based product innovation measure is created are discussed in Section 3 (Compustat)
Prod_Announce	Natural logarithm of 1 plus the total number of product announcements by a firm in a fiscal year (LexisNexis)
Patent-based innovation variables	
nPats	Natural logarithm of 1 plus total adjusted number of patent applications filed (and eventually granted) by a firm in a fiscal year, set to 0 if missing. The adjusted number of patents is computed by dividing each patent by the average number of patents in the same three-digit technology class as the patent applied by all firms in the same year (Kogan et al., 2017)
nCits	Natural logarithm of 1 plus the total adjusted number of citations received to patents applied (and eventually granted) by a firm in a fiscal year, set to 0 if missing. The adjusted number of citations is computed as the raw number of patent citations divided by the average number of patent citations in the year-and-technology class to which the patent belongs (Kogan et al., 2017)
InnovEff	Natural logarithm of 1 plus the ratio of the total number of patent applications filed (and eventually granted) in a given year divided by the previous year's research and development (R&D) expenditures (Kogan et al., 2017)
PatValue	Natural logarithm of 1 plus total economic value generated by all the patents applied by a firm in the year (Kogan et al., 2017)
Incentives variables (ExecuComp)	
Ind_Pay_Gap	Pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry, Consumer Price Index (CPI) adjusted (ExecuComp)
Firm_Gap	Pay gap between the CEO's total compensation and the median vice president's total compensation, CPI adjusted (ExecuComp)
CEO_Delta	Dollar change in CEO wealth associated with a 1% change in the firm's stock price (ExecuComp)
CEO_Vega	Dollar change in CEO wealth associated with a 0.01 change in the standard deviation of the firm's returns (ExecuComp)
Firm characteristics	
Total_Assets	Book value of total assets in millions of dollars, CPI adjusted (Compustat)
R&D	R&D expenditures divided by total assets, set to 0 if missing (Compustat)
Cash	Cash scaled by total assets (Compustat)
ROA	Operating income before interest divided by total assets (Compustat)

Capital_Invest	Investment in property, plant, and equipment divided by total assets (Compustat)
Leverage	Ratio of long-term debt plus debt in current liabilities to total assets (Compustat)
Capital_Expend	Capital expenditures scaled by total assets (Compustat)
Q	Market value of equity plus book value of assets minus book value of equity minus balance sheet deferred taxes, divided by book value of assets (Compustat)
Prodmkt_Fluid	Measure of firm-level competitive threats based on the description of a firm's product space and rivals move in their 10-Ks developed by Hoberg et al. (2014). A higher product market fluidity for the firm indicates a greater market threat from competitors
KZ_Index	Kaplan and Zingales's (1997) five-variable KZ index computed as −1.002 × Cash flow + 0.283 × Q + 3.139 × Leverage − 39.368 × Dividends − 1.315 × Cash holdings (Compustat)
Firm_Age (years)	Computed as 1 plus the difference between the year under investigation and the first year the firm appears on the Center for Research in Security Prices (CRSP) tapes (CRSP)
CEO characteristics	
CEO_Founder	Dummy variable equal to 1 if a CEO is also the founder of the firm, and 0 otherwise (ExecuComp)
CEO_Retire	Dummy variable equal to 1 if the CEO's age is more than 65 years, and 0 otherwise (ExecuComp)
Instruments and other industry-level variables	
Ind_CEO_Comp	Sum of total compensation of all other CEOs in each industry, except the highest paid CEO, CPI adjusted. (ExecuComp)
Geo_Pay_Rank	Rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm. This rank variable is normalized to have values between 0 and 1 (ExecuComp)
Ind_#CEOs	Number of CEOs (or firms) within the same industry in the sample year (ExecuComp)
Difference-in-differences variable	
NonCompete	Equals +1 for firms headquartered in Florida during 1997–2012, Kentucky during 2007–2012, Idaho and Oregon during 2009–2012, Texas and Wisconsin during 2010–2012, and Colorado, Georgia, and Illinois during 2012; equals −1 for firms in Texas during 1995–2006, Louisiana during 2002–2003, South Carolina during 2011–2012, and Montana during 2012; and equals 0 otherwise (Garmaise, 2011; Huang et al., 2019; Jeffers, 2020)

Table 2.1: Example of text-based product innovation

Word	**Year (*t*–1)**	**Year (*t*)**	***P*(*t*–1)**	***P*(*t*)**	***V*(*t*–1)**	***V*(*t*)**
computer	Yes	Yes	1	1	0.447	0.354
Mouse	Yes	Yes	1	1	0.447	0.354
motherboard	Yes	Yes	1	1	0.447	0.354
Chip	Yes	Yes	1	1	0.447	0.354
Signal	Yes	Yes	1	1	0.447	0.354
Bluetooth	No	Yes	0	1	0.000	0.354
Sensor	No	Yes	0	1	0.000	0.354
Wireless	No	Yes	0	1	0.000	0.354

Note: This table provides an example of text-based product innovation. $P(t-1)$ is the binary N-vector at year t–1, $P(t)$ is the binary N-vector at year t, $V(t-1)$ is normalized $P(t-1)$ with a unit length, $V(t)$ is normalized $P(t)$ with a unit length.

Table 2.2: Descriptive statistics and correlations

Panel A: Summary statistics

Variable	*N*	Mean	SD	25 pctl	Median	75 pctl
Dependent variables						
$Prod\_Innov_{t+1}$	12,806	0.144	0.095	0.077	0.121	0.188
$Prod\_Announce_{t+1}$	4620	0.377	0.586	0.000	0.000	0.693
$nPats_{t+3}$	11,622	0.849	1.124	0.000	0.298	1.401
$InnovEff_{t+3}$	7594	0.071	0.113	0.002	0.026	0.089
$nCits_{t+3}$	11,622	1.557	1.849	0.000	0.724	2.901
$PatValue_{t+3}$	10,083	0.096	0.146	0.000	0.024	0.144
Incentives variables						
$Ind\_Pay\_Gap_t$ (FF30) ($000)	12,806	25,159.903	25,864.730	9845.086	17,944.776	30,369.955
$Ind\_Pay\_Gap_t$ (SIC3) ($000)	9404	16,148.932	22,456.673	3996.673	9380.435	19,065.953
$Firm\_Gap_t$ ($000)	12,806	3101.145	3493.354	807.544	1910.200	4036.991
CEO_Delta_t ($000)	12,806	791.810	8674.627	77.749	202.615	528.848
CEO_Vega_t ($000)	12,806	136.128	250.159	18.510	56.927	156.010
Firm characteristics						
$Total\_Assets_t$ ($000,000)	12,806	5716.038	21,609.588	475.736	1276.230	3761.120
$R\&D_t$	12,806	0.043	0.062	0.000	0.016	0.065
$Cash_t$	12,806	0.174	0.184	0.032	0.104	0.259
ROA_t	12,806	0.128	0.122	0.087	0.133	0.182
$Capital\_Invest_t$	12,806	0.239	0.191	0.097	0.184	0.326
$Leverage_t$	12,806	0.196	0.162	0.034	0.188	0.307
$Capital\_Expend_t$	12,806	0.047	0.042	0.020	0.035	0.060
Q_t	12,806	1.974	1.250	1.193	1.580	2.275
$Prodmkt\_Fluid_t$	12,806	6.015	3.097	3.687	5.456	7.691
KZ_Index_t	12,806	–5.431	11.818	–5.942	–1.884	0.210
$Firm\_Age_t$ (years)	12,806	29.076	19.462	14.000	23.000	41.000
CEO characteristics						
$CEO\_Founder_t$ (dummy)	12,806	0.067				
CEO_Retire_t (dummy)	12,798	0.071				
Industry level and instrumental variables						
$Ind\_CEO\_Comp_t$ ($000)	12,806	472,712.850	374,244.630	131,587.290	374,891.432	808,128.888
$Geo\_Pay\_Rank_t$	12,806	0.161	0.165	0.044	0.111	0.214
$Ind\_\#CEOs_t$	12,806	112.671	80.431	38.000	69.000	189.000

Panel B: Correlation table

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. *Prod_Innov*	1.00											
2. *Prod_Announce*	0.12***	1.00										
3. *nPats*	0.09***	0.28***	1.00									
4. *nCits*	0.11***	0.29***	0.94***	1.00								
5. *PatValue*	0.13***	0.27***	0.61***	0.63***	1.00							
6. *CEO_Delta*	0.01	0.11***	0.07***	0.07***	0.04*	1.00						
7. *CEO_Vega*	0.06***	0.23***	0.29***	0.26***	0.09***	0.05***	1.00					
8. *Total_Assets*	0.04**	0.20***	0.24***	0.19***	0.05**	0.03*	0.31***	1.00				
9. *R&D*	0.09***	0.20***	0.21***	0.31***	0.34***	0.01	–0.03*	–0.11***	1.00			
10. *Cash*	0.05**	0.10***	0.02	0.14***	0.12***	0.04**	–0.07***	–0.13***	0.57***	1.00		
11. *ROA*	–0.03*	0.08***	0.11***	0.09***	–0.01	0.06***	0.14***	0.04*	–0.16***	–0.15***	1.00	
12. *Prodmkt_Fluid*	0.12***	0.20***	0.13***	0.21***	0.18***	0.07***	0.14***	0.12***	0.45***	0.41***	–0.12***	1.00

Note: This table presents summary statistics (Panel A) and Pearson correlation coefficients (Panel B) for ExecuComp firms that have patent information, excluding financials and utility firms, from 1996 to 2012. See the Appendix for variable definitions. All continuous variables are winsorized at 1% and 99%.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.3: ITIs and product innovation

	ITIs based on FF30 industry classification				ITIs based on SIC3 industry classification			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS			OLS	2SLS		
		1st stage	2nd stage			1st stage	2nd stage	
	***Prod_ Innov**$_{t+1}$*	**ln(*Ind_Pay_ Gap*)**$_t$	***Prod_ Innov**$_{t+1}$*	***Prod_ Innov**$_{t+2}$*	***Prod_ Innov**$_{t+1}$*	**ln(*Ind_Pay_ Gap*)**$_t$	***Prod_ Innov**$_{t+1}$*	***Prod_ Innov**$_{t+2}$*
Predicted ln(*Ind_Pay_Gap*)$_t$			**0.014*** **	**0.012*** **			**0.014*** **	**0.014*** **
			(4.47)	(3.12)			(3.82)	(3.06)
ln(*Ind_Pay_Gap*)$_t$	0.003**				0.001			
	(2.02)				(0.88)			
ln(*Firm_Gap*)$_t$	0.003**	–0.134***	0.004***	0.004**	0.002	–0.163***	0.004**	0.004**
	(2.49)	(–17.69)	(3.40)	(2.45)	(1.33)	(–15.16)	(2.53)	(2.25)
ln(*CEO_Delta*)$_t$	–0.006***	–0.011**	–0.006***	–0.007***	–0.006***	–0.023***	–0.006***	–0.007***
	(–5.37)	(–1.99)	(–5.35)	(–5.09)	(–5.33)	(–3.04)	(–5.22)	(–4.34)
ln(*CEO_Vega*)$_t$	0.001	0.009*	0.001	0.002**	0.002	–0.001	0.002*	0.002
	(1.38)	(1.91)	(1.53)	(2.01)	(1.54)	(–0.10)	(1.82)	(1.56)
ln(*Total_Assets*)$_t$	0.007***	–0.067***	0.008***	0.009***	0.007***	–0.071***	0.008***	0.007***
	(5.04)	(–10.79)	(5.58)	(5.18)	(4.23)	(–7.56)	(4.91)	(3.58)
R&D$_t$	0.147***	–0.232**	0.151***	0.201***	0.117***	–0.179	0.120***	0.141***
	(4.90)	(–2.26)	(5.03)	(4.91)	(3.89)	(–1.28)	(3.99)	(3.53)
Cash$_t$	0.002	0.004	0.003	0.015	0.002	–0.094*	0.003	0.016
	(0.25)	(0.11)	(0.25)	(1.14)	(0.19)	(–1.77)	(0.32)	(1.19)
ROA$_t$	–0.050***	0.055	–0.049***	–0.040***	–0.036***	–0.005	–0.035***	–0.024*
	(–4.17)	(1.45)	(–4.18)	(–2.98)	(–3.01)	(–0.09)	(–3.02)	(–1.77)
Capital_Invest$_t$	–0.033***	0.047	–0.032***	–0.029*	–0.020	–0.008	–0.018	–0.015
	(–2.70)	(0.88)	(–2.67)	(–1.91)	(–1.24)	(–0.09)	(–1.16)	(–0.74)
Leverage$_t$	0.023***	0.180***	0.022**	0.005	0.023**	0.031	0.024**	0.009
	(2.61)	(5.08)	(2.49)	(0.44)	(2.29)	(0.55)	(2.43)	(0.71)
Capital_Expend$_t$	0.041	–0.368**	0.037	0.078	0.050	–0.312	0.047	0.083
	(1.05)	(–2.13)	(0.94)	(1.57)	(1.16)	(–1.30)	(1.12)	(1.48)

Q_t	0.001	–0.011**	0.001	–0.000	0.000	0.005	0.000	–0.000
	(0.66)	(–2.23)	(0.58)	(–0.23)	(0.28)	(0.78)	(0.10)	(–0.17)
ln(*Prodmkt_Fluid*)$_t$	0.018***	–0.019	0.018***	0.017***	0.019***	0.021	0.019***	0.017***
	(4.90)	(–1.16)	(4.90)	(3.30)	(4.10)	(0.84)	(3.98)	(2.97)
KZ_Index$_t$	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
	(0.29)	(1.21)	(0.10)	(0.46)	(0.54)	(1.53)	(0.29)	(0.89)
ln(*Firm_Age*)$_t$	0.007***	–0.006	0.007***	0.006**	0.006**	–0.005	0.006**	0.007**
	(3.16)	(–0.73)	(3.26)	(2.22)	(2.50)	(–0.39)	(2.56)	(2.33)
ln(*Ind_#CEOs*)$_t$	–0.020**	–1.275***	–0.022**	–0.039***	–0.011	–0.741***	–0.021***	–0.027***
	(–2.16)	(–20.95)	(–2.35)	(–3.10)	(–1.63)	(–10.03)	(–2.85)	(–2.89)
ln(*Ind_CEO_Comp*)$_t$ (IV)		1.760***				0.962***		
		(60.05)				(22.34)		
Geo_Pay_Rank$_t$ (IV)		–0.221***				–0.397***		
		(–4.26)				(–4.80)		
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,669	12,806	12,669	12,210	9299	9399	9304	8918
Adj. R^2	0.119	0.775	0.119	0.151	0.147	0.745	0.153	0.192
Endogeneity, relevance, and overidentification tests								
Hausman test: *p*-value (endogeneity test)			0.000***	0.002***			0.000***	0.001***
First-stage *F*-statistics			1784.97***	1717.91***			269.71***	278.12***
Hansen's *J*-statistics (over-id test)			0.216	0.676			0.678	0.437

Note: This table presents the results of ordinary least squares (OLS) and instrumental variables (IV) estimation of industry tournament incentives (ITIs) on product innovation. The dependent variable *Prod_Innov* measures product innovation based on the difference between the current year's product description to the previous year's description; the details are discussed in Section 3. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classifications. In the first stage of two-stage least squares (2SLS), we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp*, and the rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. See the Appendix for variable definitions. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.4: ITIs and patent-based innovation

	(1)	(2)	(3)	(4)	(5)
	1st stage	2nd stage			
	ln(*Ind_Pay_Gap*)$_t$	***nPats***$_{t+3}$	***InnovEff***$_{t+3}$	***nCits***$_{t+3}$	***PatValue***$_{t+3}$
Panel A: ITIs based on FF30 industry classification					
Predicted ln(*Ind_Pay_Gap*)$_t$		**–0.137*****	**–0.020*****	**–0.232*****	**–0.018*****
		(–4.45)	(–3.44)	(–4.78)	(–3.59)
ln(*Firm_Gap*)$_t$	–0.135***	–0.012	–0.000	–0.017	–0.001
	(–17.12)	(–0.81)	(–0.00)	(–0.69)	(–0.62)
ln(*CEO_Delta*)$_t$	–0.011*	–0.038***	0.001	–0.056**	0.000
	(–1.94)	(–2.66)	(0.44)	(–2.23)	(0.03)
ln(*CEO_Vega*)$_t$	0.012**	0.039***	0.002	0.088***	0.003
	(2.36)	(3.31)	(0.92)	(4.42)	(1.64)
ln(*Total_Assets*)$_t$	–0.071***	0.391***	–0.009***	0.582***	0.036***
	(–11.06)	(16.31)	(–3.02)	(16.28)	(12.64)
R&D$_t$	–0.200*	4.484***		7.861***	0.616***
	(–1.85)	(9.98)		(10.03)	(8.72)
Cash$_t$	–0.000	0.141	–0.014	0.702***	0.045**
	(–0.00)	(1.09)	(–0.86)	(3.01)	(2.05)
ROA$_t$	0.039	0.551***	0.033***	1.104***	0.047**
	(0.97)	(4.26)	(2.77)	(4.82)	(2.04)
Capital_Invest$_t$	0.054	–0.521***	0.038	–1.155***	–0.077***
	(0.97)	(–2.74)	(1.19)	(–3.77)	(–2.98)
Leverage$_t$	0.193***	–0.452***	–0.015	–0.711***	–0.016
	(5.19)	(–3.67)	(–0.93)	(–3.37)	(–0.82)
Capital_Expend$_t$	–0.452**	1.651***	0.103	3.393***	0.336***
	(–2.48)	(3.33)	(1.18)	(4.33)	(4.02)
Q$_t$	–0.012**	0.100***	0.002	0.142***	0.008***
	(–2.21)	(6.56)	(0.93)	(5.48)	(3.29)
ln(*Prodmkt_Fluid*)$_t$	–0.021	–0.068	–0.019**	–0.040	–0.001
	(–1.26)	(–1.26)	(–2.29)	(–0.46)	(–0.07)
KZ_Index$_t$	0.001	0.002	–0.000	0.007***	0.001***
	(1.36)	(1.55)	(–0.40)	(2.85)	(3.19)
ln(*Firm_Age*)$_t$	–0.007	0.095***	0.001	0.046	–0.006
	(–0.80)	(2.85)	(0.33)	(0.84)	(–1.27)

ln(*Ind_#CEOs*)$_t$	–1.287***	0.161	0.046**	0.338**	0.013
	(–20.20)	(1.63)	(2.30)	(2.10)	(0.87)
ln(*Ind_CEO_Comp*)$_t$ (IV)	1.756***				
	(56.16)				
Geo_Pay_Rank$_t$ (IV)	–0.203***				
	(–3.72)				
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	11,622	11,622	7594	11,622	10,083
Adj. R^2	0.774	0.484	0.154	0.452	0.325
Endogeneity, relevance, and overidentification tests					
Hausman test: *p*-value (endogeneity test)		0.000***	0.000***	0.000***	0.000***
First-stage *F*-statistics		1592.67***	1003.02***	1592.67***	1367.32***
Hansen's *J*-statistics (over-id test)		1.090	3.489*	2.075	9.979***

Panel B: ITIs based on SIC3 industry classification

Predicted ln(*Ind_Pay_Gap*)$_t$		–0.094***	–0.028***	–0.158***	–0.012**
		(–2.82)	(–3.82)	(–2.85)	(–2.31)
ln(*Firm_Gap*)$_t$	–0.166***	–0.009	–0.002	–0.015	–0.002
	(–14.48)	(–0.59)	(–0.68)	(–0.56)	(–0.86)
ln(*CEO_Delta*)$_t$	–0.028***	–0.026	–0.001	–0.036	0.002
	(–3.50)	(–1.60)	(–0.23)	(–1.24)	(0.68)
ln(*CEO_Vega*)$_t$	0.002	0.038***	0.002	0.090***	0.004**
	(0.29)	(2.84)	(1.09)	(3.96)	(2.10)
ln(*Total_Assets*)$_t$	–0.070***	0.416***	–0.011***	0.635***	0.038***
	(–6.99)	(15.89)	(–3.69)	(16.29)	(11.20)
R&D$_t$	–0.104	3.628***		6.371***	0.581***
	(–0.70)	(8.64)		(8.65)	(7.90)
Cash$_t$	–0.078	0.094	–0.008	0.576**	0.041
	(–1.36)	(0.68)	(–0.53)	(2.25)	(1.59)
ROA$_t$	0.026	0.383***	0.027**	0.710***	0.037
	(0.46)	(2.96)	(2.41)	(3.07)	(1.53)
Capital_Invest$_t$	–0.009	0.205	0.052	–0.009	0.001
	(–0.10)	(0.78)	(1.54)	(–0.02)	(0.01)
Leverage$_t$	0.048	–0.443***	–0.016	–0.751***	0.008
	(0.77)	(–3.25)	(–1.00)	(–3.13)	(0.34)

Capital_Expend$_t$	–0.346	1.402***	0.080	2.603***	0.296***
	(–1.35)	(2.86)	(0.95)	(3.23)	(3.06)
Q_t	0.007	0.100***	0.004**	0.148***	0.010***
	(1.00)	(7.08)	(2.50)	(6.07)	(4.03)
ln(*Prodmkt_Fluid*)$_t$	0.012	0.048	–0.013*	0.195**	0.013
	(0.42)	(0.83)	(–1.73)	(2.01)	(1.45)
KZ_Index$_t$	0.001*	–0.000	–0.000	0.002	0.000
	(1.66)	(–0.41)	(–0.70)	(0.95)	(1.02)
ln(*Firm_Age*)$_t$	–0.006	0.110***	0.002	0.056	–0.006
	(–0.42)	(2.98)	(0.37)	(0.94)	(–1.06)
ln(*Ind_#CEOs*)$_t$	–0.765***	0.083	0.020	0.220*	0.003
	(–9.82)	(1.20)	(1.41)	(1.87)	(0.28)
ln(*Ind_CEO_Comp*)$_t$ (IV)	0.972***				
	(21.49)				
Geo_Pay_Rank$_t$ (IV)	–0.397***				
	(–4.53)				
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	8447	8453	5954	8453	7402
Adj. R^2	0.739	0.535	0.203	0.506	0.356
Endogeneity, relevance, and overidentification tests					
Hausman test: *p*-value (endogeneity test)		0.001***	0.000**	0.000***	0.004***
First-stage *F*-statistics		253.69***	186.71***	253.69***	248.21***
Hansen's *J*-statistics (over-id test)		1.472	3.237*	2.617	12.387***

