Journal of Banking and Finance 171 (2025) 107352

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Incentive contracting in the shadow of litigation risk: Evidence from universal demand laws

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ARTICLE INFO

JEL Codes:
G3
K22
O32
J33

Keywords:
Litigation risk
Universal demand laws
Compensation
Governance

ABSTRACT

We hypothesize and show that the impact of a regulatory shock depends both on the shock itself and on how firms respond, which can itself depend on the firm's governance attributes. To explore this, we use the staggered passage of Universal Demand (UD) laws, which insulate managers from derivative lawsuits. We find that, on average, firms respond to UD laws by increasing risk-taking incentives (vega), thereby compensating for weaker external discipline, and incentivizing valuable risky investments. Corporate governance, institutional ownership, and CEO power influences the likelihood of adjusting compensation. The firms that do boost vega subsequently experience greater innovation, and a stronger market response to new product announcements. Our results help to reconcile extant findings on the effects of UD laws by showing that the beneficial impact of the laws is conditional on firms' strengthening their CEOs' risk-taking incentives, a choice affected by their latent governance arrangements.

You can't have success unless you're prepared to have failure. As soon as you say, 'failure is not an option,' you've just said, 'innovation is not an option.' — Seth Godin

1. Introduction

Corporate governance is complex and nuanced, with many moving parts. Thus, attempts to enhance governance can sometimes be undermined by unintended consequences. For instance, penalties for corporate malfeasance can ostensibly serve a governance function and reduce wrongdoing. However, penalties are a blunt tool that can also discourage desirable behavior that carries some risk of failure – and which shareholders might mistake for wrongdoing or poor performance. An example is that of shareholder litigation. In principle, lawsuits can deter executives from shirking or acting self-interestedly. The threat of lawsuits might, however, discourage innovative investments because innovation is inherently risky, and payoffs are uncertain. This uncertainty means that shareholders might undervalue the potential payoffs ex-ante or fail to appreciate the reasons for a failure ex-post. Thus, the litigation penalty intended to discipline executives could also deter CEOs from innovating and dissuade boards from incentivizing innovation. We explore these issues through the laboratory of how firms adjust CEO compensation following an exogenous shock to litigation risk and how both the shock and compensation influence corporate innovation.

Pursuing innovation can be a double-edged sword: the rewards for success can be substantial, but there is also a heightened risk of failure. Innovation failures are themselves costly and, thus, could result in shareholder litigation. Even if the litigation is unmeritorious, the mere fact of being sued can consume managers' valuable time, impose psychological stress, and worsen managers' career and salary prospects. By contrast, the rewards to innovation might be seen as too low to offset this risk. Indeed, well-documented evidence shows that individuals can undervalue 'risky', 'long-dated', or 'uncertain' cashflows (see, e.g., Martin 2012). This can trigger managerial myopia (following Stein 1988, 1989), with firms under-investing in innovation (Cummings and Knott, 2018), which could ultimately harm long-term performance.

Shareholders and directors might be concerned about how to ameliorate such managerial myopia. In this paper, we focus on litigation-related myopia and explore how firms might mitigate it. Lin et al. (2021) argues precisely this: that reducing litigation risk will tend

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https://doi.org/10.1016/j.jbankfin.2024.107352
Received 27 November 2023; Received in revised form 16 October 2024; Accepted 24 November 2024
Available online 28 November 2024

to encourage more innovation. They show that the reduction in litigation risk in states that adopted Universal Demand laws (henceforth, UD law) was associated with an increase in innovation. Their analysis does not, however, consider the potentially critical role of managerial risk-taking incentives in the innovation process. We argue that, faced with lower litigation risk some firms, such as those with stronger governance, would be expected to reshape compensation contracts. Consequently, innovation outcomes would logically depend on both the change in litigation risk as well as subsequent changes in managerial incentives.