Note: This table presents the results of two-stage least squares (2SLS) estimation of industry tournament incentives (ITIs) on patent-based innovation. Dependent variables are patent-based innovation variables defined in the Appendix. *Ind_Pay_Gap* is the pay gap between the the CEO's total compensation and second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classifications. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp*, and the rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.5: ITIs and short-term innovation

	ITIs based on FF30 industry classification		ITIs based on SIC3 industry classification	
	(1)	(2)	(3)	(4)
	NonPat_ProdDev $_{t+1}$	***NonPat_ProdDev*** $_{t+2}$	***NonPat_ProdDev*** $_{t+1}$	***NonPat_ProdDev*** $_{t+2}$
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.009*** **	**0.010*** **	**0.010** **	**0.012*** **
	(3.10)	(3.28)	(2.49)	(3.12)
ln(*Firm_Gap*)$_t$	0.004***	0.003**	0.003**	0.003**
	(2.97)	(2.49)	(2.13)	(2.49)
ln(*CEO_Delta*)$_t$	–0.005***	–0.005***	–0.005***	–0.004***
	(–4.39)	(–4.32)	(–4.30)	(–3.25)
ln(*CEO_Vega*)$_t$	0.002*	0.001	0.002*	0.001
	(1.91)	(1.45)	(1.90)	(0.78)
ln(*Total_Assets*)$_t$	0.004***	0.004***	0.003*	0.003*
	(2.98)	(3.17)	(1.71)	(1.68)
R&D$_t$	0.109***	0.089***	0.038*	0.035
	(3.68)	(2.91)	(1.70)	(1.58)
Cash$_t$	0.009	0.011	0.007	0.007
	(0.92)	(1.12)	(0.73)	(0.70)
ROA$_t$	–0.028**	–0.032***	–0.018	–0.021*
	(–2.56)	(–3.29)	(–1.33)	(–1.71)
Capital_Invest$_t$	–0.016	–0.020*	–0.010	–0.016
	(–1.33)	(–1.72)	(–0.68)	(–1.07)
Leverage$_t$	0.007	0.008	0.006	0.010
	(0.77)	(0.87)	(0.60)	(0.97)
Capital_Expend$_t$	0.042	0.054	0.036	0.040
	(1.06)	(1.45)	(0.89)	(1.01)
Q$_t$	–0.002*	0.000	–0.000	0.001
	(–1.90)	(0.29)	(–0.50)	(1.34)
ln(*Prodmkt_Fluid*)$_t$	0.016***	0.012***	0.017***	0.014***
	(4.41)	(3.26)	(3.73)	(3.13)
KZ_Index$_t$	–0.000	0.000	–0.000	0.000
	(–0.79)	(0.91)	(–1.30)	(0.57)
ln(*Firm_Age*)$_t$	0.004*	0.002	0.003	0.003
	(1.87)	(1.10)	(1.39)	(1.32)
ln(*Ind_#CEOs*)$_t$	–0.028***	–0.039***	–0.016**	–0.024***
	(–3.03)	(–4.29)	(–2.12)	(–3.17)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	12,806	12,142	9404	8868
Adj. R^2	0.079	0.078	0.072	0.065

Endogeneity, relevance, and overidentification tests				
Hausman test: *p*-value	0.001***	0.008***	0.014**	0.000***
First-stage *F*-statistics	1826.92***	1696.26***	276.71***	278.25***
Hansen's *J*-statistics	0.768	0.924	0.498	0.528
First-stage instruments' coefficients and significance				
$\ln(Ind\_CEO\_Comp)_t$	1.760***	1.759***	0.962***	0.967***
$Geo\_Pay\_Rank_t$	–0.221***	–0.203***	–0.397***	–0.428***

Note: This table reports the second-stage of two-stage least squares (2SLS) regression models of short-term product development on predicted values of CEO industry pay gap. The dependent variable, *NonPat_ProdDev*, is the residual error term obtained by regressing *Prod_Innov* on the natural logarithm of 1 plus sum of lagged 5 years' patents as follows:

$$Prod\_Innov_{i,t} = \alpha_i + \beta_1 \ln\left(1 + \sum_{s=1}^{5} \#Patents_{i,t-s}\right) + \varepsilon_{i,t}$$

$$NonPat\_ProdDev_{i,t} = \varepsilon_{i,t},$$

where *Prod_Innov* measures product innovation based on the difference between the current year's product description to the previous year's description; the details are discussed in Section 3. We use Newey–West standard errors with five lags. The residual term obtained from this regression is denoted as *NonPat_ProdDev*. This variable represents product innovation activities that are not the outcome of patent-based technological innovation and represents short-term product development outcomes. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry, *Ind_CEO_Comp*, and the rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. See the Appendix for variable definitions. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.6: Variability in the effect of ITIs on product innovation differing in product market competition

	ITIs based on FF30 industry classification		ITIs based on SIC3 industry classification	
	(1)	**(2)**	**(3)**	**(4)**
Dep. var. = *Prod_Innov*$_{t+2}$	***Prodmkt_Fluid* < median**	***Prodmkt_Fluid* > median**	***Prodmkt_Fluid* < median**	***Prodmkt_Fluid* > median**
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.011***	**0.016*****	**0.012***	**0.017*****
	(1.70)	(2.91)	(1.95)	(2.71)
Controls$_t$	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	6158	6052	4494	4424
Adj. R^2	0.119	0.177	0.158	0.240
Endogeneity, relevance, and overidentification tests				
Hausman test: p-value	0.148	0.005***	0.030**	0.009***
First-stage F-statistics	1129.36***	1189.01***	176.01***	80.94***
Hansen's J-statistics	0.003	1.895	0.010	1.396
First-stage instruments' coefficients and significance				
ln(*Ind_CEO_Comp*)$_t$	1.672***	1.863***	0.929***	1.017***
Geo_Pay_Rank$_t$	–0.143**	–0.240***	–0.543***	–0.326***

Note: This table presents the results of the second stage of the two-stage least squares (2SLS) estimation of industry tournament incentives (ITIs) on product innovation differing in product market competitions. The dependent variable *Prod_Innov* measures product innovation based on the difference between current year's product description and the previous year's description; the details are discussed in Section 3. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classification. Product market fluidity (*Prodmkt_Fluid*) measures firm-level competitive threats based on changes in rivals' products relative to the firm's products. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp*, and the rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. The control variables (defined in the Appendix) are the same as those in Table 3. The t-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.7: Variability in the effect of ITIs on product innovation differing in CEO characteristics

Dep. var. = ***Prod_Innov***$_{t+2}$	(1) ***CEO_ Founder* = 1**	(2) ***CEO_ Founder* = 0**	(3) ***CEO_ Retire* = 1**	(4) ***CEO_ Retire* = 0**
Panel A: ITIs based on FF30 industry classification				
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.007**	**0.012*** **	**0.005**	**0.012*** **
	(0.54)	(3.10)	(0.29)	(3.20)
Controls$_t$	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	842	11,368	872	11,331
Adj. R^2	0.305	0.150	0.173	0.154
Endogeneity, relevance, and overidentification tests				
Hausman test: *p*-value	0.658	0.001***	0.815	0.002***
First-stage *F*-statistics	179.72***	1576.61***	133.03***	1564.63***
Hansen's *J*-statistics	1.064	1.237	0.021	1.050
First-stage instruments' coefficients and significance				
ln(*Ind_CEO_Comp*)$_t$	1.867***	1.757***	1.643***	1.769***
Geo_Pay_Rank$_t$	–0.089	–0.224***	0.161	–0.234***
Panel B: ITIs based on SIC3 industry classification				
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.007**	**0.014*** **	**0.009**	**0.015*** **
	(0.49)	(2.74)	(0.49)	(3.20)
Controls$_t$	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	722	8,196	636	8,275
Adj. R^2	0.360	0.191	0.313	0.194
Endogeneity, relevance, and overidentification tests				
Hausman test: *p*-value	0.881	0.002***	0.345	0.001***
First-stage *F*-statistics	62.63***	248.60***	38.87	249.16***
Hansen's *J*-statistics	2.309	1.034	0.196	0.737
First-stage instruments' coefficients and significance				
ln(*Ind_CEO_Comp*)$_t$	1.191***	0.948***	1.066***	0.969***
Geo_Pay_Rank$_t$	–0.454*	–0.413***	–0.754***	–0.412***

Note: This table presents the results of the second stage of the two-stage least squares (2SLS) estimation of industry tournament incentives (ITIs) on product innovation differing in the probability of winning as measured by CEO characteristics. The dependent variable *Prod_Innov* measures product innovation based on the difference between the current year's product description and the previous year's description; the details are discussed in Section 3. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classification. *CEO_Founder* is equal to 1 if a given CEO is also a founder of the firm, and 0 otherwise. *CEO_Retire* is equal to 1 if the CEO's age is more than 65 years, and 0 otherwise. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp,* and the rank of the CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. The control variables (defined in the Appendix) are the same as those in Table 3. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; ***$p < 0.01$.*

Table 2.8: Myopic innovation strategy and CEO turnover

	(1)	(2)	(3)
	Dependent variable: *Promote*		
$NonPat\_ProdDev_t$	**2.956*** **		
	(2.75)		
$High\_Myopic\_Innov_t$		**0.689** **	0.253
		(2.22)	(0.66)
$High\_Myopic\_Innov_t \times Ind\_Pay\_Gap_t$			**0.0000182***
			(1.77)
$Ind\_Pay\_Gap_t$			–0.0000018
			(–0.15)
$\ln(Total\_Assets)_t$	0.367***	0.377***	0.395***
	(3.50)	(3.71)	(3.79)
$R\&D_t$	–0.987	–0.380	–0.416
	(–0.30)	(–0.13)	(–0.14)
$Cash_t$	1.291	1.327	1.312
	(0.99)	(1.11)	(1.09)
ROA_t	1.515	0.875	1.038
	(0.85)	(0.49)	(0.60)
$Capital\_Invest_t$	0.238	0.212	0.219
	(0.18)	(0.13)	(0.13)
$Leverage_t$	–3.086**	–2.311*	–2.232*
	(–2.06)	(–1.67)	(–1.65)
$Capital\_Expend_t$	1.227	1.526	1.284
	(0.22)	(0.28)	(0.24)
Q_t	–0.086	–0.150	–0.154
	(–0.58)	(–0.96)	(–0.98)
$\ln(Prodmkt\_Fluid)_t$	–0.815	–0.623	–0.621
	(–1.63)	(–1.34)	(–1.34)
KZ_Index	0.014	0.007	0.006
	(0.71)	(0.43)	(0.40)
$\ln(Firm\_Age)_t$	–0.212	–0.221	–0.218
	(–0.83)	(–0.96)	(–0.94)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	10,630	11,439	11,439
Pseudo R^2	0.067	0.068	0.060

Note: This table presents the results of logit estimation of whether a myopic innovation strategy increases the likelihood of promoting to other firms. The dependent variable, *Promote*, is a dummy variable equal to 1 if the current CEO at *t* moves to another ExecuComp firm in the next 3 years, and 0 otherwise. *NonPat_ProdDev* represents product innovation activities that are not the outcome of patent-based technological innovation and represents short-term product development activities (discussed in Table 5). *High_Myopic_Innov* is equal to 1 (0) if a firm has an above (below) year-industry median of *NonPat_ProdDev*. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) industry classification. The *z*-statistics (in parentheses) are computed using robust standard errors.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.9: Effects of ITIs and short-term innovation differing in CEO tenure

	ITIs based on FF30 industry classification		ITIs based on SIC3 industry classification	
	(1)	(2)	(3)	(4)
Dep. var. = *$NonPat\_ProdDev_{t+1}$*	**Tenure ≤ Median**	**Tenure > Median**	**Tenure ≤ Median**	**Tenure > Median**
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.011*** **	**0.008***	**0.012*** **	**0.006**
	(2.64)	(1.85)	(2.59)	(1.18)
Controls$_t$	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	6409	6397	4692	4712
Adj. R^2	0.084	0.072	0.079	0.072
Endogeneity, relevance, and overidentification tests				
Hausman test: *p*-value	0.003***	0.131	0.011**	0.378
First-stage *F*-statistics	1081.44***	762.54***	128.59***	236.925***
Hansen's *J*-statistics	0.190	0.751	0.015	0.472
First-stage instruments' coefficients and significance				
ln(*Ind_CEO_Comp*)$_t$	1.739***	1.778***	0.921***	1.060***
Geo_Pay_Rank$_t$	–0.317***	–0.129**	–0.407***	–0.348***

Note: This table reports the second-stage of the two-stage least squares (2SLS) estimation of industry tournament incentives (ITIs) on short-term innovation for groups of CEO tenure. The main sample is divided into two subsamples based on whether CEO tenure is higher than the median or not. The dependent variable *NonPat_ProdDev* is a measure of short-term innovation (discussed in Table 5). *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classification. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp*, and the rank of CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. The control variables (defined in the Appendix) are the same as those in Table 3. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.10: Effect of ITIs on product innovation using enforceability of noncompetition agreements

	ITIs based on FF30 industry classification			ITIs based on SIC3 industry classification		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dep. var. = $\boldsymbol{Prod\_Innov_{t+1}}$	**#In-state competitors > 25th pctl**	**#In-state competitors > 50th pctl**	**#In-state competitors > 75th pctl**	**#In-state competitors > 25th pctl**	**#In-state competitors > 50th pctl**	**#In-state competitors > 75th pctl**
$\ln(Ind\_Pay\_Gap)_t \times NonCompete_t$	**–0.005**	**–0.008****	**–0.020*****	**–0.008***	**–0.016*****	**–0.028*****
	(–1.48)	(–2.31)	(–2.66)	(–1.93)	(–2.83)	(–2.62)
$\ln(Ind\_Pay\_Gap)_t$	0.003	0.003	0.001	0.001	0.003	0.003
	(1.31)	(1.06)	(0.21)	(0.34)	(1.05)	(0.80)
$NonCompete_t$	0.056	0.089**	0.223***	0.090**	0.163***	0.295***
	(1.60)	(2.48)	(2.95)	(2.15)	(3.00)	(2.95)
$Controls_t$	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9372	6418	3199	4739	3333	1616
Adj. R^2	0.126	0.143	0.165	0.170	0.198	0.214

Note: This table presents the results of ordinary least squares (OLS) estimation of industry tournament incentives (ITIs) on product innovation using a difference-in-differences specification exploiting enforceability of noncompetition agreements. *NonCompete* equals +1 for firms headquartered in Florida during 1997–2012, Kentucky during 2007–2012, Idaho and Oregon during 2009–2012, Texas and Wisconsin during 2010–2012, and Colorado, Georgia, and Illinois during 2012; equals −1 for firms in Texas during 1995–2006, Louisiana during 2002–2003, South Carolina during 2011–2012, and Montana during 2012; and equals 0 otherwise. The table reports OLS estimation for each group partitioned based on the number of in-state competitors in the year greater than 25th, 50th, and 75th, respectively. The 25th, 50th, and 75th percentiles of the number of in-state competitors for Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industries are 5, 14, and 43 (2, 6, and 30), respectively. The dependent variable *Prod_Innov* measures product innovation based on the difference between the current year's product description and the previous year's description; the details are discussed in Section 3. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same FF30 (SIC3) industry classification. The control variables (defined in the Appendix) are the same as those in Table 3. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 2.11: ITIs and product announcements

	ITIs based on FF30 industry classification		ITIs based on SIC3 industry classification	
	(1)	**(2)**	**(3)**	**(4)**
	Prod_ Announce $_{t+1}$	***Prod_ Announce*** $_{t+2}$	***Prod_ Announce*** $_{t+1}$	***Prod_ Announce*** $_{t+2}$
Predicted ln(*Ind_Pay_Gap*)$_t$	**0.081*** **	**0.063** **	**0.095** **	**0.076** **
	(2.92)	(2.27)	(2.33)	(1.97)
Controls$_t$	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	4620	4601	3333	3317
Adj. R^2	0.223	0.211	0.264	0.248
Endogeneity, relevance, and overidentification tests				
Hausman test: *p*-value	0.020**	0.048**	0.058*	0.134
First-stage *F*-statistics	406.84***	406.97***	75.30***	76.51***
Hansen's *J*-statistics	0.486	1.001	0.767	1.333
First-stage instruments' coefficients and significance				
ln(*Ind_CEO_Comp*)$_t$	1.847***	1.847***	0.963***	0.964***
Geo_Pay_Rank$_t$	–0.251***	–0.252***	–0.442***	–0.445***

Note: This table reports the second-stage of two-stage least squares (2SLS) estimation of industry tournament incentives (ITIs) on product announcements. The dependent variable *Prod_Announce* is the natural logarithm of 1 plus the total number of product announcements by a firm in a fiscal year. *Ind_Pay_Gap* is the pay gap between the CEO's total compensation and the second highest paid CEO's total compensation within the same Fama–French 30 (FF30) and three-digit Standard Industrial Classification (SIC3) industry classification. In the first stage, we regress the CEO *Ind_Pay_Gap* incentive variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same FF30 (SIC3) industry, *Ind_CEO_Comp*, and the rank of the CEO's total compensation among all other CEOs from different industries who work at firms that are headquartered within a 250-km radius of the firm, *Geo_Pay_Rank*. The control variables (defined in the Appendix) are the same as those in Table 3. The *t*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Chapter 3: Industry Tournament Incentives and Corporate Hedging Policies

1. Introduction

The use of financial derivatives as hedging tools has been increasing worldwide, even though active corporate risk management is irrelevant under the perfect market assumption of Modigliani and Miller (1958). Bartram, Brown, and Fehle (2009) report that, based on a sample of 7,319 firms from 50 countries, around 60% of the firms use derivative instruments, around 45% use foreign exchange (FX), around 33% use interest rate (IR), and around 10% use commodity (CMD) derivatives. According to the Bank for International Settlements (BIS), the notional value of outstanding FX, IR, and CMD derivatives held by non-financial customers has increased in the period between 2000 and 2018: from \$3.3 trillion (FX), \$6.1 trillion (IR), and \$0.6 trillion (CMD), to \$11.8 trillion, \$14.4 trillion, and \$2.1 trillion, respectively. One of the main reasons for hedging is to flatten a firm's performance in order to stabilize its net income and cash flows. For example, Bartram, Brown, and Conrad (2011) find that derivative users experience lower cash-flow volatility, lower idiosyncratic volatility, and lower systematic risk.[70]

This study aims to examine how industry tournament incentives (ITIs) affect corporate hedging policies. ITIs can be defined as an external job-market setting in which CEOs aim to assume a CEO position in their industry's leading firm (Coles, Li, and Wang, 2017). These CEOs, therefore, are competing with one another; they are likely to compete for the highest-paid CEO position in their industry. Their performance is relatively evaluated, and the CEO with the highest performance

[70] The other motivations to hedge are tax convexity (Smith and Stulz, 1985; Graham and Smith, 1999), reduction in bankruptcy cost (Smith and Stulz, 1985), lowering the cost of debt (Smith and Stulz, 1985, Campello, Lin, Ma, and Zou, 2011; Chen and King, 2014), agency problems (Nance, Smith, and Smithson, 1993; Kumar and Rabinovitch, 2013; Huang, Peyer, and Segal, 2013), managerial incentives (Smith and Stulz, 1985; Bakke, Mahmudi, Fernando, and Salas, 2016), lower information asymmetry (DeMarzo and Duffie, 1991), and financial flexibility (Francis and Gao, 2018; Graham and Rogers, 2002).

moves up and wins the tournament. The winner of the tournament earns the difference between the highest-paid compensation in the industry and the winner's original compensation. Our results suggest that a CEO motivated by external job markets is more likely to engage in hedging activities. This finding is robust to the instrumental approach and natural experiment implementation, using different ITIs measures and industry classifications.

Coles et al. (2017) find that ITIs induce CEOs to exert greater effort and to increase the firm's risk level, resulting in a positive association between ITIs and both firm performance and risky corporate policies.[71] Promotion-based tournaments may also be considered an option; in these, the winner is given the entire tournament prize, while the others get nothing. Such tournaments provide CEOs with a convex payoff (Kini and Williams, 2012). These option-like and convex tournament compensation schemes might induce CEOs to pursue riskier corporate policies in order to increase the probability that they will win, or in an attempt to catch up with the leading firms (Hvide, 2002; Goel and Thakor, 2008; Kini and Williams, 2012; Coles et al., 2017). Therefore, our *risk incentive hypothesis* predicts that the risk-increasing incentives of ITIs might induce CEOs to refrain from engaging in hedging activities.

On the other hand, according to our *risk management hypothesis*, CEOs might be induced to use hedging tools as a buffer against the side effects of ITIs. ITIs are documented to have a positive association with the cost of borrowing (Kubick et al., 2020) and with stock price crash risk (Kubick and Lockhart, 2021), both of which can hurt a firm's performance. This negative effect can damage a CEO's reputation, thereby curtailing the probability of moving up.[72] Levine (2005) claims that

[71] Other studies note that ITIs increase the level and marginal value of cash holdings (Huang, Jain, and Kini, 2019), influence corporate innovation strategies (Kong, Lonare, and Nart, 2019), and motivate tax aggressiveness (Kubick and Lockhart, 2016).
[72] Firm performance is considered by outsiders to be one of the major indicators of CEO capability (Fee and Hadlock, 2003).

financial derivatives make it possible to pursue high-risk–high-return projects. Hence, the *risk management hypothesis* requires a higher level of hedging activities to mitigate the adverse effects of undertaking the risky corporate policies incentivized by ITIs.

Following Coles et al. (2017), we define ITIs as the difference between the total compensation of the second-highest-paid CEO in the industry and the compensation of the CEO under consideration.[73] Industry classifications are determined using the Fama–French 30 (henceforth FF30) and size-median Fama–French 30 (henceforth FF30 size-median). Following the practice in recent corporate hedging literature, we develop our hedging measures based on a textual analysis of 10-K statements (e.g., Almeida, Hankins, and Williams, 2017; Hoberg and Moon, 2017; Manconi, Massa, and Zhang, 2017; Qiu, 2019). We apply three keyword lists related to foreign exchange (FX), interest rate (IR), and commodity (CMD) hedging to generate binary variables to measure the likelihood to hedge. We also use the number of words related to financial hedging in 10-K statements to measure hedging intensity. The assumption we make here regarding the hedging proxy, which is generated by counting words, is that the more intensely a firm expresses its hedging policies, the more actively it manages them.

Consistent with the *risk management hypothesis*, we find a positive association between ITIs and hedging practices, suggesting that a CEO who is motivated by higher visibility and status, a larger compensation package, and a greater span of control is more likely to engage in hedging activities. This result is consistent with findings by Knopf, Nam, and Thornton (2002), Graham and Rogers (2002), and Kumar and Rabinovitch (2013), which find a CEO with an incentive-based compensation including more option delta hedges more.[74]

[73] The compensation of the second-highest-paid CEO, instead of that of the highest-paid CEO, is used in the literature to mitigate the outlier effect.
[74] However, Bakke et al. (2016) find that a reduction in option pay may actually result in an increase in hedging intensity.

We also explore the possible reasons why a CEO motivated by the external CEO labor market might hedge more. Findings by Kubick et al. (2020) and Kubick and Lockhart (2021) suggest that the corporate policies of a CEO who is motivated by ITIs lead to a higher cost of borrowing and a higher stock price crash risk. Hedging, however, can lower financing costs by alleviating cash flow variability (Smith and Stulz, 1985). Furthermore, it is shown that firms can reduce their stock return exposure to exchange rate shocks through hedging (e.g., Allayannis and Ofek, 2001; Bartram, Brown, and Minton, 2010; Chang, Hsin, and Shiah-Hou, 2013). Thus, we test the impact of hedging tools on the effects of ITIs on both the cost of debt and the stock price crash risk. We find that hedging has a mitigating role on the amplifier impacts of ITIs on both the cost of debt and the stock price crash risk. Consistent with Levine's (2005) arguments, these results suggest that a CEO incentivized by ITIs uses hedging instruments as a buffer, thereby alleviating the anticipated negative impacts of their riskier corporate policies.

In this study, we use the instrumental variable approach to identify the causal association between ITIs and corporate hedging. Also, following Huang et al. (2019), we utilize the change in the enforceability of non-competition employment agreements within states as an exogenous shock. By implementing the difference-in-differences (DID) method, we find that the increase in enforceability lessens ITIs' positive effect on corporate hedging as the number of competitors increases; this is consistent with Huang et al. (2019).

Our study contributes to the literature in the following ways. First, to the best of our knowledge, this paper is the first to examine the effects of ITIs on hedging behavior. Bakke et al. (2016) investigate the causal effect of the risk-taking incentives stemming from option compensation on corporate risk management policy; in comparison, we focus on convex payoffs that are driven by the external CEO labor market instead of those driven by options in a CEO's compensation package.

Second, most of the previous studies examine a specific industry or a few industries (e.g., the oil and gas industries), investigating their corporate risk management policies using a limited sample (Tufano, 1996; Haushalter, 2000; Carter et al., 2006; Jin and Jorion, 2006; Mackay and Moeller, 2007; Kumar and Rabinovitch, 2013; Gilje and Taillard, 2017). Our sample contains data from a relatively larger number of firms from various different industries; this enables us to deduce the general implications of firms' hedging attitudes and how they are influenced by ITIs.

We also contribute to the literature by finding another channel through which a CEO who is influenced by ITIs may impact firm performance. Smith and Stulz (1985), Allayannis and Weston (2001), Carter et al. (2006), Mackay and Moeller (2007), and Gilje and Taillard (2017) detect a positive relation between hedging and firm performance. Thus, CEOs might be induced to hedge more in order to increase the probability that they will move up in the tournament by improving their firm's performance. Lastly, we explore the possible reasons behind the positive association between ITIs and hedging, namely, the need to mitigate the amplifying impact of risk-inducing ITIs on the cost of debt and stock price crash risk.

The rest of this paper is organized as follows. In Section 2, we discuss our hypotheses before describing our sample and the construction of our variables in Section 3. In Section 4, we examine the relation between ITIs and corporate hedging; we then investigate the effect of ITIs on different types of hedging and search for possible reasons behind the association between ITIs and corporate hedging. In Section 5, we examine the heterogeneities in the relation, while Section 6 contains the conclusions to our findings. Appendices A, B, C, and D provide more detailed information about our variables, including their definitions and how they are calculated.

2. Literature review and hypotheses development

Hedging is a risk management tool used by firms to shield against unpredicted shocks, which can have a potentially harmful impact on contingent firm values. The primary benefit of hedging is to secure adequate and stable internal cash flows and to protect a firm from the inefficient liquidation of its investment. In perfect capital markets, which form the neoclassical view of risk management, risk management does not have any real impact on firm economics (Modigliani and Miller, 1958). However, more recent hedging theories, which take into account market imperfections, support the idea that hedging has real effects on firms. The major real benefits of hedging are enhancing firm value (Allayannis and Weston, 2001; Carter et al., 2006; Mackay and Moeller, 2007), mitigating the underinvestment problem (Froot et al., 1993; Geczy et al., 1997), and lowering the cost of capital (Smith and Stulz, 1985; Gay et al. 2011; Campello et al., 2011; Chen and King, 2014). Furthermore, corporate hedging also provides financial benefits, such as improving financial flexibility (Francis and Gao, 2018), reducing financial distress (Mayers and Smith, 1982; Smith and Stulz, 1985), and lowering contracting costs (Mayers and Smith, 1987).

Motivations behind corporate hedging that go beyond its real and financial benefits have also been investigated. These include engaging in tax reduction (Smith and Stulz, 1985; Graham and Smith, 1999; Dionne and Garand, 2003), addressing agency problems (Nance et al., 1993; Kumar and Rabinovitch, 2013; Huang et al., 2013), taking advantage of economies of scale (Mian, 1996), and dealing with information asymmetry (DeMarzo and Duffie, 1991). Managerial incentives also play an essential role in corporate hedging; for example, Bakke et al. (2016) find a significantly negative relation between CEO vega and hedging intensity.[75] However, the effect of ITIs (which are also viewed as managerial incentives) on corporate hedging has not yet been scrutinized.

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[75] The findings of Bakke et al. (2016) are consistent with those of Coles, Daniel, and Naveen (2006), who show a positive association between CEO vega (which is mainly driven by option pay) and firm risk level.

Initiated by Lazear and Rosen (1981), promotion-based tournament theory suggests that if it is costly to monitor and measure the efforts and outputs of employees, compensating them based on their positions in the firm can be an optimal compensation scheme inducing them to expend a greater effort. Compensating high-level employees based on their ordinal ranks promotes competition among them; this may influence their policy choices, including how they deal with riskier firm activities (Hvide, 2002; Goel and Thakor, 2008; Kini and Williams, 2012; Coles et al., 2017), the acquisition policies (Nguyen and Phan, 2015), the aggressiveness of their approach to taxes (Kubick and Lockhart, 2016), their innovation strategies (Shen and Zhang, 2018; Kong et al., 2019), and their incrementation of cash holdings (Huang et al., 2019).[76]

Risk incentive hypothesis

In this study, we focus on tournaments among CEOs, in which they compete for a CEO position in their industry's leading firm. The winning CEO moves up, eventually assuming the position of CEO in the leading firm. CEOs compete for such a position because it includes a larger compensation scheme, an enlarged span of control, higher visibility, and higher status (Coles et al., 2017). Tournaments have been theoretically and empirically shown to serve as a risk incentive (Hvide, 2002; Goel and Thakor, 2008; Kini and Williams, 2012; Coles et al., 2017). That is, CEOs tend to engage in riskier activities in an attempt to catch up with the leading firm and in order to increase the probability that they will win the tournament. Thus, CEOs are expected to be less risk-averse as they are induced by more ITIs. However, Smith and Stulz (1985) claim that managers are risk averse due to being undiversified (compared to shareholders); as such, they are likely to hedge in order to

[76] We focus on CEOs' impact on risk management policies because the extant literature shows that CEOs significantly influence firms' financial policies (Tufano, 1996; Coles, Daniel, and Naveen, 2006; Chava and Purdanandam, 2010).

diminish their exposure to the firm (Giambona et al., 2018). Since ITIs act as risk-seeking incentives, they discourage a CEO from engaging in corporate hedging.

Further, tournament incentives are option-like because the winner of the tournament earns the tournament prize, while the other participants receive nothing; thus, they provide a convex managerial payoff (Kini and Williams, 2012). The risk incentives of managerial option pay have been shown to have a negative impact on corporate hedging (Smith and Stulz, 1985; Tufano, 1996; Haushalter, 2000; Bakke et al., 2016). Consequently, the convexity inherent in option-like tournaments can discourage CEOs from corporate hedging. All these arguments support the idea of a negative relation between ITIs and corporate hedging; we refer to this hypothesis as the *risk incentive hypothesis*.

Risk management hypothesis

There are several reasons why CEOs are likely to hedge more while experiencing higher ITIs (henceforth, we will refer to this as the *risk management hypothesis*). First, hedging can facilitate an increase in firm value and mitigate the unfavorable effects of ITIs on the cost of borrowing and stock price crash risk. CEOs induced by higher ITIs are empirically shown to exert more effort to improve their firm's standings (Coles et al., 2017). The reason for the positive relation between ITIs and firm value can be that firm performance is considered by outsiders to be one of the major indicators of CEO capability (Fee and Hadlock, 2003). Several studies support the idea that corporate hedging has a positive effect on firm value (e.g., Allayannis and Weston, 2001; Carter et al., 2006; Mackay and Moeller, 2007). Therefore, a CEO induced by ITIs might be more inclined to use hedging instruments to enhance firm value in order to increase the probability of moving up in the tournament. ITIs have been shown to increase stock price crash risk (Kubick and Lockhart, 2021) and the cost of debt (Kubick et al., 2020), both of which can negatively affect firm value. At the same time, however, hedging derivatives have been shown to reduce stock price crash risk (Kim, Si, Xia, and Zhang, 2021) and the cost of external financing (Campello et al., 2011; Chen and King, 2014). Therefore, CEOs may hedge more as a means of alleviating the adverse impact of ITIs on firm value.[77]

Second, hedging makes the application of riskier policies by a CEO motivated by ITIs more possible. The *risk management hypothesis* is also consistent with Levine (2005), who observes that financial derivatives facilitate the pursuance of high-risk–high-return projects. Since ITIs are likely to motivate CEOs to choose riskier projects (Coles et al., 2017), hedging can enable them to implement said projects without harming firm value. Third, CEOs might prefer hedging, treating it as a means of positively influencing the labor market's perception of their managerial ability (Froot et al., 1993; DeMarzo and Duffie, 1995) or as a way to separate themselves from lower-ability managers (Breeden and Viswanathan, 2016). In addition, CEOs can hedge to satisfy shareholders; Campbell and Kracaw (1987) note that, since shareholders expect hedging to enhance managerial productivity, they want managers to hedge observable and unsystematic risks.

Lastly, Smith and Stulz (1985) indicate that, because managers have concave utility, they are risk averse, which induces them to hedge. The convexity in managerial payoff mitigates the risk aversion that discourages CEOs from hedging. However, Carpenter (2000) and Ross (2004) provide evidence that the convexity in managerial compensation might not afford sufficient risk-seeking incentives, which can deter them from hedging. Hence, the *risk management hypothesis* predicts a positive association between ITIs and corporate hedging.

[77] Similarly, findings by Francis and Gao (2018) provide some evidence that the reduction in the cost of debt through hedging is because firms can stabilize their cash flows through hedging, thus enabling them to use internal cash flows as an alternative to costly external capital financing.

Overall, the relation between ITIs and corporate hedging is likely to depend on CEOs' incentives to induce risk, preferences, and career concerns. On the one hand, if a CEO is not too risk averse, the *risk incentive hypothesis* suggests that a CEO motivated by ITIs, which are also risk incentives, can refrain from using hedging instruments. On the other hand, the *risk management hypothesis* can dominate (i) if the positive effect of hedging on firm value attracts a CEO to hedging; (ii) if they prefer to hedge as a buffer against unpredicted adverse shocks; (iii) if they want to improve outsiders' perceptions of their ability; (iv) if they need to differentiate themselves from managers with only limited ability; or (v) if they are so highly risk averse that ITIs cannot induce them to engage in risky activities.

Furthermore, this paper is similar in some aspects to the study by Bakke et al. (2016), which examines the impacts of options pay on corporate hedging. However, there are differences in the samples, factors, and hedging measures used. First, they focus on practices in the oil and gas industry; because earnings in this industry are exposed to commodity prices, commodity hedging is very common. However, while the literature indicates that commodity price exposure is a significant risk factor for the oil and gas industry, it does not have a significant impact on an aggregate level (Bartram, 2005; Nelson et al., 2005).[78] Second, the incentives arising from the tournaments are different from the performance-based executive incentives (delta and vega) that arise from CEO compensation structures. The basic difference is that performance-based incentives tie an executive's future earnings to their current performance (Becker and Stigler, 1974), while tournament prizes are promised in advance (Lazear and Rosen, 1981). The probability of moving up to a leading firm has been extensively proven to incentivize CEOs and to impact firm policies (e.g.,

[78] Similarly, we could not find a significant difference in the percentage of firm-year observations of oil-and-gas firms that choose to hedge versus those of non-oil-and-gas firms. This is because we also include FX and IR hedging along with CMD hedging.

Kini and Williams, 2012; Coles et al., 2017). CEOs place more importance on upward mobility in their labor market than on their current compensation schemes in influencing their corporate decisions (Graham, Harvey, and Rajgopal, 2005). Moreover, in order to test the impact of ITIs on corporate hedging, we control for the performance-based and risk-taking incentives (CEO delta and CEO vega) that arise from their holdings and grants of stocks and options. Third, textual analysis enables us to obtain a much larger sample, covering a longer period of time.[79]

3. Data sources, variable construction, and sample descriptions

3.1 Data sources

Our sample is constructed from the intersection of 10-K filings, Compustat, and ExecuComp databases starting from the fiscal year 1997 up to 2016.[80] CEO compensation data are taken from ExecuComp, stock returns from CRSP, and firm characteristics from Compustat. Following the convention in the finance literature, we exclude financial (SIC codes 6000–6999) and utility firms (SIC codes 4900–4999). We obtain 10-K statements from the U.S. Securities and Exchange Commission (SEC) EDGAR filings to compute the text-based hedging measures.[81] The FF30 industry classification is taken from the Fama–French data library.[82]

Additionally, we gather information on loans from the Loan Pricing Corporation's (LPC) DealScan. We require that loans are U.S. dollar-denominated. Following Bharath, Dahiya, Saunders, and Srinivasan (2009) and Kubick, Lockhart, and Mauer (2020), we merge lagged variables from

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[79] Bakke et al. (2016) have a sample of 154 firm-year observations from 2003 to 2006, while our sample includes 19,705 firm-year observations from 1997 to 2016. The large sample enhances the generality and power of our results. Moreover, in their analysis, Huang et al. (2013) detect a high correlation between the notional values of hedging derivatives and hedging proxies based on the number of hedging-related words in the 10-K.

[80] SEC EDGAR filings started in 1994, but the full coverage of public firms was not available until 1997. Thus, we start our sample period from 1997 in order to obtain full coverage.

[81] We use an R package to download and parse 10-Ks provided by Lonare, Patil, and Raut (2020).

[82] The data is available at Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/Siccodes30.zip

Compustat and ExecuComp with DealScan loan contracts and ensure that lenders observe firm characteristics and compensation variables prior to loan origination.[83] We use loan-spread information to examine the channels through which ITIs influence corporate hedging.

The details about stock price crash risk variables are defined in Appendix C, while the computation of expected default frequency (EDF) is provided in Appendix D. Changes in state-level non-competition enforceability laws are obtained from Garmaise (2011), Jeffers (2019), and Huang et al. (2019).[84] We also extend this data to cover the 2014–2016 period.

3.2 Measures of industry tournament incentives

We follow Coles et al. (2017) to measure ITIs as the total compensation difference (ExecuComp data item *TDC1*) between the CEO under consideration and the second-highest-paid CEO in the same industry.[85] Following Coles et al. (2017), we use FF30 industry group and FF30 size-median industry group to compute the CEO industry pay gap.[86] We denote the CEO industry pay gap as *INDGAP1* for the FF30 industry group and as *INDGAP2* for the FF30 size-median industry group. Specifically, ITIs are computed as follows:

INDGAP1 (or *INDGAP2*) = *Total compensation of the second highest-paid CEO in the same FF30* (*or FF30 size-median*) *industry*
– *Total compensation of the CEO under consideration.*

We also use the natural logarithm of *INDGAP1* (*INDGAP2*), denoted as *LN_INDGAP1* (*LN_INDGAP2*), in our regression tests to mitigate the influence of outliers. The higher value of

[83] We thank Michael Roberts for sharing the linking table (Chava and Roberts, 2008).
[84] As Compustat backfills headquarters state based on the most recent business address, we use the Loughran-McDonald augmented 10-X header data to identify a firm's headquartered state at any given fiscal year. This data is available at https://sraf.nd.edu/data/augmented-10-x-header-data.
[85] As discussed in Coles et al. (2017), we consider the second highest-paid CEO in the industry when computing ITIs for each year in order to eliminate the outlier effect of any abnormally highest-paid CEOs in the industry.
[86] Firm size is considered in the literature when benchmarking compensation (e.g., Faulkender and Yang, 2010; Bizjak, Lemmon, and Nguyen, 2011; Coles et al., 2017). Following Coles et al., 2017, we partition each FF30 industry-year sample into two groups: below median firm size and above median firm size (here, firm size is measured by net sales).

LN_INDGAP1 (*LN_INDGAP2*) for a CEO-year observation indicates that the CEO is facing higher ITIs.

3.3 Hedging measures

Financial Accounting Standard (FAS) 133, implemented on June 15, 2000, requires firms to disclose the fair market value of derivatives, but not notional values. Without any information on the notional values of hedging instruments, any measurement of the extent of corporate derivative holdings could be undermined (Graham and Roger, 2002). Thus, we generate a general proxy for corporate hedging that can be used across all industries. Being aware of the limitations of corporate hedging measures, we develop our hedging measures based on a textual analysis of 10-K statements following the recent corporate hedging literature (Almeida et al., 2017; Hoberg and Moon, 2017; Manconi et al., 2017; Qiu, 2019, among others).

We first downloaded 10-K (and its variants) filings from the SEC EDGAR server and searched for hedging-related keywords. We applied three keyword lists related to FX, IR, and CMD hedging to generate binary variables (proxies for the likelihood to hedge) and the number of counts (proxies for hedging intensity). A binary variable is set to one if a firm mentions the use of related hedging instruments in its 10-K. We also generate the count variables for each hedging type. We then combine binary or count variables to form aggregated hedging variables. The binary variable *HEDGE* takes a value of one if a firm mentions the use of any hedging activity (FX hedge, CMD hedge, or IR hedge) in its 10-K for a given year; it is set to zero otherwise. *HEDGE count* is a count of the total number of times a firm mentions the use of any hedging instruments in its 10-K. Following the hedging literature, we use the natural logarithm of one plus hedge count, *Ln(1+ HEDGE count)*, as a measure of hedging intensity in our regression tests.

While employing our text-based hedging variables, we assume that firms expressing their hedging policies more intensely in their 10-Ks manage them more actively. It is then possible that the external job market motivates a CEO to mislead their investors by discussing hedging activities more intensely. This concern is mitigated by Huang et al. (2013), who detect a high correlation (between 42% and 67%) between the notional values of hedging derivatives and text-based hedging variables. Additionally, Francis and Gao (2018) attribute their use of text-based binary hedging variables to inconsistencies in the notional amount of derivative usage.[87] A detailed discussion about hedging-related word lists and the formation of our hedging variables is provided in Appendix B.

3.4 Instrumental variables

ITIs are recognized as endogenous in the tournament incentives literature. We use instruments for the industry pay gap from Coles et al. (2017) and Huang et al. (2019). Our first instrumental variable is the sum of total compensation received by all other CEOs in the same industry, except the highest-paid CEO. As discussed in Coles et al. (2017), total industry CEO compensation reflects an industry's ability to pay its CEOs; it is expected to be highly correlated with the industry pay gap. However, this industry-level total compensation variable is unlikely to be correlated with firm-level corporate hedging activities. Following Huang et al. (2019), our second instrument is the number of higher-paid CEOs in the same industry group in a given year: *#Higher paid ind CEOs*. An increase in the number of higher-paid CEOs in the same industry is likely to increase the pay gap between the CEO under consideration and the highest-paid CEO in the industry. Thus, using the number of higher-paid CEOs in the same industry as an instrument for ITIs is likely to satisfy the relevance

[87] We find an 85% correlation between the binary *HEDGE* measure and the binary corporate hedging variable used by Chen and King (2014). Additionally, effective in 2001, FAS 133 requires that unrealized holding gains and losses from changes in the fair value of the cash flow hedge are to be reported in the accumulated other comprehensive income data (Campbell, Downes, and Schwartz, 2015; Bonaimé, Hankins, and Harford, 2014). This information is reported in Compustat (Item *AOCIDERGL*), which has full coverage starting from 2004. We categorize a firm as a hedging firm if *AOCIDERGL* is non-missing, finding a 94% correlation with our binary *HEDGE* measure.

condition. In our regression models, we mainly use the natural logarithms of *Ind CEO comp* and *#Higher paid ind CEOs* as instruments for our ITIs variable in order to minimize any problems associated with outliers.

Following Coles et al. (2017), we use another instrument—the average total compensation received by all other CEOs who work at firms that are in different industries but that are headquartered within a 250-km radius of the firm under consideration: *Geo CEO mean*. We use *Geo CEO mean* and *#Higher paid ind CEOs* variables alternately in our instrumental variable estimations.