The intended policy purpose behind UD laws is to prevent shareholders from launching frivolous, ill-informed, or uneconomic litigations. Indeed, Houston et al. (2018) show that the adoption of UD laws reduces the incidence of derivative litigation by about 56 % of the sample mean during 1994–2013. We expect that before passage of UD laws, some corporate boards would have been reluctant to give their managers strong risk-taking incentive contracts, even if they came at the cost of risky but valuable investments. In other words, boards might (rationally) have refrained from offering strong risk-seeking incentives if it increased the likelihood of costly litigation. In these circumstances, an exogenous reduction in litigation risk could make it optimal for boards to restructure executive compensation and reward the pursuit of innovative, risky strategies.

If firms are in equilibrium prior to the passage of a UD law in their state then, after its passage (which makes shareholder lawsuits less likely), firms could be expected to respond with greater risk-taking. Given these changed incentives, boards of directors would be more apt to increase risk-taking incentives contained in the compensation contracts (*aka* compensation portfolio vega). Regardless of the equilibrium compensation scheme prior to the passage of a UD law, the *incremental* effect on the board's incentives is presumably to encourage further risk-taking by managers after UD law adoption.

The focus of our paper is, therefore, on how firms *restructure* compensation contracts after law changes that curb the risk of shareholder litigation. Our hypotheses on the restructuring of managerial incentive contracts build on extant literature that highlights the role of incentive contracts in affecting managerial risk-taking (e.g., Hirshleifer and Suh 1992; Guay 1999; Coles et al., 2006; Gormley et al., 2013; Dittman et al., 2017; Benischke et al., 2019). Our contention is that the risk of litigation might be of significant concern to corporate boards, inducing them to moderate the risk-taking incentives in compensation contracts offered to managers (Seligman, 1994). To the extent litigation risk factors into the structure of incentive contracts, we predict that the adoption of laws that restrict litigation could prompt boards to restructure managerial incentive contracts. Specifically, we expect corporate boards to refashion incentive contracts such that managers are more likely to invest in valuable but risky and longer-term projects.[1]

A convincing empirical test of our proposed hypotheses is difficult for at least two reasons. First, incentive compensation contracts arise endogenously, partly due to the assortative matching based on firms' and managers' unobservable risk preferences (Benischke et al., 2019). For example, risk-tolerant managers may be attracted to firms that offer explicit risk-taking incentives (Goel and Thakor, 2008), and initial pay packages can reflect CEOs' risk and pay preferences (Graffin et al., 2020). Risk-averse CEOs might be given more convex payoffs to mitigate the moral hazard problems arising from their risk aversion (Guay, 1999). Arguably, managers' compensation is structured in anticipation of a particular risk environment, making it difficult to exclude the possibility of reverse causality. Second, incentive contracts can be a complex function of the dynamic interplay between alternative governance mechanisms, such as institutional investors and the extent to which they monitor managers (Cremer and Nair, 2005; Bushee, 1998; Roychowdhury, 2006; McCahery et al., 2016), the effectiveness of the market for corporate control (Low, 2009), and the relative ability of shareholders to wield power over managers to hold them accountable, among others.

Thus, to address our research question, we rely upon quasi-exogenous shocks to the levels of shareholders' litigation risk obtained from staggered changes in the legal environment. We focus on the staggered state-level passage of UD Laws in the firms' incorporation states as quasi-exogenous shocks to shareholders' litigation rights. Derivative litigation enables shareholders to sue on behalf of their company for wrongs done to the company, including by its officers and directors. UD Laws erect procedural hurdles by requiring shareholders to obtain near-impossible board approval (the "Demand" requirement) before launching derivative litigation, thus undermining shareholders' litigation rights (Davis, 2008; Erickson, 2010; Houston et al., 2018).

To overcome the apparent endogeneity concerns emanating from firm-executive matching, we distill our identification strategy by focusing on the firm-executive pairs that stay matched both before and after the shocks to shareholders' litigation rights. More specifically, we employ executive-firm pair or 'Spell' fixed effects (see Graham et al., 2012) that enable us to examine changes within an executive's uninterrupted spell at a firm. Effectively, this augmented identification strategy enables us to compare executives against themselves regarding the extent of risk-taking incentives in their compensation contracts, both *before* and *after* the legal shocks.