3.5 Control variables

Kale et al. (2009) and Kini and Williams (2012) show that the pay gap between the CEO and other executives is positively related to firm riskiness and performance. Thus, following the literature (Kale et al., 2009; Kini and Williams, 2012; Coles et al., 2017; Huang et al., 2019), we control for firm-level internal promotion–based incentives. We compute *Firm gap*, the proxy of firm-level internal promotion–based incentives, as the difference between the CEO's total compensation and the median of vice presidents' total compensation. CEO incentives have been documented as being determinants of corporate risk management (e.g., Smith and Stulz, 1985; Tufano, 1996; Bakke et al., 2016). Thus, we also include *CEO delta* and *CEO vega* in the regression, where *CEO delta* is defined as the change in executive wealth per $1,000 change in stock price, and *CEO vega* indicates the change in the value of a CEO's wealth when the annualized standard deviation of stock returns changes by 0.01.[88] We also control for CEO age and tenure, as these factors

[88] Following Coles, Daniel, and Naveen (2006; 2013), we use the Black–Scholes option-valuation model modified by Merton (1973) to account for dividends, and use the estimates in Bettis, Bizjak, and Lemmon (2005) to model how the holding period of stock options varies with volatility. We use the SAS code provided by Coles et al. (2013) to compute both CEO delta and CEO vega.

can affect a firm's hedging strategies (Croci, Del Giudice, and Jankensgard, 2017). Following Coles et al. (2017), we also control for the number of CEOs (firms) in the industry each year.

Following corporate hedging literature, we include firm-level control variables that affect corporate risk management. We control for firm size, investment in R&D expenditures scaled by total assets, book leverage scaled by total assets, growth opportunities (Tobin's Q), investment in fixed assets (capital expenditures scaled by total assets), profitability (return on assets [ROA]), asset tangibility (net property, plant, and equipment scaled by total assets), cash holdings scaled by total assets, leverage, cash flow volatility, financial distress (Z-score), and firm age. Following Almeida et al. (2017), we also control for inventory (inventory divided by the costs of goods sold) and trade credit (account payables divided by total assets). Additionally, following Purnanandam (2008), we control for *Non-debt Tax Shield*, which is the depreciation and amortization scaled by total assets. Detailed variable definitions and data sources are provided in Appendix A.

Following Kale et al. (2009) and Coles et al. (2017), we require the firm-year observations to have *Firm gap* and *INDGAP1* (*INDGAP2)* variables greater than zero. In all our regression models, as hedging behavior is industry-specific, we include both year and industry fixed effects. We also show that our results are consistent by using year and CEO-firm fixed effects in Table 4. All dollar amounts are CPI-adjusted to the 2006 dollar value.

3.6 Summary statistics

Table 1 shows summary statistics for our variables: binary and count hedging variables (Panel A), incentive variables (Panel B), firm characteristics (Panel C), CEO characteristics (Panel D), industry and instrument variables (Panel E), crash risk measures and related controls (Panel F), bank loan characteristics (Panel G), and macroeconomic controls (Panel H).

As shown in Table 1, the mean values of the binary variables *HEDGE*, *FX hedge*, *IR hedge*, and *CMD hedge* are 0.692, 0.505, 0.448, and 0.140, respectively. As the proxies of ITIs (using the second-highest CEO pay within FF30 industry classifications as the benchmark), the mean (median) of the industry pay gap, *INDGAP1*, is $25 million ($17.7 million), while the size-median industry pay gap, *INDGAP2*, is $14.5 million ($8.1 million). The internal pay gap, *Firm gap*, has a mean (median) value of $3.1 million ($2 million), which is smaller than *INDGAP1*. The sizes of *INDGAP1*, *INDGAP2,* and *Firm gap* are similar to the sizes reported in Coles et al. (2017). The means (medians) of *CEO delta* and *CEO vega* are $800 ($198) and $123 ($48), respectively. The means (medians) of *CEO tenure* and *Ind # CEOs* are 7.85 (5.67) and 110.4 (81), respectively. The median CEO age is 55.

Finally, the means of the measures of stock price crash risk, *CRASH*, *NCSKEW,* and *DUVOL*, are 0.356, 0.656, and 0.239, respectively, while the mean (median) of *Loan spread* is 179 (150) basis points.

4. Results

4.1 ITIs and corporate hedging

In this section, we examine the relation between ITIs and corporate hedging. We use two different corporate hedging variables. The first proxy for corporate hedging is the binary *HEDGE* variable, which is equal to one if a firm engages in hedging activity (either FX, IR, or CMD) in a given fiscal year, and set to zero otherwise. The second dependent variable is *HEDGE count*, which is the number of hedging-related words. The formation of these two variables is based on a textual analysis of 10-K statements. A detailed discussion of hedging and all other variables is given in Appendices A and B.

We perform ordinary least squares (OLS), Probit, two-stage least squares (2SLS), and instrumental variable (IV) Probit estimations. We employ Probit, 2SLS, and IV Probit models for regressions where the dependent variable is the binary variable *HEDGE*, and use OLS and 2SLS models for regressions where the dependent variable is *HEDGE count*. We cluster standard errors by firms. All regressions incorporate year and industry fixed effects so as to control for heterogeneity by year and industry. The reason why we control for industry fixed effects is that each industry has its own risk management characteristics. Additionally, following Coles et al. (2017) and Huang et al. (2019), we check the robustness of the relation between ITIs and corporate hedging using CEO-firm and year-fixed effects in Table 4.

Coles et al. (2017) discuss that the analysis of ITIs is unlikely to be contaminated by an endogeneity issue because board members are unlikely to control the external job market. However, since ITIs are defined as endogenous variables by both Coles et al. (2017) and Huang et al. (2019), we perform both instrumental and lagged variable analyses. The instruments used to examine the relation between ITIs and corporate hedging are *ln(Ind CEO comp)* (the natural logarithm of the sum of the total compensation paid to all other CEOs in the same FF30 or FF30 size-median industry classifications) and *#Higher paid ind CEOs* (the total number of CEOs that are paid a higher compensation within the same FF30 or FF30 size-median industry classifications).

We report our findings regarding Probit, OLS, 2SLS, and IV Probit regressions in Table 2, where the industry pay gap is based on the FF30 industry classification. The coefficients shown in the Probit and IV Probit models (Columns 1 and 6) are marginal effects at means. Columns 1, 4, and 6 show the results when using binary *HEDGE* as the dependent variable, and Columns 2 and 5 present the results when using *HEDGE count* as the dependent variable. Columns 1 and 2 show the results relating to the Probit model and the OLS model, respectively, while Columns 3–5 illustrate the results relating to the 2SLS model, and Column 6 presents the results relating to the IV Probit model. The exogeneity tests in the 2SLS and IV Probit regressions in columns 4, 5, and 6 reject the null hypothesis of exogeneity at the 5% or 10% significance level, which validates the endogeneity of the variable *LN_INDGAP1*. Column 3 illustrates the results related to the first stage of the 2SLS regression. The significance of the coefficients on the two IVs and the significance of the *F*-statistics indicate that the relevance criterion has been satisfied by the instrumental variables. We also test the validity of the instruments through the overidentification test: Hansen's *J*-test *p*-values are 0.315 and 0.836 for the dependent variables *HEDGE* and *HEDGE count*, respectively, which suggests that the instruments used are unlikely to influence firm-level corporate hedging policy directly. We have similar results for *LN_INDGAP2*, based on the FF30 size-median industry classification in Table 3.

The coefficients on *LN_INDGAP1* in Table 2 and *LN_INDGAP2* in Table 3 are positive and statistically significant for all the Probit (Column 1), OLS (Column 2), 2SLS (Columns 4 and 5), and IV Probit (Column 6) regressions at the 1% significance level.[89] The positive effect of ITIs on corporate hedging activity is also economically significant. For instance, for the FF30 industry classification, in Table 2 (Column 5), a one standard deviation increase in *LN_INDGAP1* is associated with a 14% (0.865 × 0.164) increase in *HEDGE count* in the next year.[90] When we account for the fact that Huang et al. (2013) find a 42% to 67% correlation between the notional values of hedging derivatives and hedging proxies, based on the number of hedging-related words in the 10-Ks, we can deduct that a one standard deviation increase in *LN_INDGAP1* leads to a 5.88% (14% × 42%) to 9.38% (14% × 67%) increase in the notional value of hedging.[91] Additionally, the

[89] Except the coefficient on *HEDGE* variable for the Probit model in Table 3, which is significant at the 5% level.
[90] Similarly, for the FF30 size-median industry classification, in Table 3 (Column 5), a one standard deviation increase in *LN_INDGAP2* is associated with a 17% (1.767 × 0.099) increase in *HEDGE count* in the next year.
[91] Similarly, as seen in Table 3 (Column 5), we can suggest that a one standard deviation increase in *LN_INDGAP2* leads to a 7% (17% × 42%) to 11% (17% × 67%) rise in the notional value of hedging.

marginal effect reported in Column 6 suggests that a one standard deviation increase in *LN_INDGAP1* increases *HEDGE* by 23% (0.201 / 0.865).[92]

Further to this, following Coles et al. (2017) and Huang et al. (2019), we test the relation between ITIs and corporate hedging using year and CEO-firm fixed effects. We perform a 2SLS regression analysis using binary *HEDGE* or *HEDGE count* variables. We use the two instruments *Ind CEO comp* and *Geo CEO mean*, where *Geo CEO mean* is the average total compensation received by all other CEOs who is employed at firms in different industries that are headquartered within a 250-km radius of the firm. We report the results of this test in Table 4. Columns 1–3 show the results relating to ITIs based on the FF30 industry classification, while Columns 4–6 illustrate the results relating to ITIs based on the FF30 size-median industry classification. Similar to the previous results, Hausman exogeneity tests confirm the endogeneity of ITIs proxies, high first-stage *F*-statistics show the relevance of the instruments, and overidentification tests (Hansen's *J*-test) indicate that the instruments are valid. Consistent with our earlier analyses, we find a significantly positive association between ITIs and corporate hedging at conventional levels.

These results are consistent with our *risk management hypothesis*, which suggests that the likelihood of hedging and the level of corporate hedging that takes place increases in line with the size of industry tournament prizes.[93] These results also confirm that a CEO influenced by ITIs is more inclined to hedge and that they tend to hedge more due to the positive effect doing so has on their career, rather than refraining from hedging as a result of being motivated for risk-taking activities. This indicates the dominance of the *risk management hypothesis* over the *risk incentive*

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[92] Similarly, for the FF30 size-median industry classification in Table 3, the marginal effect reported in Column 6 suggests that a one standard deviation increase in *LN_INDGAP2* increases *HEDGE* by 4% (0.072 / 1.767).

[93] To separate the impact of ITIs from the CEO incentives through their compensation package, we control for CEO pay incentives (delta and vega). We also test the difference between compensation schemes offered by high ITIs industry firms and low ITIs industry firms. We cannot find a significant difference between their total compensations and their components (salary, bonus, option, and stock pays) within the high vs. low ITIs groups.

hypothesis. Similarly, we detect a positive association between internal tournament incentives, *Firm gap*, and corporate hedging.[94] This result shows that other senior executives, too, tend to hedge to get an upward leap to CEO position when they are induced by within-firm tournaments among vice presidents. This is consistent with the argument by Chava and Purnanandam (2010), who state that senior executives below the rank of CEO can also influence financial policies.[95] Kini and Williams (2012) find that internal tournament incentives induce next-level senior executives to pursue riskier firm activities. However, contrary to these findings, we show that the advantages of hedging prevail over any risk incentives offered by an internal tournament.

Consistent with Graham and Rogers (2002), Knopf et al. (2002), and Kumar and Rabinovitch (2013), we find a positive (albeit statistically insignificant) association between CEO delta and corporate hedging in all regression models. This result is consistent with the arguments put forward by Smith and Stulz (1985) and Guay (1999), which note that a lack of diversification in a CEO's wealth may lead them to be more conservative and risk averse. The coefficients on *ln(CEO vega)* are negative (albeit statistically insignificant) in all the regressions shown in Tables 2 and 3. Rajgopal and Shevlin (2002), Coles et al. (2006), and Mao and Zhang (2018) report that CEO vega, which is defined as the sensitivity of managerial wealth to firm risk, maintains convexity in managerial compensation; as such, it incentivizes risk-taking activities. Thus, a CEO influenced by CEO vega may be inclined to abstain from hedging, which can stabilize the volatility of cash flows.

We discover a positive relation, similar to that found in previous studies, between firm size and corporate hedging.[96] Nance et al. (1993) and Mian (1996) explain this link through the presence of

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[94] In the untabulated coefficients on the controls shown in Table 4, we also have a significantly positive coefficient on *Firm gap*.

[95] The significance of the coefficients on job market incentives for both CEOs and lower-ranked senior executives suggests that both types of executives have a significant effect on risk management policies.

[96] This result is also consistent with the argument by Bandiera, Prat, Hansen, and Sadun (2020), who find more leadership behaviors and more CEO dominance to be evident in financial policy choices in multinational firms, public firms, and high–R&D industries, where risk management is essential.

fixed costs, which obstruct the feasibility of hedging for small firms. We also find a positive relation between leverage and corporate hedging. Nance et al. (1993) hypothesize that firms with higher leverage are more inclined to hedge due to possessing greater underinvestment problems. Furthermore, we observe that corporate hedging is positively related to R&D activities and firm inventory levels. A firm might decide to hedge while dealing with intense R&D activities, stockpiling more inventory so that it can mitigate the firm risk related to such activities. Additionally, we find a negative association between cash levels and hedging, which is consistent with findings by Francis and Gao (2018), while Holmstrom and Tirole (2000) assert that firms tend to hold liquid assets as buffers against shocks. Accordingly, as cash holding reduces the need for risk management, it functions as a substitute for hedging. The signs of the coefficients on the other control variables are mostly consistent with previous literature.

Overall, the findings are consistent with the *risk management hypothesis* that, when the industry tournament prize is high, CEOs are more likely to hedge and have a greater incentive to undertake more corporate-hedging activities, as these can potentially increase the probability that they will win the tournament.

4.2 ITIs and different types of hedging

In this section, we investigate how ITIs affect the hedging of different types of risk, including FX, IR, and CMD risk. We employ the IV Probit regression model to analyze the dichotomous variables for each hedging type (*FX hedge*, *IR hedge*, and *CMD hedge*), testing the likelihood that a CEO will engage in hedging, and use the 2SLS regression model to account for continuous hedging variables (*FX count*, *IR count*, and *CMD count*), testing hedging intensity under the FF30 (*LN_INDGAP1*) and FF30 size-median (*LN_INDGAP2*) industry classifications. The instrumental variables used for IV Probit and 2SLS regressions are *Ind CEO comp* and *#Higher paid ind CEOs*. We report our findings in Table 5.

We explore a significantly positive association between ITIs and the likelihood and intensity of FX hedging, IR hedging, and CMD hedging at various conventional significance levels. However, we could not find a significant impact on the likelihood that a CEO will engage in hedging CMD risk.[97] These results illustrate that, consistent with the *risk management hypothesis*, as the tournament prize increases, so does the intensity of different hedging types.

4.3 Possible reasons for the link between ITIs and corporate hedging

In this section, we examine possible reasons for the positive relation between ITIs and corporate hedging. Although Coles et al. (2017) report that ITIs, which are risk incentives, have a positive effect on firm value, some papers find that they have harmful effects as well. Kubick and Lockhart (2021) detect a positive relation between ITIs and stock price crash risk. They argue that CEOs who are more strongly motivated to progress in the CEO labor-market tournament have a higher propensity to withhold negative firm-specific information. This inclination can result in large negative stock price corrections when the accumulated information is disclosed. However, Kim et

[97] Possible reasons for the weak association between ITIs and the likelihood of CMD hedging might be as follows. Commodities are at the core of a firm's business, whereas IR and FX risks are more likely to be related to financial instruments. Therefore, a CEO might not be willing to change corporate traditions regarding how the firm's business is run. Also, in comparison with other types of derivatives, CMD derivatives involve carrying costs, which include interest, insurance, and storage costs. The CEO has to manage both CMD price risks and the costs associated with holding those commodities. Therefore, CMD hedging can be seen as more complicated in terms of the actions needed to manage risk. Further to this, Brogaard, Ringgenberg and Sovich (2019) show that index commodities damage firm performance following the financialization of commodity markets. Lastly, it is not always possible to find the same underlying commodity in the financial markets as the firm's own products. Therefore, perfect hedging related to commodity prices through financial markets can become impracticable. Hence, a CEO may not be motivated by the outside CEO labor market to hedge CMD risk. The INVERTO Raw Materials Study (2018), conducted with input from 112 managing directors, board members, and purchasing managers from companies in various European countries, found that hedging methods are only rarely used by the sample companies. This is due to a lack of hedging knowledge and skills, as well as the awareness that there are insufficient hedging instruments for most raw materials.

al. (2021) document that hedging has a mitigating effect on stock price crash risk by lowering information asymmetry and enhancing transparency.

In addition, Kubick et al. (2020) find a positive association between ITIs and the cost of borrowing. They argue that greater risk-taking incentives associated with ITIs may result in higher-cost bank loans; this is because the increase in firm risk is harmful to creditors, who then try to protect themselves by charging higher interest rates. However, Smith and Stulz (1985) assert that hedging reduces the probability of distress by alleviating the likelihood of violating a covenant. Thus, hedging might provide the borrower with an opportunity to negotiate contract terms with lenders. Additionally, Campello et al. (2011) explore the negative association between hedging and the cost of debt, while Bessembinder (1991) has indicated that hedging can reduce the agency cost of benefiting shareholders at the expense of lenders by weakening the probability of default. Lastly, Stulz (1996) argues that firms hedge in order to assure against the possibility of costly lower-tail outcomes.

Further to this, hedging provides a shield against unpredicted shocks, securing adequate and stable internal cash flows and preventing a firm from inefficient liquidation. Thus, it has a mitigating impact on firm risk levels. Therefore, we argue that a CEO who anticipates the amplifying impact of ITIs on the cost of debt and stock price crash risk can use hedging derivatives to alleviate these effects, making the application of riskier policies more possible (Levine, 2005). To test whether hedging mitigates the amplifying effects of ITIs on the cost of debt and stock price crash risk, we analyze the models for subsamples of hedgers and non-hedgers. We define hedgers and non-hedgers based on the binary variable *HEDGE* (i.e., whether a firm mentions the use of hedging instruments in its 10-K). We also add hedge count variables and the interaction between hedge count variables and the industry pay gap into the regression models.

Following the literature on the stock price crash risk (e.g., Chen, Hong, and Stein, 2001; Kim, Li, and Zhang, 2011; Kim, Wang, and Zhang, 2016), we form *CRASH* (a dummy variable set to one if the firm has a weekly return that is less than 3.2 standard deviations below the average weekly return for the entire fiscal year), *DUVOL* (the natural logarithm of the ratio of the standard deviation of weekly returns for below-average weeks to the standard deviation of weekly returns for above-average weeks, over the fiscal year), and *NCSKEW* (the negative conditional skewness of firm-specific weekly returns during the entire fiscal year).[98]

Table 6 shows the impact of hedging on the relation between ITIs and stock price crash risk. Columns 1–6 show the results relating to the subsample analyses of hedgers and non-hedgers, while Columns 7–9 show the interaction between *LN_INDGAP1* and *HEDGE count*. The results indicate that the effect of ITIs on stock price crash risk is less pronounced for hedgers (Columns 2, 4, and 6) than it is for non-hedgers (Columns 1, 3, and 5). Additionally, the coefficients on the interaction between *LN_INDGAP1* and *ln(1+HEDGE count)* are significantly negative in Columns 7 and 8 at the 5% and 10% levels, respectively.

Following Kubick et al. (2020), we measure the cost of debt as the amount the firm pays in basis points above the LIBOR, plus any additional fees for each dollar drawn down from the loan facility. For the impact of hedging on the relation between ITIs and the cost of debt, we employ the 2SLS regression model. The instruments used are *Ind CEO comp* and *#Higher paid ind CEOs*. Table 7 illustrates the results of the investigation into the effect of hedging on the association between ITIs and the cost of borrowing. Columns 1 and 2 illustrate the results relating to the subsample hedger analyses, while Columns 3 and 4 report on the non-hedger analyses. The results indicate that the

[98] The details about the proxies of stock price crash risk are in Appendix C.

effect of ITIs on the cost of borrowing is less pronounced, both in terms of significance and magnitude, for hedgers than it is for non-hedgers.

Accordingly, these results provide supporting evidence that corporate hedging has a mitigating effect on the magnifying impact of ITIs on stock price crash risk and the cost of debt. These could be possible reasons why a CEO might use hedging tools, besides the reasons that fall under the *risk management hypothesis* discussed earlier.

5. Heterogeneities in the association between ITIs and corporate hedging

5.1 Financial distress and the effect of ITIs on corporate hedging

In this section, we test how financial distress affects the relation between ITIs and hedging practices. As we find in Section 4.3, one of the possible reasons for a positive relation between ITIs and corporate hedging is that hedging decreases the adverse impact of ITIs on the cost of debt. In this context, hedging mitigates cash flow volatility, thus curtailing the probability of financial distress (Smith and Stulz, 1985). Therefore, hedging cuts down the likelihood of violating a covenant. Also, hedging can reduce the probability of default (Bessembinder, 1991) and mitigate the possibility of costly lower-tail outcomes (Stulz, 1996). Campello et al. (2011) establish that the mitigating impact of hedging on the cost of debt is stronger in firms that are near to being in distress. Lastly, Gilje (2016) finds that when firms approach financial distress, they tend to cut down on their investment risks.

Purdanandam (2008) empirically models the impact of financial distress on hedging. His model forecasts a nonlinear association between financial distress and hedging, and a U-shaped association between costs relating to financial distress and hedging. Consequently, it discovers a negative relation between leverage and hedging for highly leveraged firms, despite finding a positive relation between leverage and hedging for gently leveraged firms. [99] Therefore, we expect that a CEO working at a firm that is in financial distress is likely to influence hedging, but we do not predict the sign of this effect.

In our analysis, we use the modified Altman (1968) Z-score, the Merton model expected default frequency (EDF), and the Naïve model expected default frequency (EDF) as proxies for firm-specific financial distress. The Merton EDF is computed following the Merton (1974) bond-pricing model, while Naïve EDF is computed based on the "simplified" Merton model used to measure the probability of default, following Bharath and Shumway (2008). (A detailed explanation of both the Merton and Naïve EDF models is given in Appendix D.) A lower Altman Z-score and higher EDF values indicate that a firm is experiencing financial distress.

Table 8 shows how financial distress impacts the relation between ITIs and corporate hedging. We report the results of the second stage of the IV Probit estimation of ITIs on *ln(1+HEDGE count)* across firms experiencing different levels of financial distress. The sample is grouped into two subsamples based on the sample-year median of the financial distress variables. The instruments used are *Ind CEO comp* and *#Higher paid ind CEOs*. The coefficients on *LN_INDGAP1* in Models 1, 3, and 5 are larger and significant at the 1% level, whereas those in Models 2, 4, and 6 are insignificant. Consistent with Purdanandam's (2008) argument, these findings suggest that the effect of ITIs on hedging is significantly less pronounced for financially distressed firms.

5.2 CEO characteristics that affect CEO mobility

This section examines the effect of CEO characteristics (that would determine the likelihood that a CEO will move up in the tournament) on the relation between ITIs and corporate hedging. A retiring or a founding CEO (to whom the external job market might be less attractive) might have a

[99] Purdanandam (2008) uses the leverage as a proxy for financial distress.

lower motivation to transfer to a leading firm compared to other CEOs. Similarly, Coles et al. (2017) find that if a CEO is close to retirement or is the founder of their company, the incentives to exert greater effort and engage in riskier corporate activities offered by the external CEO labor market vanish. Thus, we test how being at retirement age or being the founder of the firm influences whether a CEO's motivation to hedge can be affected by ITIs.

A CEO is defined as the founder CEO based on ExecuComp's title and as the retiring CEO if they are aged over 65 years. The full sample is partitioned into two subsamples, based on whether a CEO is a founder (or not) or whether they are of retirement age (or not). As shown in Table 9, the likelihood of hedging and the intensity of hedging activities significantly increase when a CEO is not a founder (Columns 2 and 4) or not of retirement age (Columns 6 and 8). Similar to Coles et al. (2017), we find that those effects disappear when a CEO is a founder (Columns 1 and 3) or of retirement age (Columns 5 and 7).

5.3 The enforceability of non-competition agreements

Non-competition agreements in employment contracts are designed to mitigate the possibility that employees or executives will accept employment offers from their firm's competitors (Garmaise, 2011; Jeffers, 2019). Therefore, the enforceability of non-competition agreements can reduce CEOs' ability to accept offers from the leading firms in their industry, thus decreasing the impact of ITIs. Because the effectiveness of these agreements relies on their ability to block executives' transfers, any modification in their enforceability builds a shock into ITIs (Garmaise, 2011); for example, an increase in the enforceability of a non-competition agreement mitigates any motivation created by ITIs to engage in hedging under the *risk management hypothesis*. Such a consequence is primarily the result of a lesser need to hedge for career-enhancing purposes due to a decline in the probability that the CEO will benefit from incentives offered by the CEO external job market should they hedge in states where non-competition agreements are strictly enforced.[100] Thus, the staggered changes in the enforceability of non-competition agreements across states provide an identification strategy that can be used to examine a causal relation between ITIs and corporate hedging.

Following Garmaise (2011), Jeffers (2019), and Huang et al. (2019), we construct a variable *NON_COMPETE* that takes on the value of +1 for firms headquartered in Florida from 1997–2016, in Kentucky from 2007–2016, in Idaho and Oregon from 2009–2016, in Texas and Wisconsin from 2010–2016, in Colorado and Georgia from 2012–2016, in Illinois from 2012–2013, and in Virginia from 2014–2016. It takes the value of −1 for firms in Texas from 1995–2006, in Louisiana from 2002–2003, in South Carolina from 2011–2016, and in Montana from 2012–2016. It is set to equal 0 otherwise. We then interact the *NON_COMPETE* variable with the industry pay-gap variable *LN_INDGAP1* (*LN_INDGAP2*). CEOs in those firms that enforce the non-competition agreements have a lesser ability to move to the leading firms in their industry; therefore, we predict a negative coefficient on the interaction of *NON_COMPETE* and *LN_INDGAP1* (*LN_INDGAP2*).

Garmaise (2011) claims that the importance of within-state competition is enhanced for those firms exposed to a higher number of within-state competitors due to the limited geographic scope of non-compete covenants and the ease of imposing them within a state. Therefore, the impact of the exogenous shock on the relation between ITIs and corporate hedging caused by the enforceability of non-competition agreements is likely to be more pronounced due to the high number of within-

[100] Non-competition agreements are enforceable in the US within a restricted geographical area (usually within a state); their effectiveness diminishes when crossing state boundaries (Germaise, 2011). The use of those agreements is common (Jeffers, 2019), providing us with a useful setting in which to implement our analysis. State rulings regarding the enforceability of non-competition agreements vary in terms of the business type or area, executives' compensation levels, and/or the time span covered by the employment contract. State rulings on this matter are generally stable, but changes can still occur. A change in the enforceability of non-competition agreements usually stems from changes in state laws or state-level court rulings, the latter of which annul any previous rules and practices, immediately altering an agreement's enforceability (Jeffers, 2019).

state competitors. Accordingly, we expect that the negative coefficient on the interaction of *NON_COMPETE* and *LN_INDGAP1* (*LN_INDGAP2*) will become significantly stronger when the number of in-state competitors rises.

We employ the DID approach to investigate the effect of the exogenous shock on the association between ITIs and corporate hedging. Firms based in states that have not experienced any judicial or regulatory variation act as a control group in the DID setting. Panel A of Table 10 reports the OLS estimates of the DID approach. We estimate our specification for three subsamples based on the number of in-state competitors each year, noting whether they are above the 25^{th}, 50^{th}, or 75^{th} percentiles (5, 14, and 43 in-state competitors, respectively). As seen in Panel A of Table 10, the coefficient on *NON_COMPETE* × *LN_INDGAP1* is significantly negative only when the number of in-state competitors is above the 75^{th} percentile. This is consistent with Garmaise (2011) and Huang et al. (2019), who confirm that any enhancement of non-compete enforceability is stronger when the number of rivals in a state rises.

We then perform a subsample analysis using IV Probit estimation. We partition our sample into two subsamples, based on whether or not a firm is headquartered in a state that has enforced a non-competition agreement in a given year,[101] and report the results in Panel B of Table 10. The positive effect of ITIs on corporate hedging is shown to be significant only for the group that has not experienced the enforcement of a non-competition law in its state in that year (i.e., where *ENFORCE* is equal to 0).

Overall, the results of the quasi-natural experiment examining changes in the enforceability of non-compete agreements identify a causal relation between ITIs and corporate hedging.

[101] We construct a variable, *ENFORCE*, which is set equal to 1 if a non-competition agreement is enacted in the state for a given year; otherwise, it is set to zero.

5.4 Cross-industry variation in the effects of ITIs on corporate hedging

The CEO talent pool can be defined as the proportion of insider CEO hires, diversified across industries (Cremers and Grinstein, 2014). Parrino (1997) reports varying characteristics, across industries, that influence the CEO labor market; further to this, each industry may have a different approach to its risk management policies. Thus, we examine cross-industry variations in the incentivizing effects of CEO external job markets on corporate hedging.

In order to measure the relation between ITIs and corporate hedging in each industry, we re-estimate the second stage of the 2SLS regression model in Table 2 for each FF30 industry classification. Table 11 illustrates the coefficients on *LN_INDGAP1* for each industry. The industries that evidence the strongest ITI impacts on corporate hedging are Precious Metals, Non-Metallic and Industrial Metal Mining, and Business Equipment. We also observe significant positive relations between ITIs and corporate hedging in Aircraft, Ships, and Railroad Equipment, Petroleum and Natural Gas, Transportation, Retail, and Other Industries. However, we cannot determine any significant associations between ITIs and corporate hedging for the remainder of the industries. Generally speaking, there seems to be considerable variation in the effect of ITIs on corporate hedging across industries.

5.5 Additional robustness tests

In this section, we employ additional measures to assess the industry tournament prize (industry pay gap), using different industry classifications. First, we scale the industry pay gap variable by the CEO's total compensation under the FF30 (FF30 size-median) industry classification: *Scaled_INDGAP1* (*Scaled_INDGAP2*). Further to this, we test the relation between ITIs and corporate hedging under the Fama–French 48 (FF48) and FF48 size-median industry classifications.

We report these robustness results in Table 12. As seen in Columns 1–4, our previous findings regarding the positive effects of ITIs in terms of the likelihood and intensity of corporate hedging persist even if we scale the industry pay gap variable using the CEO's total compensation. Moreover, we obtain similar results under the FF48 and FF48 size-median industry classifications; these are reported in Columns 5–8. Hence, our results are robust to using different measures of the industry pay gap and different industry classifications.

Firms can choose to strategically provide stakeholders with more forward-looking hedging information in their 10-Ks, instead of picturing their current position; this is especially true when CEOs need to impact outsiders' perceptions. Therefore, we cannot rule out the possibility that CEOs motivated by external job-market tournaments are induced to make forward-looking hedging disclosures. Accordingly, forward-looking 10-K disclosures related to hedging can distort our hedging variable. Thus, using the approach taken by Muslu et al. (2015) to define forward-looking sentences, we generate our textual hedging variables by taking into account both forward-looking and backward-looking hedge disclosures. We define the first variable, *FRWD HEDGE*, as the number of forward-looking hedging sentences scaled by the total number of sentences in the 10-K.[102] The other variable is *BCWD HEDGE*, which is the number of backward-looking hedging sentences scaled by the total number of sentences in the 10-K.[103] We then multiply these variables by 100 to put them in percentage form.

The results are illustrated in Columns 1 and 2 of Table 13. We do not find a significant relation between *FRWD HEDGE* and *LN_INDGAP1* (Column 1), whereas we find a significantly positive relation between *BCWD_HEDGE* and *LN_INDGAP1* (Column 2). Based on our results, we can rule

[102] We identify a forward-looking hedging sentence if a sentence contains any of the hedging-related keywords from Appendix B and is recognized as forward-looking based on the approach from Muslu et al. (2015).
[103] We identify a hedging-related sentence as backward-looking if it is not recognized as a forward-looking sentence based on the approach from Muslu et al. (2015).

out the possibility that ITIs motivate CEOs to make speculative disclosures related to hedging. However, our results also suggest that ITIs incentivize CEOs to provide stakeholders with disclosures regarding both their current and previous hedging activities.

Lastly, we scale *HEDGE count* variable by the total number of words in the 10-K, thereby avoiding any correlation to the size or complexity of the firm and the word counts. Based on the results shown in Column 3 of Table 13, the positive relation between ITIs and hedging is robust to the scaling of the hedging count variable.

6. Conclusion

Corporate hedging is mostly carried out by firms that wish to protect themselves against unexpected shocks. The primary benefit of hedging is that it can prevent a firm from inefficient liquidation by allowing it to secure adequate and stable internal cash flows. This paper investigates how industry tournament incentives (ITIs) act as a factor affecting corporate hedging policies. Promotion-based tournament theory suggests that competition among employees can induce them to work harder and change their risk appetite (Lazear and Rosen, 1981; Hvide, 2002; Goel and Thakor, 2008). Accordingly, Coles et al. (2017) claim that CEOs compete with one another to obtain CEO positions in the leading firms in their industries because these aspirational positions incorporate higher compensation levels, status, and visibility, and an enlarged span of control. They find that CEOs motivated by the pay gap between their original compensation and that of the highest-paid CEO within their industry tend to increase their effort and engage in riskier activities; this can, in turn, impact their attitude toward corporate hedging.

Following Almeida et al. (2017), Hoberg and Moon (2017), Manconi et al. (2017), and Qiu (2019), we undertake a textual analysis of 10-Ks, using them to form corporate hedging measures.

In line with our *risk management hypothesis*, we find that ITIs positively influence both the likelihood that a CEO will hedge and the hedging intensity. This finding indicates that ITIs motivate CEOs to engage in corporate hedging.

We then explore possible reasons for the positive relation between ITIs and corporate hedging, finding that corporate hedging alleviates the amplifying impact of ITIs on the cost of debt and stock price crash risk. This effect can encourage CEOs to hedge. Additionally, we show that the association between ITIs and corporate hedging is less pronounced for firms that are in greater financial distress, and that this association causes the likelihood of a CEO moving up in the tournament to soar.

Using an exogenous shock provided by changes in the enforceability of non-competition agreements, we identify a causal relation between ITIs and corporate hedging. Overall, our analysis illustrates that the compensation gaps among CEOs are important incentive mechanisms that can be used to motivate them to influence their corporate hedging policies.

Appendix A
Data sources and definitions

Variable	Definition
A. Hedging variables (Source: 10-K statements from SEC)	
HEDGE	Dummy variable set to one if a firm mentions the use of any hedging instruments (foreign exchange, interest rate, or commodity derivatives) in its 10-K for a given year and set to zero otherwise, details in Appendix B.
HEDGE count	The number of times a firm mentions the use of any hedging instruments in its 10-K statement for a given year, details in Appendix B.
FX hedge	Dummy variable set to one if a firm uses foreign exchange hedging contracts in a given year and zero otherwise, details in Appendix B.
FX count	The number of times a firm mentions foreign exchange hedging in a given year based on the combination of the keywords documented in Appendix B.
IR hedge	Dummy variable set to one if a firm uses interest rate hedging contract in a given year and zero otherwise, details in Appendix B.
IR count	The number of times a firm mentions interest rate hedging in a given year, details in Appendix B.
CMD hedge	Dummy variable set to one if a firm uses commodity hedging contract in a given year and zero otherwise, details in Appendix B.
CMD count	The number of times a firm mentions commodity hedging contract in a given year, details in Appendix B.
Scaled HEDGE count	The number of times a firm mentions the use of any hedging instrument in its 10-K statement scaled by the total number of words in the 10-K times 100.
FRWD HEDGE	The number of forward-looking hedging sentences used in 10-K scaled by the total number of sentences in the 10-K times 100.
BCWD HEDGE	The number of backward-looking hedging sentences used in 10-K scaled by the total number of sentences in the 10-K times 100.
B. Incentives variables (Source: ExecuComp)	
INDGAP1	The pay gap between the second-highest-paid CEO's total compensation within the same Fama–French 30 industry and the CEO's total compensation (CPI-adjusted).
INDGAP2	The pay gap between the second-highest-paid CEO's total compensation within the same Fama–French 30 size-median industry and the CEO's total compensation (CPI-adjusted).
LN_INDGAP1	The natural logarithm of one plus *INDGAP1*.
LN_INDGAP2	The natural logarithm of one plus *INDGAP2*.
Firm gap	The pay gap between the CEO's total compensation and the median vice president total compensation (CPI-adjusted).
CEO delta	Dollar change in CEO wealth associated with a 1% change in the firm's stock price.
CEO vega	Dollar change in CEO wealth associated with a 0.01 change in the standard deviation of the firm's returns.
C. Firm characteristics (Source: Compustat and CRSP)	
Total assets	Book value of total assets (CPI-adjusted).
R&D/Assets	R&D expenditures divided by total assets, set to 0 if missing.
Leverage	The ratio of long-term debt plus debt in current liabilities to total assets.

Tobin's Q	The market value of equity plus book value of assets minus book value of equity minus balance sheet deferred taxes, divided by book value of assets.
CAPX/Assets	Capital expenditures divided by total assets.
ROA	Operating income before interest divided by total assets.
MTB	The ratio of the market value of equity to book value of equity.
Cash/Assets	Cash divided by total assets.
PPE/Assets	Investment in property, plant, and equipment divided by total assets.
Cashflow vol	The standard deviation of annual operating cash flows over the past five fiscal years, divided by the total assets.
Z-score	Modified Altman's (1968) Z-score is computed as (1.2 working capital + 1.4 retained earnings + 3.3 EBIT + 0.999 sales) divided by total assets. We exclude (0.6 market value/liabilities) because a similar term, market-to-book, is used as a control variable in the regressions.
Firm age	One plus the difference between the year under investigation and the first year the firm appears on the CRSP tapes.
Non-debt tax shield	Depreciation divided by total assets.
Inventory	Inventory divided by costs of goods sold.
Trade credit	Account payables divided by total assets.
Asset maturity	Asset maturity is the book value-weighted average maturity of long-term assets and current assets, where the maturity of long-term assets is computed as gross property, plant, and equipment divided by depreciation expense, and the maturity of current assets is computed as current assets divided by the cost of goods sold (see Billett, King, and Mauer, 2007; Graham, Li, and Qiu, 2008).
D. CEO characteristics (Source: ExecuComp)	
CEO founder	Dummy variable set to one if a CEO is also the founder of the firm and set to zero otherwise.
CEO retire	Dummy variable set to one if the CEO's age is more than 65 years and set to 0 otherwise.
CEO tenure	The CEO's tenure at the firm, in years.
CEO age	The CEO's age, in years.
E. Industry and instrument variables (Source: ExecuComp)	
Ind # CEOs	The number of CEOs (or firms) within the same industry in the sample year.
Ind CEO comp	The sum of total compensation of all other CEOs in each Fama-French 30 industry, except the highest-paid CEO, CPI-adjusted.
Geo CEO mean	The average total compensation received by all other CEOs who work at firms in different industries which are headquartered within a 250-km radius of the firm (CPI-adjusted).
#Higher paid ind CEOs	The total number of CEOs with higher total compensation within the same Fama-French 30 (or FF30 size-median) industry.
F. Crash risk measures and related controls (Source: Compustat and CRSP)	
CRASH	Dummy variable equal to one if the firm has a weekly return that is less than 3.2 standard deviations below the average weekly return for the entire fiscal year.
NCSKEW	Negative conditional skewness of firm-specific weekly returns during the entire fiscal year.

DUVOL	The natural logarithm of the ratio of the standard deviation of weekly returns for below-average weeks to the standard deviation of weekly returns for above-average weeks, for weekly returns over the fiscal year.
DTURN	The difference between average daily share turnover during the current fiscal year and the previous fiscal year. Daily stock turnover is calculated as the ratio of daily trading volume over the number of shares outstanding.
SIGMA	The standard deviation of firm-specific weekly stock returns over the fiscal year.
RET	Average firm-specific weekly return during the entire fiscal year.
OPAQUE	The absolute value of discretionary accruals, which are measured using the modified Jones model following Dechow et al. (1995).
G. Bank loan characteristics and related controls (Source: DealScan)	
Loan spread	Loan spread is measured as all-in spread drawn.
Loan maturity	Loan maturity measured in months.
Covenant count	A count of the number of covenants in the loan facility.
Loan Secured	A dummy variable equal to one if the loan facility is secured by collateral and zero otherwise.
Performance pricing	A dummy variable equal to one if the loan facility has a performance pricing feature and zero otherwise.
No. of Lenders	The number of lenders funding the loan facility (i.e., the size of the loan syndicate).
Loan amount	The loan amount measured in dollars, CPI-adjusted.
Term loan	A dummy variable equal to one if the loan facility is a term loan and zero otherwise.
Revolver loan	A dummy variable equal to one if the loan facility is a revolver or 364-day facility and zero otherwise.
Bridge loan	A dummy variable equal to one if the loan facility is a bridge loan and zero otherwise.
General purpose loan	A dummy variable equal to one if the loan purpose is for general corporate purposes, project finance, or other purpose and zero otherwise.
Takeover/recap loan	A dummy variable equal to one if the loan purpose is for a takeover or recapitalization and zero otherwise.
Working capital loan	A dummy variable equal to one if the loan purpose is to finance working capital and zero otherwise.
Rated dummy	Dummy variable equal to one if the firm has an S&P long-term debt rating (Compustat).
H. Macroeconomic controls (Source: The Federal Reserve)	
Credit spread	The difference between BBB corporate bond yield and AAA corporate bond yield.
Term spread	The difference between the 10-year U.S. constant maturity Treasury yield and the 3-month constant maturity U.S. Treasury yield (see Kubick, Lockhart, and Mauer, 2020).
Crisis dummy	A dummy variable equal to one if the loan activation date falls in the calendar year 2007 or 2008 and zero otherwise.
Post-crisis dummy	A dummy variable equal to one if the loan activation date is after the calendar year 2008 and zero otherwise.

Appendix B
Hedging variables

We develop hedging variables using textual analysis of 10-K statements. We search for 10-Ks to find if a firm utilizes hedging activities. First, we create measures for three different types of hedging: foreign exchange (FX), interest rate (IR), and commodity (CMD) hedging. Then we combine them to form an overall hedging variable. The details of these variables are as follows:

FX hedging:

We closely follow Chen and King (2014) and Huang et al. (2013) to generate FX hedging variable. A firm is concluded to follow FX hedging in a year if it mentions any of the following combinations of the words in its 10-K statement:

(currency/ currency rate/ exchange/ exchange rate/ cross-currency) AND (cap/ collar/ contract/ derivative/ floor/ forward/ future/ option/ swap)

(e.g., the combination of two words from each list, such as currency cap, currency collar, currency contract)

We also exclude false-positive hits by searching following different words surrounded by the above FX combination that would make a firm not to use in FX hedging activities such as "in the future", "forward-looking", "not material", "do not engage in foreign exchange", "does not have any currency forward." We develop the following two FX hedging variables:

- *FX hedge* is set to one if a firm uses FX hedging contract in a year and zero otherwise;
- *FX count* is the number of times a firm mentions FX hedging in a given year based on the combination of the words specified above.

IR hedging:

For IR hedging, we use the following list of words documented in Huang et al. (2013): "interest rate swap", "interest rate cap", "interest rate collar", "interest rate floor", "interest rate forward", "interest rate option", "interest rate future." We develop the following two IR hedging variables:

- *IR hedge* is set to one if a firm mentions any of the words from the above interest rate hedging-related word list in a year and zero otherwise;
- *IR count* is the total number of IR hedging words documented in the 10-K statement.

CMD hedging:

For commodity hedging, we use the following word list documented in Almeida et al. (2017).

hedge fuel	uses derivative financial instruments to manage the price risk
fuel hedge	uses financial instruments to manage the price risk
fuel call option	uses derivative financial instruments to manage price risk
commodity derivative	uses derivatives to manage the price risk
commodity contract	uses derivatives to manage price risk
commodity forward	forward contracts for certain commodities
commodity future	forward contracts for commodities derivatives to mitigate commodity price risk
commodity hedge	futures to mitigate commodity price risk
commodity hedging	options to mitigate commodity price risk
commodity option	swaps to mitigate commodity price risk
commodity swap	corn future
hedges of commodity price	cattle future commodity price swap

We develop the following two commodity hedging variables:

- *CMD hedge* is set to one if a firm mentions any of the words from the above commodity hedging-related word list in a year and zero otherwise;

- *CMD count* is the total number of commodity hedging words documented in the 10-K statement.

Finally, our two main overall hedging variables are formed as follow:

- *HEDGE* takes a value of one if any one of the hedging dummies (*FX hedge*, *IR* hedge, or *CMD* hedge) is one, zero otherwise.

- *HEDGE count* is the sum of *FX count*, *IR count*, and *CMD count*.

Appendix C
Measures of stock price crash risk

For firm *i* during its fiscal year *t*, we first estimate firm-specific weekly residual returns from the expanded market model as follows:

$$r_{i,t} = \alpha_i + \beta_{1,i} r_{m,t-2} + \beta_{2,i} r_{m,t-1} + \beta_{3,i} r_{m,t} + \beta_{4,i} r_{m,t+1} + \beta_{5,i} r_{m,t+2} + \varepsilon_{i,t}, \quad \text{(C1)}$$

where $r_{i,\tau}$ is the return on stock *i* in week τ, and $r_{m,\tau}$ is the return on the CRSP value-weighted market index in week τ. The firm-specific weekly returns are then defined as

$$W_{i,t} = \ln\left(1 + \varepsilon_{i,t}\right). \quad \text{(C2)}$$

Following stock price crash risk literature (e.g., Chen et al., 2001; Kim et al., 2011; Kim et al., 2016), we form three measures of crash risk. First, *CRASH* is a dummy variable that takes the value of one if the firm has experienced at least one weekly return $\left(W_{i,t}\right)$ 3.2 standard deviations below the average firm-specific weekly return during the entire fiscal year, and zero otherwise.

The second measure of crash risk is the firm-specific negative conditional skewness (*NCSKEW*). *NCSKEW* is defined as the standardized negative value of the third central moment of firm-specific weekly return scaled by its sample variance raised to the power of 3/2. More specifically, *NCSKEW* of stock *i* in its fiscal year *t* is calculated as

$$NCSKEW_{i,t} = -\frac{n\left(n-1\right)^{3/2} \sum W_{i,t}^3}{\left(n-1\right)\left(n-2\right)\left(\sum W_{i,t}^2\right)^{3/2}}, \quad \text{(C3)}$$

where *n* is the number of weekly observations in year *t*. A larger value of *NCSKEW* indicates more negatively skewed returns and thus greater crash risk.

Our third measure of crash risk is the firm-specific down-to-up volatility ratio measured over the entire fiscal year (*DUVOL*). *DUVOL* is computed as a natural logarithm of the ratio of the standard deviation of weekly returns for "down" weeks to the standard deviation of weekly returns for "up" weeks. The "down" weeks are the weeks during which the weekly return is less than the annual firm-specific mean, and the "up" weeks are the weeks during which the weekly return is greater than the yearly firm-specific mean. Larger values of *DUVOL* indicate greater crash risk.

Appendix D
Computation of expected default frequency (EDF)

Merton's expected default frequency: The Merton's expected default frequency (EDF) measure is computed using the Merton (1974) bond pricing model. Merton's model assumes that the total value of a firm follows a geometric Brownian motion,

$$dV = \mu V dt + \sigma_V V dW, \tag{D1}$$

where *V* is the value of the firm, μ is the expected continuously compounded return on *V*, σ_V is the volatility of firm value, and *dW* is a standard Weiner process. Additionally, it assumes the firm has issued only one discount bond with maturity of *T* periods. Merton's expected default frequency is computed by the following three-step procedure.

Step 1: The following two equations are solved numerically for *V* and σ_V :

$$E = VN\left(d_1\right) - e^{-rT} FN\left(d_2\right) \tag{D2}$$

and

$$\sigma_E = \left(\frac{V}{E}\right) N\left(d_1\right) \sigma_V, \tag{D3}$$

where *E* is the market value of equity, *F* is the face value debt, *r* is assumed to be constant risk-free rate, $N(.)$ is the cumulative standard normal distribution function, d_1 is given by

$$d_1 = \frac{ln\left(\frac{V}{F}\right) + \left(r + 0.5\sigma_V^2\right)T}{\sigma_V \sqrt{T}}, \tag{D4}$$

and $d_2 = d_1 - \sigma_V \sqrt{T}$.

Step 2: After obtaining a numerical solution for *V* and σ_V , the distance to default is computed as

$$DD = \frac{ln\left(\frac{V}{F}\right) + \left(\mu - 0.5\sigma_V^2\right)T}{\sigma_V \sqrt{T}}, \tag{D5}$$

where μ is the expected annual returns.

Step 3: The implied probability of default or the Merton expected default frequency (EDF) is computed as

$$Merton\ EDF = N\left(-DD\right). \tag{D6}$$

We set the inputs to the above procedure following the literature (Vassalou and Xing, 2004; Sundaram and Yermack, 2007; Bharath and Shumway, 2008; Kubick et al., 2020). μ is set as EBITDA scaled by book value of total assets, σ_E is the annualized standard deviation of returns over the previous year, *F* is measured as (debt in current liabilities + 1.5 × long-term debt), E is measured as the end of the year common share price multiply by common shares outstanding, r is the one-year Treasury Constant Maturity Rate (obtained from the Federal Reserve Board's website: http://www.federalreserve.gov), and T is assumed as 1 year.

Naïve expected default frequency: The Naïve expected default frequency (EDF) measure is computed based on the "simplified" Merton model probability of default documented in Bharath and Shumway (2008). This procedure assumes the firm's market value of debt equal to its face value of debt (i.e., $D = F$) and the volatility of debt as $\sigma_D = 0.05 + 0.25 \times \sigma_E$. The total volatility of the firm's value is then estimated as

$$\sigma_V = \frac{E}{E+F}\sigma_E + \frac{F}{E+F}\sigma_D. \qquad \text{(D7)}$$

The naïve distance to default is then computed as

$$Naive\ DD = \frac{\ln\left(\frac{E+F}{F}\right) + \left(\mu - 0.5\sigma_V^2\right)T}{\sigma_V\sqrt{T}} \qquad \text{(D9)}$$

and the naïve expected default frequency is computed as

$$Naive\ EDF = N\left(-Naive\ DD\right) \qquad \text{(D10)}$$

Higher values of Merton and Naïve EDF indicate a higher likelihood of default.

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Table 3.1: Descriptive statistics

This table presents summary statistics for ExecuComp firms that have information on all the required variables, excluding financials and utility firms, from the period 1997 to 2016. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity in a given year and set to zero otherwise. *HEDGE* count is a count of the number of times a firm mentions the use of any hedging instruments in its 10-K statement. The details on the hedging variables are discussed in Appendix B. All the other variables are defined in Appendix A. All the continuous variables are winsorized at 1% and 99%.

	N	Mean	Std Dev	25th Pctl	Median	75th Pctl
A. Hedging variables						
HEDGE	19,705	0.692	0.462	0.000	1.000	1.000
HEDGE count	19,705	13.934	19.238	0.000	6.000	21.000
FX hedge	19,705	0.505	0.500	0.000	1.000	1.000
FX count	19,705	6.439	10.605	0.000	1.000	10.000
IR hedge	19,705	0.448	0.497	0.000	0.000	1.000
IR count	19,705	5.875	10.378	0.000	0.000	8.000
CMD hedge	19,705	0.140	0.347	0.000	0.000	0.000
CMD count	19,705	1.264	4.747	0.000	0.000	0.000
Scaled HEDGE count	19,688	0.048	0.061	0.000	0.026	0.075
FRWD HEDGE	19,688	0.035	0.078	0.000	0.000	0.043
BCWD HEDGE	19,688	0.596	0.729	0.000	0.339	0.955
B. Incentives variables						
INDGAP1 ($000)	19,705	24,997.486	26,506.094	10,271.997	17,669.775	29,627.477
INDGAP2 ($000)	19,402	14,508.217	20,316.610	4,000.878	8,126.845	17,353.416
LN_INDGAP1	19,705	9.754	0.865	9.237	9.780	10.296
LN_INDGAP2	19,402	8.833	1.767	8.333	9.022	9.772
Firm gap ($000)	19,705	3,107.064	3,388.223	859.562	2,005.303	4,084.390
CEO delta ($000)	19,705	800.005	7,593.010	75.889	197.679	523.493
CEO vega ($000)	19,705	123.054	225.854	13.112	47.867	135.808
C. Firm characteristics						
Total assets ($000,000)	19,705	5,291.627	16,204.687	469.233	1,226.968	3,646.080
R&D/Assets	19,705	0.035	0.058	0.000	0.005	0.048
Leverage	19,705	0.203	0.169	0.036	0.192	0.318
Tobin's Q	19,705	2.013	1.291	1.207	1.614	2.329
CAPX/Assets	19,705	0.053	0.050	0.020	0.036	0.066
ROA	19,705	0.136	0.096	0.091	0.134	0.185
MTB	19,705	2.040	1.284	1.239	1.641	2.348
Cash/Assets	19,705	0.164	0.176	0.031	0.097	0.241
PPE/Assets	19,705	0.261	0.216	0.096	0.195	0.364
Cashflow vol	19,705	0.047	0.040	0.022	0.036	0.057
Z-score	19,705	1.819	1.608	1.158	1.922	2.691
Merton EDF (%)	16,502	0.259	2.354	0.000	0.000	0.000
Naive EDF (%)	16,502	0.210	1.775	0.000	0.000	0.000
Firm age (years)	19,705	27.870	19.169	13.000	22.000	40.000
Non-debt tax shield	19,705	0.044	0.026	0.027	0.039	0.055
Inventory	19,705	0.189	0.181	0.038	0.159	0.272

Trade credit	19,705	0.076	0.066	0.032	0.058	0.098
Asset maturity	19,692	7.764	5.684	3.708	6.177	10.319
Rated dummy	13,822	0.672	0.469	0.000	1.000	1.000
D. CEO characteristics						
CEO founder	19,705	0.074	0.263	0.000	0.000	0.000
CEO retire	19,705	0.071	0.257	0.000	0.000	0.000
CEO tenure (years)	19,705	7.849	7.250	2.701	5.671	10.674
CEO age (years)	19,705	55.442	7.178	51.000	55.000	60.000
E. Industry and instrument variables						
Ind # CEOs	19,705	110.406	75.866	44.000	81.000	185.000
Ind CEO comp ($000)	19,705	485,622.942	358,818.902	157,455.906	454,482.375	792,448.813
Geo CEO mean ($000)	19,705	5,208.993	1,715.009	4,172.117	4,972.411	5,946.660
#Higher paid ind CEOs	19,705	52.953	50.446	15.000	34.000	77.000
F. Crash risk measures and related controls						
CRASH	15,449	0.356	0.479	0.000	0.000	1.000
NCSKEW	15,449	0.656	1.736	-0.387	0.276	1.115
DUVOL	15,449	0.239	0.600	-0.127	0.131	0.445
DTURN	15,449	0.000	0.004	-0.001	0.000	0.002
SIGMA	15,449	0.058	0.037	0.034	0.047	0.068
RET	15,449	-0.002	0.009	-0.005	-0.001	0.003
OPAQUE	15,449	0.220	0.111	0.182	0.223	0.254
G. Bank loan characteristics						
Loan spread (bps)	13,822	179.076	136.246	75.000	150.000	250.000
Loan maturity (months)	13,822	48.799	21.934	36.000	60.000	60.000
Covenant count	13,822	1.532	1.419	0.000	2.000	3.000
Loan Secured	13,822	0.449	0.497	0.000	0.000	1.000
Performance pricing	13,822	0.498	0.500	0.000	0.000	1.000
No. of Lenders	13,822	9.753	8.728	4.000	7.000	13.000
Loan amount ($000,000)	13,822	511.807	1,034.501	100.000	250.000	525.000
Term loan	13,822	0.262	0.440	0.000	0.000	1.000
Revolver loan	13,822	0.708	0.455	0.000	1.000	1.000
Bridge loan	13,822	0.021	0.145	0.000	0.000	0.000
General purpose loan	13,822	0.428	0.495	0.000	0.000	1.000
Takeover/recap loan	13,822	0.127	0.333	0.000	0.000	0.000
Working capital loan	13,822	0.155	0.362	0.000	0.000	0.000
H. Macroeconomic controls						
Credit spread	13,822	0.011	0.006	0.008	0.010	0.012
Term spread	13,822	0.023	0.013	0.010	0.023	0.036
Crisis dummy	13,822	0.095	0.293	0.000	0.000	0.000
Post-crisis dummy	13,822	0.356	0.479	0.000	0.000	1.000

Table 3.2: Industry tournament incentives and corporate hedging (based on FF30 industry)

This table presents the results of OLS and instrumental variables (IV) estimation of ITIs on corporate hedging with year and industry fixed effects. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 industry (FF30) and the CEO's total compensation. In the first stage, we regress *LN_INDGAP1* variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp,* and the total number of CEOs with higher total compensation within the same FF30 industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. Models (1), (4), and (6) present marginal effects of Probit (IVProbit) models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
				2SLS		2nd stage
	Probit	OLS	1st stage	2nd stage	2nd stage	IVProbit
Dependent variable	$HEDGE_{t+1}$	ln(1+*HEDGE* $count_{t+1}$)	$LN\_INDGAP1_t$	$HEDGE_{t+1}$	ln(1+*HEDGE* $count_{t+1}$)	$HEDGE_{t+1}$
Predicted **$LN\_INDGAP1_t$**				**0.059*****	**0.164*****	**0.201*****
				(4.091)	(3.600)	(3.997)
$LN\_INDGAP1_t$	**0.042*****	**0.096*****				
	(4.656)	(3.806)				
ln(*Firm* gap_t)	0.025***	0.069***	0.056***	0.026***	0.077***	0.082***
	(3.871)	(3.878)	(9.700)	(4.155)	(4.256)	(4.216)
ln(*CEO* $delta_t$)	0.005	0.003	0.005	0.004	0.003	0.015
	(0.724)	(0.170)	(1.505)	(0.629)	(0.147)	(0.698)
ln(*CEO* $vega_t$)	-0.005	-0.008	0.004	-0.003	-0.007	-0.015
	(-1.077)	(-0.571)	(1.391)	(-0.654)	(-0.524)	(-1.020)
ln(*CEO* $tenure_t$)	-0.012	-0.036	0.003	-0.011	-0.036	-0.036
	(-1.524)	(-1.642)	(0.634)	(-1.460)	(-1.625)	(-1.515)
ln(*CEO* age_t)	0.010	-0.133	-0.037	0.005	-0.131	0.032
	(0.163)	(-0.757)	(-1.251)	(0.088)	(-0.749)	(0.173)
ln(*Total* $assets_t$)	0.062***	0.282***	0.001	0.056***	0.287***	0.189***
	(6.332)	(10.515)	(0.127)	(6.768)	(10.789)	(6.490)
$R\&D_t/Assets_t$	0.359*	1.120**	-0.131	0.411**	1.142**	1.089**
	(1.905)	(2.105)	(-1.610)	(2.256)	(2.162)	(1.961)
$Leverage_t$	0.362***	1.431***	0.062**	0.335***	1.421***	1.061***
	(6.541)	(9.145)	(2.436)	(7.015)	(9.072)	(6.537)
Tobin's Q_t	-0.023***	-0.048**	0.004	-0.024***	-0.048**	-0.069***
	(-3.287)	(-2.535)	(1.095)	(-3.488)	(-2.564)	(-3.319)

CAPX $CAPX_t/Assets_t$	0.246	0.800	-0.017	0.156	0.768	0.691
	(1.385)	(1.622)	(-0.174)	(0.976)	(1.560)	(1.312)
ROA_t	0.056	-0.087	-0.052	0.073	-0.063	0.193
	(0.576)	(-0.355)	(-1.034)	(0.790)	(-0.255)	(0.673)
$Cash_t/Assets_t$	-0.203***	-0.609***	0.033	-0.216***	-0.608***	-0.599***
	(-3.535)	(-3.844)	(1.360)	(-3.850)	(-3.842)	(-3.525)
$PPE_t/Assets_t$	-0.176**	-0.541**	-0.050	-0.137**	-0.538**	-0.516**
	(-2.391)	(-2.515)	(-1.635)	(-2.061)	(-2.509)	(-2.369)
Cashflow vol$_t$	-0.286	-0.896*	0.176*	-0.324*	-0.901*	-0.856
	(-1.578)	(-1.843)	(1.950)	(-1.815)	(-1.858)	(-1.593)
Z-score$_t$	-0.004	0.014	0.006**	-0.004	0.012	-0.014
	(-0.551)	(0.696)	(1.979)	(-0.498)	(0.596)	(-0.650)
ln(1+*Firm age*$_t$)	-0.041***	-0.098**	-0.003	-0.035***	-0.097**	-0.120***
	(-2.669)	(-2.374)	(-0.520)	(-2.721)	(-2.360)	(-2.657)
Non-debt tax shield$_t$	-0.039	0.457	0.215	-0.053	0.432	-0.150
	(-0.104)	(0.445)	(1.181)	(-0.152)	(0.421)	(-0.135)
Inventory$_t$	0.118**	0.280*	0.011	0.116**	0.276*	0.345**
	(2.046)	(1.729)	(0.506)	(2.189)	(1.704)	(2.015)
Trade credit$_t$	0.063	0.636	0.020	0.061	0.642	0.195
	(0.424)	(1.496)	(0.316)	(0.469)	(1.514)	(0.443)
ln(*Ind # CEOs*$_t$)	-0.145**	-0.402***	-1.309***	-0.129***	-0.413***	-0.445***
	(-2.548)	(-2.621)	(-25.893)	(-2.604)	(-2.690)	(-2.617)
ln(*Ind CEO comp*$_t$) (IV)			1.580***			
			(65.136)			
ln(*#Higher paid ind CEOs*$_t$) (IV)			0.421***			
			(33.724)			
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,631	19,631	19,631	19,631	19,631	19,631
Adj. R-squared		0.272	0.801	0.169	0.271	
Pseudo R-squared	0.146					
Endogeneity, relevance, and overidentification tests						
Exogeneity test (Hausman/Wald *p*-value)				0.071*	0.031**	0.041**
First-stage *F*-statistics				6427.804***	6427.804***	
Hansen *J*-test (*p*-value)				0.315	0.836	

Table 3.3: Industry tournament incentives and corporate hedging (based on FF30 size-median industry)

This table presents the results of OLS and instrumental variables (IV) estimation of ITIs on corporate hedging with year and industry fixed effects. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. *LN_INDGAP2* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 size-median industry and the CEO's total compensation. In the first stage, we regress *LN_INDGAP2* variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. Models (1), (4), and (6) present marginal effects of Probit (IVProbit) models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
				2SLS		2nd stage
	Probit	OLS	1st stage	2nd stage	2nd stage	IVProbit
Dependent variable	$HEDGE_{t+1}$	ln(1+*HEDGE* $count_{t+1}$)	$LN\_INDGAP2_t$	$HEDGE_{t+1}$	ln(1+*HEDGE* $count_{t+1}$)	$HEDGE_{t+1}$
Predicted **$LN\_INDGAP2_t$**				**0.022*** **	**0.099*** **	**0.072*** **
				(2.833)	(3.988)	(2.664)
$LN\_INDGAP2_t$	**0.008** **	**0.028*** **				
	(2.357)	(2.849)				
ln(*Firm gap*$_t$)	0.025***	0.076***	0.303***	0.030***	0.105***	0.094***
	(3.881)	(4.136)	(16.860)	(4.320)	(5.127)	(4.348)
ln(*CEO delta*$_t$)	0.006	0.006	0.015	0.005	0.007	0.017
	(0.749)	(0.288)	(1.178)	(0.747)	(0.370)	(0.797)
ln(*CEO vega*$_t$)	-0.006	-0.013	0.006	-0.004	-0.013	-0.019
	(-1.252)	(-0.887)	(0.706)	(-0.923)	(-0.934)	(-1.264)
ln(*CEO tenure*$_t$)	-0.011	-0.036*	0.009	-0.010	-0.037*	-0.033
	(-1.372)	(-1.647)	(0.578)	(-1.358)	(-1.662)	(-1.405)
ln(*CEO age*$_t$)	0.008	-0.116	-0.046	0.002	-0.121	0.020
	(0.125)	(-0.655)	(-0.454)	(0.041)	(-0.688)	(0.109)
ln(*Total assets*$_t$)	0.055***	0.262***	0.368***	0.043***	0.234***	0.145***
	(5.434)	(9.418)	(23.617)	(4.647)	(7.790)	(4.316)
$R\&D_t/Assets_t$	0.334*	1.106**	0.872***	0.383**	1.100**	0.990*
	(1.768)	(2.069)	(3.266)	(2.088)	(2.074)	(1.769)
$Leverage_t$	0.363***	1.451***	-0.184**	0.338***	1.442***	1.071***
	(6.513)	(9.235)	(-2.133)	(7.016)	(9.202)	(6.576)
Tobin's Q_t	-0.023***	-0.049**	0.052***	-0.025***	-0.050***	-0.070***
	(-3.346)	(-2.577)	(4.059)	(-3.603)	(-2.676)	(-3.416)

CAPX$_t$/Assets$_t$	0.286	0.970**	-0.387	0.206	0.972**	0.845
	(1.621)	(1.968)	(-1.090)	(1.287)	(1.980)	(1.614)
ROA$_t$	0.050	-0.102	-0.392**	0.069	-0.074	0.167
	(0.518)	(-0.412)	(-2.272)	(0.749)	(-0.298)	(0.586)
Cash$_t$/Assets$_t$	-0.202***	-0.601***	0.062	-0.210***	-0.570***	-0.577***
	(-3.508)	(-3.781)	(0.687)	(-3.731)	(-3.597)	(-3.381)
PPE$_t$/Assets$_t$	-0.180**	-0.560***	-0.531***	-0.134**	-0.524**	-0.504**
	(-2.463)	(-2.615)	(-4.171)	(-2.028)	(-2.455)	(-2.327)
Cashflow vol$_t$	-0.300	-0.943*	1.018***	-0.355*	-1.049**	-0.963*
	(-1.637)	(-1.921)	(3.200)	(-1.957)	(-2.127)	(-1.768)
Z-score$_t$	-0.004	0.014	0.042***	-0.004	0.007	-0.016
	(-0.535)	(0.697)	(4.326)	(-0.588)	(0.352)	(-0.724)
ln(1+*Firm age$_t$*)	-0.042***	-0.102**	0.049**	-0.038***	-0.108***	-0.129***
	(-2.742)	(-2.452)	(2.186)	(-2.903)	(-2.580)	(-2.831)
Non-debt tax shield$_t$	-0.030	0.397	2.180***	-0.084	0.188	-0.227
	(-0.079)	(0.384)	(3.368)	(-0.238)	(0.181)	(-0.202)
Inventory$_t$	0.130**	0.331**	-0.222***	0.136**	0.359**	0.404**
	(2.234)	(2.052)	(-2.845)	(2.553)	(2.251)	(2.363)
Trade credit$_t$	0.041	0.570	0.983***	0.014	0.445	0.038
	(0.276)	(1.332)	(4.887)	(0.102)	(1.027)	(0.085)
ln(*Ind # CEOs$_t$*)	-0.145***	-0.436***	0.043	-0.154***	-0.534***	-0.493***
	(-2.753)	(-2.833)	(0.231)	(-3.281)	(-3.386)	(-3.066)
ln(*Ind CEO comp$_t$*) (IV)			1.263***			
			(14.806)			
ln(*#Higher paid ind CEOs$_t$*) (IV)			1.631***			
			(36.908)			
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,274	19,274	19,274	19,274	19,274	19,274
Adj. R-squared		0.271	0.502	0.166	0.266	
Pseudo R-squared	0.145					
Endogeneity, relevance, and overidentification tests						
Exogeneity test (Wald/Hausman *p*-value)				0.006***	0.000***	0.029**
First-stage *F*-statistics				3554.301***	3554.301***	
Hansen *J*-test (*p*-value)				0.065*	0.217	

Table 3.4: Industry tournament incentives and corporate hedging (with CEO-firm and year fixed effects)

This table presents the results of instrumental variables (IV) estimation of ITIs on corporate hedging with CEO-firm and year fixed effects. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. *LN_INDGAP1* (*LN_INDGAP2*) is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same FF30 industry (FF30 size-median) and the CEO's total compensation. The controls are the same as in Table 2. In the first stage of 2SLS, we regress *LN_INDGAP1* (*LN_INDGAP2)* variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the average total compensation received by all other CEOs working in the firms in different industries that are headquartered within a 250-km radius of the firm, *Geo CEO mean*. All the other variables are defined in Appendix A. We include year fixed effects and CEO-firm fixed effects in all specifications. *T*-statistics (in parentheses) are computed using robust standard errors corrected for clustering at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	ITIs based on FF30 industry classification			*ITIs based on FF30 size-median industry classification*		
	1st stage	2nd stage 2SLS		1st stage	2nd stage 2SLS	
Dependent variable	$LN\_INDGAP1_t$	$HEDGE_{t+1}$	ln(1+$HEDGE\ count_{t+1}$)	$LN\_INDGAP2_t$	$HEDGE_{t+1}$	ln(1+$HEDGE\ count_{t+1}$)
Predicted $\boldsymbol{LN\_INDGAP1_t}$		**0.040*** **	**0.105*** **			
		(2.818)	(2.628)			
Predicted $\boldsymbol{LN\_INDGAP2_t}$					**0.037** **	**0.098** **
					(2.544)	(2.293)
ln(*Ind CEO comp*$_t$) (IV)	1.741***			1.690***		
	(54.779)			(15.581)		
ln(*Geo CEO mean*$_t$) (IV)	-0.049**			0.019		
	(-2.409)			(0.295)		
$Controls_t$	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
CEO-firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,899	18,899	18,899	18,555	18,555	18,555
Adj. R-squared	0.795	0.064	0.126	0.487	0.035	0.098
Endogeneity, relevance, and overidentification tests						
Exogeneity test (Hausman *p*-value)		0.004***	0.007***		0.014***	0.020**
First-stage *F*-statistics		2680.121***	2680.121***		249.123***	249.123***
Hansen *J*-test (*p*-value)		0.917	0.276		0.986	0.166

Table 3.5: Industry tournament incentives and different types of hedging activities

This table presents the results of the 2nd stage of instrumental variables (IV) estimation of ITIs on different types of hedging instruments. *FX hedge*, *IR hedge*, and *CMD hedge* are dummy variables that are set equal to one if a firm is defined to use the foreign exchange hedging, interest rate hedging, and commodity hedging, respectively, set to zero otherwise. *FX count*, *IR count*, and *CMD count* are the number of times a firm mentions its foreign exchange hedging, interest rate hedging, and commodity hedging, respectively, in the 10-K statement. The details on these hedging variables are discussed in Appendix B. *LN_INDGAP1* (*LN_INDGAP2*) is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same FF30 (FF30 size-median) industry and the CEO's total compensation. The controls are the same as in Table 2. In the first stage, we regress *LN_INDGAP1* (*LN_INDGAP2*) variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. For dummy dependent variables, we report the marginal effects of IVProbit models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Foreign exchange hedging				Interest rate hedging				Commodity hedging			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent var	$FX\ hedge_{t+1}$		$\ln(1+FX\ count_{t+1})$		$IR\ hedge_{t+1}$		$\ln(1+IR\ count_{t+1})$		$CMD\ hedge_{t+1}$		$\ln(1+CMD\ count_{t+1})$	
$LN\_INDGAP1_t$	**0.111****		**0.049**		**0.088***		**0.095****		**0.001**		**0.086*****	
	(2.237)		(1.181)		(1.829)		(2.349)		(0.020)		(3.561)	
$LN\_INDGAP2_t$		**0.088*****		**0.077*****		**0.028**		**0.046****		**0.020**		**0.021***
		(3.361)		(3.448)		(1.177)		(2.237)		(0.574)		(1.907)
$Controls_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,631	19,274	19,631	19,274	19,631	19,274	19,631	19,274	19,631	19,274	19,631	19,274
Adj. R-squared			0.278	0.275			0.246	0.244			0.332	0.336
Exogeneity test	0.632	0.005***	0.584	0.011***	0.325	0.578	0.269	0.035**	0.122	0.910	0.000***	0.070*
First-stage *F*-stat			6393***	3554***			6393***	3554***			6393***	3554***
Hansen *J*-test (*p*)			0.714	0.324			0.182	0.075*			0.008***	0.000***

Table 3.6: The effect of ITIs on stock price crash risk differing in hedging activities

This table presents the results of OLS and Tobit estimation of the effect of ITIs on stock price crash risk in the firms differing in hedging activities. We use three measures of crash risk: *CRASH* is a dummy variable set to one if the firm has a weekly return that is less than 3.2 standard deviations below the average weekly return for the entire fiscal year; *DUVOL* is the natural logarithm of the ratio of the standard deviation of weekly returns for below-average weeks to the standard deviation of weekly returns for above-average weeks, over the fiscal year; *NCSKEW* is the negative conditional skewness of firm-specific weekly returns during the entire fiscal year. The details on these measures are discussed in Appendix C. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. The subsample with *HEDGE* equals one is defined as *Hedgers*, and with *HEDGE* equals zero is defined as *Non-Hedgers*. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 industry (FF30) industry and the CEO's total compensation. All the other variables are defined in Appendix A. Models (1), (2), and (7) present marginal effects of Tobit models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Non-Hedgers	Hedgers	Non-Hedgers	Hedgers	Non-Hedgers	Hedgers	Full sample with the interaction of ITIs on hedging		
Dependent variable	$CRASH_{t+1}$	$CRASH_{t+1}$	$DUVOL_{t+1}$	$DUVOL_{t+1}$	$NCSKEW_{t+1}$	$NCSKEW_{t+1}$	$CRASH_{t+1}$	$DUVOL_{t+1}$	$NCSKEW_{t+1}$
	Tobit	Tobit	OLS	OLS	OLS	OLS	Tobit	OLS	OLS
$LN\_INDGAP1_t$	**0.101*****	**0.025**	**0.055*****	**0.025****	**0.159*****	**0.065****	0.085***	0.050***	0.126***
	(2.640)	(0.945)	(3.099)	(2.249)	(3.201)	(2.132)	(3.208)	(4.293)	(3.857)
***$LN\_INDGAP1_t$* * ln(1+*HEDGE count*$_t$)**							**-0.017****	**-0.007***	**-0.014**
							(-2.009)	(-1.912)	(-1.417)
ln(1+*HEDGE count*$_t$)							0.188**	0.075**	0.158
							(2.249)	(2.076)	(1.605)
ln(*Firm gap*$_t$)	0.047**	0.019	0.030***	0.009	0.080***	0.026	0.030**	0.018***	0.049***
	(2.193)	(1.118)	(2.849)	(1.136)	(2.738)	(1.211)	(2.289)	(2.817)	(2.801)
ln(*CEO delta*$_t$)	0.057***	0.000	0.031***	0.015**	0.116***	0.048**	0.024*	0.022***	0.076***
	(2.766)	(0.023)	(3.226)	(2.099)	(4.230)	(2.372)	(1.944)	(3.851)	(4.675)
ln(*CEO vega*$_t$)	-0.019	-0.026***	-0.010	-0.020***	-0.037*	-0.061***	-0.027***	-0.018***	-0.056***
	(-1.188)	(-2.594)	(-1.353)	(-4.297)	(-1.744)	(-4.867)	(-3.167)	(-4.453)	(-5.204)
ln(*CEO tenure*$_t$)	-0.050*	0.039**	-0.018	0.014*	-0.054*	0.036	0.008	0.003	0.004
	(-1.952)	(2.206)	(-1.573)	(1.671)	(-1.701)	(1.603)	(0.538)	(0.411)	(0.228)
ln(*CEO age*$_t$)	-0.271*	-0.028	-0.090	0.012	-0.236	0.102	-0.124	-0.025	-0.024
	(-1.705)	(-0.233)	(-1.271)	(0.226)	(-1.159)	(0.687)	(-1.268)	(-0.576)	(-0.198)
$DTURN_t$	4.030	2.351	0.015	1.724	1.598	5.367	3.132	1.115	3.959
	(0.949)	(0.676)	(0.008)	(1.230)	(0.283)	(1.356)	(1.153)	(0.965)	(1.214)
$NCSKEW_t$	0.015	0.001	0.003	-0.005	0.006	-0.010	0.007	-0.002	-0.003
	(0.863)	(0.084)	(0.367)	(-0.933)	(0.263)	(-0.623)	(0.688)	(-0.451)	(-0.206)
$SIGMA_t$	1.220	0.617	0.576	0.978***	1.718*	2.637***	0.969**	0.884***	2.412***

	(1.542)	(1.041)	(1.641)	(3.841)	(1.717)	(3.725)	(2.043)	(4.296)	(4.208)
RET_t	17.090***	10.176***	10.384***	8.329***	28.502***	22.877***	12.966***	9.137***	25.199***
	(5.859)	(4.361)	(8.198)	(8.612)	(7.982)	(8.243)	(6.945)	(11.883)	(11.450)
$OPAQUE_t$	-0.425***	-0.415**	-0.134**	-0.153**	-0.396**	-0.303	-0.415***	-0.142***	-0.375***
	(-2.621)	(-2.373)	(-2.216)	(-2.010)	(-2.337)	(-1.325)	(-3.483)	(-2.991)	(-2.928)
ln(*Total assets*$_t$)	-0.038*	-0.013	0.004	0.013*	-0.012	0.009	-0.022*	0.009	0.001
	(-1.665)	(-0.834)	(0.404)	(1.868)	(-0.393)	(0.501)	(-1.657)	(1.579)	(0.036)
MTB_t	0.026*	0.052***	0.042***	0.051***	0.137***	0.162***	0.040***	0.046***	0.148***
	(1.687)	(3.568)	(4.952)	(5.894)	(5.770)	(6.642)	(3.737)	(7.703)	(8.847)
$Leverage_t$	0.009	-0.015	-0.094	-0.057	-0.243	-0.118	-0.000	-0.058*	-0.131
	(0.065)	(-0.162)	(-1.459)	(-1.431)	(-1.328)	(-1.077)	(-0.005)	(-1.726)	(-1.394)
ROA_t	0.332	0.749***	0.163*	0.386***	0.096	0.762***	0.562***	0.292***	0.491***
	(1.590)	(4.086)	(1.744)	(4.588)	(0.357)	(3.155)	(4.118)	(4.751)	(2.814)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,127	10,283	5,110	10,261	5,110	10,261	15,410	15,372	15,372
Adj. R-squared			0.079	0.056	0.092	0.061		0.063	0.071
Pseudo R-squared	0.027	0.019					0.019		

Table 3.7: The effect of ITIs on loan spread differing in hedging activities

This table presents the results of the 2SLS estimation of the effect of ITIs on loan spread in the firms differing in hedging activities. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. The subsample with *HEDGE* equals one is defined as *Hedgers*, and with *HEDGE* equals zero is defined as *Non-Hedgers*. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 industry (FF30) industry and the CEO's total compensation. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry (*Ind CEO comp*) and the total number of CEOs with higher total compensation within the same industry (*#Higher paid ind CEOs*). All the other variables are defined in Appendix A. The sample period is from 1997 to 2015. *T*-statistics (in parentheses) are computed using robust standard errors corrected for clustering at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Hedgers		Non-Hedgers	
Dependent variable	$Ln(Loan\ spread_t)$			
Predicted				
LN_INDGAP1 $_{t-1}$	**0.099***	**0.074****	**0.162*****	**0.187*****
	(1.896)	(1.977)	(2.671)	(2.748)
ln(*CEO delta* $_{t-1}$)	0.010	0.005	-0.020	-0.017
	(0.973)	(0.627)	(-1.513)	(-1.189)
ln(*CEO vega* $_{t-1}$)	-0.026***	-0.008	0.013	0.026**
	(-3.479)	(-1.340)	(1.084)	(1.996)
ln(*Total assets* $_{t-1}$)	-0.179***	-0.015	-0.232***	-0.024
	(-8.014)	(-0.831)	(-9.830)	(-0.667)
ln(*MTB* $_{t-1}$)	-0.171***	-0.131***	-0.171***	-0.120***
	(-7.298)	(-7.788)	(-9.103)	(-5.042)
Leverage $_{t-1}$	0.838***	0.486***	0.471***	0.246*
	(8.556)	(6.780)	(3.883)	(1.675)
ROA $_{t-1}$	-0.135	-0.116	-0.122	-0.077
	(-0.773)	(-0.886)	(-0.510)	(-0.236)
Asset maturity $_{t-1}$	-0.000	0.001	0.003	0.004
	(-0.026)	(0.225)	(0.599)	(0.702)
($PPE_{t-1}/Assets_{t-1}$)	-0.480***	-0.253***	-0.616***	-0.483***
	(-4.213)	(-2.887)	(-4.162)	(-2.702)
Cashflow vol $_{t-1}$	2.650***	2.228***	1.931***	2.266***
	(6.828)	(7.272)	(3.732)	(3.541)
Z-score $_{t-1}$	-0.114***	-0.064***	-0.065***	-0.032
	(-6.212)	(-5.005)	(-3.447)	(-1.237)
Rated Dummy $_{t-1}$	0.102***	0.036	0.114***	0.075
	(3.231)	(1.563)	(2.724)	(1.508)
ln(*Loan maturity* $_t$)		0.171***		0.138***
		(10.419)		(5.777)
Loan Secured $_t$		0.445***		0.563***
		(22.127)		(14.824)
Covenant count $_t$		0.042***		0.031**
		(5.625)		(2.248)
Performance pricing $_t$		-0.148***		-0.049
		(-8.552)		(-1.438)
ln(*No. of Lenders* $_t$)		-0.016		0.039*
		(-1.351)		(1.722)
ln(*Loan Amount* $_t$)		-0.170***		-0.214***
		(-14.809)		(-8.490)
Term loan $_t$		-0.010		0.034

		(-0.148)		(0.340)
Revolver loan$_t$		-0.256***		-0.312***
		(-3.776)		(-2.934)
Bridge loan$_t$		0.440***		0.293*
		(4.835)		(1.727)
General purpose loan$_t$		0.009		0.028
		(0.376)		(0.665)
Takeover/Recap loan$_t$		0.100***		0.167***
		(3.595)		(3.247)
Working capital loan$_t$		0.053**		0.079*
		(2.206)		(1.679)
Credit spread$_t$	-14.463***	-9.873***	-4.386	-0.153
	(-6.056)	(-5.800)	(-1.184)	(-0.042)
Term spread$_t$	6.000***	7.554***	3.576***	3.620***
	(6.340)	(11.266)	(2.714)	(2.732)
Crisis dummy$_t$	0.150***	0.054	0.318***	0.197**
	(2.633)	(1.294)	(4.019)	(2.483)
Post-crisis dummy$_t$	0.622***	0.580***	0.818***	0.764***
	(17.718)	(19.457)	(19.201)	(13.687)
ln(*Ind # CEOs$_{t-1}$*)	0.239**	0.136*	-0.117	-0.215
	(2.341)	(1.723)	(-0.960)	(-1.597)
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	8,732	8,732	2,744	2,744
Adj. R-squared	0.381	0.604	0.406	0.598
Endogeneity, relevance, and overidentification tests				
Hausman *p*-value	0.028**	0.033**	0.00***	0.00***
First-stage *F*-statistic	55.345***	55.183***	21.22***	21.22***
Hansen *J*-test (*p*-value)	0.000***	0.000***	0.000***	0.000***

Table 3.8: Industry tournament incentives and corporate hedging (financial distress analysis)

This table presents the results of 2nd stage of instrumental variables (IV) estimation of ITIs on hedging varying across firms with different levels of financial distress. The dependent variable is the natural logarithm of one plus *HEDGE count* variable, which is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The sample is grouped in two subsamples based on whether a firm has below or above sample-year median Altman *Z*-score, Merton model expected default frequency (EDF), and Naïve model expected default frequency (EDF). The Altman's *Z*-score is the modified Altman (1968) *Z*-score, where a below-median value indicates a higher likelihood of default (High distress). The Merton EDF is computed following the Merton (1974) bond pricing model, and the Naïve EDF is computed based on the "simplified" Merton model probability of default following Bharath and Shumway (2008). The above-median values of Merton and Naïve EDF indicate a higher likelihood of default (High distress). The details are in Appendix D. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same FF30 industry and the CEO's total compensation. The controls are the same as in Table 2. In the first stage, we regress *LN_INDGAP1* variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. *T*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Altman's Z-score		Merton EDF		Naïve EDF	
	(1)	(2)	(3)	(4)	(5)	(6)
	Low distress	High distress	Low distress	High distress	Low distress	High distress
Dependent variable			ln(1+*HEDGE count*$_{t+1}$)			
Predicted ***LN_INDGAP1***$_t$	**0.216*****	**0.086**	**0.237*****	**0.034**	**0.237*****	**0.037**
	(3.727)	(1.370)	(3.596)	(0.549)	(3.589)	(0.585)
Controls$_t$	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,817	9,814	8,270	8,264	8,271	8,263
Adj. R-squared	0.182	0.127	0.123	0.122	0.122	0.122
Endogeneity, relevance, and overidentification tests						
Exogeneity test (*p*-value)	0.207	0.203	0.040**	0.560	0.039**	0.555
First-stage *F*-statistics	3567.209***	2883.911***	2559.888***	2583.875***	2562.866***	2582.746***
Hansen *J*-test (*p*-value)	0.375	0.958	0.808	0.942	0.819	0.933

Table 3.9: Untangling the effect of ITIs on corporate hedging based on the likelihood of a CEO to move

This table presents the results of instrumental variables (IV) estimation of ITIs on corporate hedging differing in the likelihood of a CEO to move. A CEO is defined as a founder CEO based on ExecuComp's title variable. A CEO is defined as a retiring CEO if the age of the CEO is greater than 65 years. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 industry and the CEO's total compensation. The controls are the same as in Table 2. In the first stage, we regress the industry pay gap variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. We use 2SLS model for *HEDGE count* variable and IVProbit model for *HEDGE* variable. Models (3), (4), (7), and (8) present marginal effects of IVProbit models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Founder CEO	Non-Founder CEO	Founder CEO	Non-Founder CEO	Retiring CEO	Non-Retiring CEO	Retiring CEO	Non-Retiring CEO
Dependent variable	ln(1+*HEDGE count*$_{t+1}$)		*HEDGE*$_{t+1}$		ln(1+*HEDGE count*$_{t+1}$)		*HEDGE*$_{t+1}$	
Predicted ***LN_INDGAP1***$_t$	**0.054**	**0.162*** **	**0.069**	**0.196*** **	**0.214**	**0.155*** **	**0.218**	**0.195*** **
	(0.411)	(3.431)	(0.336)	(3.766)	(1.437)	(3.288)	(1.202)	(3.753)
Controls$_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,446	18,185	1,384	18,185	1,400	18,231	1,370	18,231
Adj. R-squared	0.361	0.269			0.349	0.270		
Endogeneity, relevance, and overidentification tests								
Exogeneity test (Hausman/Wald *p*-value)	0.448	0.047**	0.742	0.057**	0.133	0.086	0.233	0.067*
First-stage *F*-statistics	455.802***	5854.720***			299.324***	5954.125***		
Hansen *J*-test (*p*-value)	0.271	0.996			0.690	0.784		

Table 3.10: Effect of enforceability of non-competition agreements on the relation between ITIs and corporate hedging

This table presents the results of OLS and instrumental variables (IV) estimation of ITIs on corporate hedging differing in the enforceability of non-competition agreements. *NON_COMPETE* takes on the value of +1 for firms headquartered in Florida from 1997-2016, in Kentucky from 2007-2016, in Idaho and Oregon from 2009-2016, in Texas and Wisconsin from 2010-2016, in Colorado and Georgia from 2012-2016, in Illinois from 2012-2013, and in Virginia from 2014-2016; takes the value of -1 for firms in Texas from 1995-2006, in Louisiana from 2002-2003, in South Carolina from 2011-2016, and in Montana from 2012-2016; and is set to equal 0 otherwise. Panel A reports OLS estimation for three groups partitioned on the number of in-state competitors in the given year, greater than 5, 14, and 43 (25^{th}, 50^{th}, and 75^{th} percentiles, respectively). Panel B reports the second stage of IV estimation where *ENFORCE* is set equal to one if the non-competition agreement is enacted in the state for the given year, otherwise set to zero. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. *LN_INDGAP1* (*LN_INDGAP2*) is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 (FF30 size-median) industry and the CEO's total compensation. For Panel B, in the first stage, we regress industry pay gap variables on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. We use 2SLS model for *HEDGE count* variable and IVProbit model for indicator *HEDGE* variable. Models (1), (2), (5), and (6) in Panel B present marginal effects of IVProbit models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: OLS estimation for enforceability of non-competition agreements on the relation between ITIs and corporate hedging

	ITIs based on FF30 industry classification			ITIs based on FF30 size-median industry classification		
Dependent var = ln(1+*HEDGE count*$_t$)	(1) #In-state competitors > 5	(2) #In-state competitors > 14	(3) #In-state competitors > 43	(4) #In-state competitors > 5	(5) #In-state competitors > 14	(6) #In-state competitors > 43
LN_INDGAP1$_t$* NON_COMPETE$_t$	**-0.077**	**-0.019**	**-0.248****			
	(-1.094)	(-0.254)	(-2.386)			
LN_INDGAP1$_t$	0.110***	0.085**	0.158**			
	(3.308)	(2.032)	(2.411)			
LN_INDGAP2$_t$* NON_COMPETE$_t$				**-0.027**	**0.010**	**-0.127****
				(-0.865)	(0.284)	(-2.418)
LN_INDGAP2$_t$				0.049***	0.057***	0.090***
				(3.442)	(3.111)	(3.162)
NON_COMPETE$_t$	0.755	0.221	2.606**	0.245	-0.049	1.260***
	(1.104)	(0.308)	(2.510)	(0.859)	(-0.153)	(2.593)
ln(*Firm gap$_t$*)	0.060***	0.066***	0.086***	0.071***	0.082***	0.102***
	(2.665)	(2.673)	(2.607)	(3.056)	(3.249)	(3.032)
ln(*CEO delta$_t$*)	-0.017	-0.018	0.017	-0.015	-0.016	0.016
	(-0.743)	(-0.634)	(0.432)	(-0.659)	(-0.575)	(0.419)
ln(*CEO vega$_t$*)	-0.017	-0.018	-0.027	-0.021	-0.022	-0.035
	(-0.942)	(-0.810)	(-0.816)	(-1.140)	(-0.967)	(-1.052)
ln(*CEO tenure$_t$*)	-0.007	-0.003	-0.085*	-0.003	0.001	-0.081*

	(-0.233)	(-0.097)	(-1.785)	(-0.111)	(0.016)	(-1.692)
ln(*CEO age$_t$*)	-0.075	-0.190	0.040	-0.086	-0.206	-0.012
	(-0.342)	(-0.751)	(0.113)	(-0.392)	(-0.815)	(-0.034)
ln(*Total assets$_{t-1}$*)	0.314***	0.339***	0.338***	0.287***	0.310***	0.301***
	(9.733)	(9.222)	(7.278)	(8.494)	(8.026)	(6.007)
R&D$_{t-1}$/Assets$_{t-1}$	0.752	0.732	1.054	0.711	0.690	1.041
	(1.268)	(1.165)	(1.418)	(1.187)	(1.091)	(1.394)
Leverage$_{t-1}$	1.364***	1.167***	0.959***	1.378***	1.170***	0.938***
	(6.960)	(4.930)	(3.320)	(6.987)	(4.915)	(3.232)
Tobin's Q$_{t-1}$	-0.024	-0.032	-0.046*	-0.025	-0.033	-0.046*
	(-1.182)	(-1.428)	(-1.726)	(-1.233)	(-1.461)	(-1.682)
CAPX$_{t-1}$/Assets$_{t-1}$	-0.100	-0.226	-0.750	0.050	-0.144	-0.716
	(-0.166)	(-0.346)	(-0.835)	(0.081)	(-0.223)	(-0.832)
ROA$_{t-1}$	-0.161	-0.126	-0.022	-0.196	-0.160	-0.077
	(-0.539)	(-0.398)	(-0.056)	(-0.657)	(-0.504)	(-0.201)
Cash$_{t-1}$/Assets$_{t-1}$	-0.915***	-0.820***	-0.953***	-0.895***	-0.791***	-0.913***
	(-4.886)	(-3.781)	(-3.968)	(-4.761)	(-3.640)	(-3.800)
PPE$_{t-1}$/Assets$_{t-1}$	0.042	-0.079	0.393	0.019	-0.101	0.350
	(0.151)	(-0.245)	(0.906)	(0.069)	(-0.316)	(0.820)
Cashflow vol$_{t-1}$	-0.421	-0.823	-1.152	-0.464	-0.985	-1.462*
	(-0.732)	(-1.279)	(-1.358)	(-0.804)	(-1.532)	(-1.733)
Z-score$_{t-1}$	0.020	0.018	0.022	0.020	0.016	0.020
	(0.851)	(0.750)	(0.734)	(0.861)	(0.664)	(0.670)
ln(1+*Firm age$_{t-1}$*)	-0.178***	-0.183***	-0.338***	-0.181***	-0.182***	-0.337***
	(-3.393)	(-2.836)	(-3.446)	(-3.429)	(-2.827)	(-3.464)
Non-debt tax shield$_{t-1}$	-0.209	-0.084	0.611	-0.199	0.058	0.911
	(-0.169)	(-0.060)	(0.348)	(-0.160)	(0.042)	(0.531)
Inventory$_{t-1}$	0.037	0.015	0.006	0.057	0.039	0.032
	(0.195)	(0.067)	(0.021)	(0.301)	(0.177)	(0.119)
Trade credit$_{t-1}$	0.331	0.743	1.170	0.229	0.645	1.123
	(0.595)	(1.185)	(1.408)	(0.405)	(1.019)	(1.355)
ln(*Ind # CEOs$_t$*)	-0.391*	-0.255	-0.223	-0.338	-0.175	0.118
	(-1.725)	(-0.795)	(-0.388)	(-1.559)	(-0.567)	(0.218)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,455	7,700	3,924	11,455	7,700	3,924
Adj. R-squared	0.293	0.314	0.353	0.293	0.316	0.356

Panel B: IV estimation for enforceability of non-competition agreements on the relation between ITIs and corporate hedging

	ITIs based on FF30 industry classification				ITIs based on FF30 size-median industry classification			
	(1) ENFORCE = 1	(2) ENFORCE = 0	(3) ENFORCE = 1	(4) ENFORCE = 0	(5) ENFORCE = 1	(6) ENFORCE = 0	(7) ENFORCE = 1	(8) ENFORCE = 0
Dependent variable	$HEDGE_{t+1}$		ln(1+$HEDGE\ count_{t+1}$)		$HEDGE_{t+1}$		ln(1+$HEDGE\ count_{t+1}$)	
Predicted ***LN_INDGAP1***$_t$	**-0.184**	**0.221*****	**-0.046**	**0.176*****				
	(-1.178)	(4.236)	(-0.349)	(3.799)				
Predicted ***LN_INDGAP2***$_t$					**0.060**	**0.076*****	**0.075**	**0.101*****
					(0.797)	(2.734)	(1.265)	(4.001)
ln($Firm\ gap_t$)	0.021	0.076***	0.039	0.072***	0.085	0.086***	0.098	0.096***
	(0.337)	(3.662)	(0.680)	(3.884)	(1.154)	(3.767)	(1.465)	(4.582)
ln($CEO\ delta_t$)	-0.042	0.031	0.004	0.006	-0.041	0.035	0.011	0.012
	(-0.806)	(1.340)	(0.077)	(0.290)	(-0.784)	(1.495)	(0.223)	(0.564)
ln($CEO\ vega_t$)	-0.019	-0.019	-0.015	-0.012	-0.025	-0.023	-0.024	-0.017
	(-0.518)	(-1.222)	(-0.482)	(-0.805)	(-0.679)	(-1.476)	(-0.759)	(-1.152)
ln($CEO\ tenure_t$)	-0.052	-0.037	-0.041	-0.034	-0.039	-0.035	-0.045	-0.034
	(-0.777)	(-1.510)	(-0.727)	(-1.507)	(-0.570)	(-1.425)	(-0.785)	(-1.518)
ln($CEO\ age_t$)	-0.031	0.005	-0.336	-0.120	-0.062	-0.007	-0.287	-0.125
	(-0.059)	(0.025)	(-0.777)	(-0.679)	(-0.116)	(-0.036)	(-0.666)	(-0.703)
ln($Total\ assets_t$)	0.351***	0.176***	0.365***	0.273***	0.349***	0.129***	0.342***	0.220***
	(4.659)	(5.823)	(5.784)	(9.997)	(4.353)	(3.699)	(5.063)	(7.089)
$R\&D_t/Assets_t$	-1.526	0.561	0.941	0.696	-1.488	0.461	1.179	0.645
	(-0.629)	(0.964)	(0.503)	(1.335)	(-0.621)	(0.786)	(0.638)	(1.230)
$Leverage_t$	1.451***	1.098***	1.647***	1.440***	1.394***	1.112***	1.625***	1.461***
	(3.238)	(6.593)	(4.203)	(9.160)	(3.102)	(6.643)	(4.132)	(9.232)
$Tobin's\ Q_t$	-0.088	-0.067***	-0.090*	-0.045**	-0.066	-0.069***	-0.080	-0.048**
	(-1.337)	(-3.130)	(-1.801)	(-2.359)	(-1.029)	(-3.279)	(-1.643)	(-2.519)
$CAPX_t/Assets_t$	1.454	0.538	0.103	0.785	1.369	0.772	0.308	0.997**
	(0.998)	(0.979)	(0.095)	(1.553)	(0.938)	(1.414)	(0.294)	(1.964)
ROA_t	-0.037	0.318	-0.473	0.053	-0.218	0.293	-0.592	0.061
	(-0.043)	(1.042)	(-0.740)	(0.209)	(-0.256)	(0.964)	(-0.920)	(0.239)
$Cash_t/Assets_t$	0.253	-0.836***	1.084**	-0.855***	0.365	-0.808***	1.172**	-0.818***
	(0.394)	(-4.770)	(2.042)	(-5.485)	(0.548)	(-4.585)	(2.138)	(-5.234)
$PPE_t/Assets_t$	-0.083	-0.488**	0.538	-0.565**	-0.116	-0.485**	0.483	-0.548**
	(-0.181)	(-2.055)	(1.292)	(-2.494)	(-0.249)	(-2.074)	(1.150)	(-2.433)

Cashflow vol$_t$	-1.293	-0.692	-1.656	-0.558	-1.939	-0.785	-2.045	-0.701
	(-0.853)	(-1.225)	(-1.323)	(-1.115)	(-1.285)	(-1.375)	(-1.567)	(-1.385)
Z-score$_t$	0.028	-0.022	0.037	0.007	0.013	-0.024	0.026	0.002
	(0.441)	(-0.935)	(0.690)	(0.358)	(0.205)	(-0.985)	(0.489)	(0.101)
ln(1+*Firm age*$_t$)	-0.311***	-0.080*	-0.155*	-0.070	-0.323***	-0.089*	-0.165*	-0.078*
	(-2.665)	(-1.670)	(-1.786)	(-1.572)	(-2.724)	(-1.832)	(-1.892)	(-1.734)
Non-debt tax shield$_t$	-2.176	-0.299	-1.455	-0.021	-1.735	-0.412	-1.249	-0.317
	(-0.699)	(-0.263)	(-0.565)	(-0.020)	(-0.557)	(-0.357)	(-0.491)	(-0.303)
Inventory$_t$	-0.269	0.285	-0.316	0.247	-0.235	0.342*	-0.125	0.301*
	(-0.506)	(1.595)	(-0.792)	(1.513)	(-0.422)	(1.921)	(-0.294)	(1.851)
Trade credit$_t$	1.034	-0.148	2.122**	0.190	0.917	-0.308	1.939**	-0.009
	(0.897)	(-0.313)	(2.277)	(0.419)	(0.772)	(-0.637)	(2.021)	(-0.019)
ln(*Ind # CEOs*$_t$)	0.752	-0.534***	0.178	-0.544***	0.628	-0.573***	0.119	-0.662***
	(1.208)	(-2.939)	(0.336)	(-3.389)	(1.044)	(-3.433)	(0.233)	(-4.099)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,296	17,335	2,296	17,335	2,242	17,032	2,197	17,074
Adj. R-squared			0.224	0.190			0.229	0.185
Endogeneity, relevance, and overidentification tests								
Exogeneity test (Hausman/Wald *p*-value)	0.054*	0.027**	0.299	0.059*	0.814	0.017**	0.803	0.000***
First-stage *F*-statistics			671.124***	5911.474***			309.952***	3242.490***
Hansen *J*-test (*p*-value)			0.644	0.953			0.349	0.132

Table 3.11: Industry tournament incentives and corporate hedging in various industries

This table presents the results of 2SLS estimation of ITIs on corporate hedging for different Fama-French 30 (FF30) industries. Due to a small number of firms, we combine firms in Food Products, Beer and Liquor, and Tobacco Products together. We also merge firms in Mines and Coal industry due to the same reason. We separately run our main model in Table 2 for each FF30 industry. We report the coefficients on the predicted *LN_INDGAP1* variable in the 2nd stage regression where the dependent variable is ln(1+*HEDGE count*). *HEDGE* count is a count of the number of times a firm mentions the use of any hedging instruments in its 10-K statement. *LN_INDGAP1* is the natural logarithm of one plus pay gap between the second-highest-paid CEO's total compensation within the same FF30 industry and the CEO's total compensation. In the first stage, we regress *LN_INDGAP1* variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp,* and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the control variables are defined in Appendix A. *T*-statistics are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Fama French-30 Industry	Coefficient on Predicted $LN\_INDGAP1_t$	*T*-statistics	N
Food Products, Beer and Liquor, and Tobacco	0.158	(0.617)	667
Games & Recreation	0.173	(0.578)	299
Books, Printing and Publishing	0.091	(0.294)	285
Household Consumer Goods	-0.271	(-0.587)	406
Clothing and Accessories	-0.885	(-1.509)	382
Healthcare, Medical Equip. & Pharmaceuticals	0.155	(0.558)	2,093
Chemicals	-0.063	(-0.197)	674
Textiles	1.776	(1.552)	104
Construction and Construction Materials	-0.265	(-0.699)	723
Steel Works	0.103	(0.390)	411
Fabricated Products and Machinery	0.335	(1.190)	968
Electrical Equipment	0.189	(0.326)	288
Automobiles and Trucks	-0.190	(-0.475)	409
Aircraft, Ships and Railroad Equipment	0.627**	(2.330)	161
Mines & Coal	1.278***	(2.667)	180
Oil, Petroleum and Natural Gas	0.556**	(2.108)	960
Telecommunications	-0.526	(-1.363)	469
Personal and Business Services	0.301	(0.750)	2,585
Business Equipment	0.580***	(2.590)	3,126
Paper and Business Supplies	-0.377	(-1.360)	548
Transportation	0.646*	(1.825)	714
Wholesale	0.131	(0.240)	869
Retail	0.478*	(1.949)	1,561
Restaurants, Hotels, Motels	0.012	(0.040)	441
Others	0.783*	(1.951)	308

Table 3.12: Robustness check: scaled measure of ITIs and FF48 industry classification

This table presents the 2nd stage results of instrumental variables (IV) estimation of ITIs on corporate hedging. *HEDGE* is a dummy variable assigned to one if a firm is defined to use any hedging activity (foreign exchange, interest rate, or commodity derivatives) in a given fiscal year and set to zero otherwise. *HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement. The details on these hedging variables are discussed in Appendix B. *INDGAP1* (*INDGAP2*) is the pay gap between the second-highest-paid CEO's total compensation within the same Fama-French 30 or 48 (size-median) industry and the CEO's total compensation. *Scaled_INDGAP1* (*Scaled_INDGAP2*) is the *INDGAP1 (INDGAP2*) divided by CEO's total compensation. *LN_INDGAP1* **(***LN_INDGAP2***)** is the natural logarithm of one plus the industry pay gap variable. The controls are the same as in Table 2. In the first stage, we regress the respective industry pay gap variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. For the models using scaled variables on the industry pay gap, we also use scaled variable on *Firm gap* by dividing it by the CEO's total compensation. All the other variables are defined in Appendix A. Models (1), (3), (5), and (7) present marginal effects of IVProbit models at the mean. *T* (Z)-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Scaled measure of ITIs based on FF30 industry		Scaled measure of ITIs based on FF30 size-median industry		ITIs based on FF48 industry		ITIs based on FF48 size-median industry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	$HEDGE_{t+1}$	ln(1+$HEDGE$ $count_{t+1}$)	$HEDGE_{t+1}$	ln(1+$HEDGE$ $count_{t+1}$)	$HEDGE_{t+1}$	ln(1+$HEDG$ E $count_{t+1}$)	$HEDGE_{t+1}$	ln(1+$HEDGE$ $count_{t+1}$)
Scaled_INDGAP1$_t$	**0.011*** **	**0.009*** **						
	(3.724)	(3.233)						
Scaled_INDGAP2$_t$			**0.014*** **	**0.019*** **				
			(2.633)	(3.632)				
LN_INDGAP1$_t$					**0.182*** **	**0.149*** **		
					(3.428)	(3.143)		
LN_INDGAP2$_t$							**0.067** **	**0.067** **
							(2.313)	(2.550)
Controls$_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,631	19,631	19,274	19,274	19,628	19,628	19,293	19,293
Adj. R-squared		0.260		0.263		0.283		0.281
Endogeneity, relevance, and overidentification tests								
Exogeneity test (Wald/Hausman *p*-value)	0.000***	0.000***	0.000***	0.000***	0.054*	0.016**	0.076*	0.019**
First-stage *F*-statistics		1178.701***		2545.666***		4497.968***		2003.630***
Hansen *J*-test (*p*-value)		0.608		0.574		0.657		0.097*

Table 3.13: Robustness check: additional measures of hedging

This table presents the 2nd stage results of instrumental variables (IV) estimation of ITIs on various measures of corporate hedging. *FRWD HEDGE* is the number of forward-looking hedging sentences used in 10-K scaled by the total number of sentences in 10-K. *BCWD HEDGE* is the number of backward-looking hedging sentences used in 10-K scaled by the total number of sentences in 10-K. *Scaled HEDGE count* is a count of the number of times a firm mentions the use of any hedging instrument in its 10-K statement scaled by the total number of words in 10-K statement. We multiple these variables by 100 to get them in the percentage form. *LN_INDGAP1* is the natural logarithm of one plus the industry pay gap variable. The controls are the same as in Table 2. In the first stage, we regress the respective industry pay gap variable on contemporaneous control variables and instruments. The instruments are the natural logarithms of the sum of total compensation of all other CEOs in the same industry, *Ind CEO comp*, and the total number of CEOs with higher total compensation within the same industry, *#Higher paid ind CEOs*. All the other variables are defined in Appendix A. *T*-statistics (in parentheses) are computed using robust standard errors corrected for clustering of observations at the firm level. Signs ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Dependent variable	*FRWD HEDGE* $_{t+1}$	*BCWD HEDGE* $_{t+1}$	*Scaled HEDGE count* $_{t+1}$
LN_INDGAP1 $_t$	**0.002**	**0.089*** **	**0.007*** **
	(0.818)	(3.588)	(3.497)
Controls $_t$	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	19,631	19,631	19,631
Adj. R-squared	0.054	0.168	0.172
Endogeneity, relevance, and overidentification tests			
Exogeneity test	0.680	0.043**	0.024**
First-stage *F*-statistics	3709.286***	3709.286***	3709.286***
Hansen *J*-test (*p*-value)	0.069*	0.528	0.806

CONCLUSIONS

My PhD dissertation consists of three essays that studies how the different incentives arising from managerial compensation affect firm policies. The first chapter titled “CEOs’ Capital Gains Tax Liabilities and Accounting Conservatism” studies whether CEOs’ tax liability affect conservative accounting policy. Recent studies show that CEOs are reluctant to sell their appreciated stock due to capital gains tax liabilities (CEO tax burdens). This tax-related selling friction in CEOs’ equity portfolios exacerbates CEO risk aversion, and therefore, CEO tax burdens lead to a decrease in risky corporate policies (Yost, 2018). Since creditors have little or no desire for risk, the risk-reducing incentives from CEO tax burdens are likely to mitigate creditors’ expropriation risk and reduce manager-creditor agency conflicts. I find that CEO tax burdens decrease the need for accounting conservatism reporting by creditors. Further analysis shows that the negative relation between CEO locked-in capital gains and conservatism is more pronounced in firms with higher default risk. Additionally, this relation strengthens when the CEO’s incentives are more aligned with equityholders, as proxied by lower CEO relative inside debt and CEO non-entrenchment.

The second chapter titled “Industry Tournament Incentives and Corporate Innovation Strategies” examines how the tournament-like progression in the CEO labor market influences corporate innovation strategies. CEOs compete for the highest compensation within an industry. This can be considered an external job market tournament setting in which the winner of the tournament earns the difference between the highest compensation in the industry and her original compensation as a tournament prize, referred to as industry tournament incentives (ITIs). By exploiting a text-based proxy for product innovation based on product descriptions from 10-Ks, we find a positive and significant relation between ITIs and product innovation. We then explore the trade-off effects of ITIs on product innovation created through long-term patenting technologies and short-term product development. We discover that ITIs strengthen short-term innovation but decrease patent-based innovation. This suggests that CEOs facing ITIs may strategically focus on short-term innovation activities that can quickly draw market attention and boost firm profitability, and forgo long-term innovation activities that take years to develop.

Lastly, the third chapter titled “Industry Tournament Incentives and Corporate Hedging Policies” studies how a tournament among CEOs to progress within the CEO labor market influences their corporate hedging policies. We employ a textual analysis of 10-Ks to generate corporate hedging proxies, finding that the likelihood and intensity of hedging grow as the CEO labor-market tournament prizes (ITIs) increase. The result suggests that CEOs facing ITIs might hedge more to buffer against unpredicted adverse shocks from risk inducing incentives of ITIs. We also explore the mitigating impact of corporate hedging on the adverse effects of risk-inducing industry tournament incentives (ITIs) on the cost of debt and stock price crash risk, noting that these could be possible reasons behind the relation. Additionally, we observe that the relationship between ITIs and corporate hedging is less pronounced for firms that demonstrate more financial distress and for firms whose CEOs are the founders of the company or are of retirement age.