In a difference-in-difference estimation strategy, we analyze the pre-to-post changes in the structure of compensation contracts of treated executives, defined as those employed at firms incorporated in UD Laws adopting states, relative to a set of control executives at firms located in non-adopting states or states that adopted UD laws in a non-overlapping period. We are able to control for all unobserved, time-invariant executive and firm characteristics (through spell-fixed effects) and time-varying differences across industries (through industry-year fixed effects). Since many firms are incorporated in a different state than where they are headquartered, we can implement headquarters state-year fixed effects that allow us to avoid confounding interpretations of our estimates from unobserved, time-varying headquarter state-level features that potentially coincide with the UD laws' adoption.[2]

We find that boards respond by significantly increasing the convexity of treated executives' pay. Specifically, we find that the sensitivity of managers' wealth to stock return volatility (known as compensation portfolio *Vega*) increases, on average, by between 7.20 % and 9.01 %, depending on the specification used. Such a large adjustment to the risk-taking incentives contained in compensation contracts of treated executives appears to be consistent with boards' deliberate response to encourage risk-taking in an enabling legal regime when the adoption of UD laws muffles shareholders' governance through litigation.

We also ensure that the results are robust to nascent improvements to difference-in-difference technology, such as the Callaway and Sant'Anna (2021) method to enhance and validate difference-in-difference results. In so doing, we address some of the econometric concerns frequently raised about difference in differences tests (see, e.g., Baker et al., 2022). This approach contrasts with some of the prior literature that uses UD laws as an exogenous shock. This ameliorates concerns that the results merely reflect data quirks or reflect spurious correlations. The results suggest that our findings are robust to concerns about the parallel trend assumption or the composition of the 'control' sample in our study. In so doing, we also help to cross-validate the staggered passage of UD laws as

[1] The provision of more risk-taking incentives is also consistent with the idea suggested in the literature that risk-averse managers engage in risk-reducing activities due to largely non-diversifiable employment risks and personal preferences (Amihud and Lev, 1981; May 1995; Low, 2009; Gormley and Matsa, 2011, 2016; Gormley et al., 2013; Jensen and Meckling, 1976).

[2] We find robust results *regardless* of using Headquarter state-year fixed effects, a criticism by Donelson et al. (2022) for studies exploiting UD laws as an identification strategy.

an appropriate exogenous shock that can influence management behavior.[3]

We decompose the equity-based components of annual compensation packages of CEOs into stock options and restricted stock and separately estimate the effect of UD Laws on these components of compensation. We find that stock intensity *reduces* while options intensity *increases* significantly, both economically and statistically, leaving the pay-performance sensitivity (i.e., compensation Delta) unaffected. The literature on executive compensation contracts suggests that an option-intensive compensation structure that reduces downside risk while keeping the upside potential relatively open would be valuable to risk-averse managers.[4] In contrast, restricted stock grants may exacerbate risk-related conflicts by magnifying exposure to downside risk. Thus, the adjustments in compensation structure that we observe in the baseline estimation appear to be targeted at providing explicit risk-taking incentives, not performance or effort-related incentives per se.

We also dig deeper into what factors could moderate the impact of UD laws on compensation setting. We posit that firms with better governance are more apt to respond in a value-maximizing way to changes in the firm's risk-reward environment after UD law adoption. Alternatively, firms where the manager has co-opted the board are less likely to respond. We focus on the role of institutional investors, which typically monitor firms and act as a catalyst to initiate the necessary governance changes, including via stronger incentives in executive compensation (McCahery et al., 2016; Hartzell and Starks, 2003; David et al., 1998). We find that the increase in risk-taking incentives mainly occurs in firms with relatively high levels of institutional ownership and institutional block ownership. Furthermore, our cross-sectional tests suggest that the baseline effect is more discernible for less powerful CEOs and for CEOs who are arguably more risk-averse. These findings are consistent with corporate boards' deliberate reshaping of incentive contracts to incentivize risky investments.

We conduct various auxiliary tests to instill confidence in our interpretation of the baseline findings. These include, among others, confirming a parallel trends assumption, extending the sample (to 2010 relative baseline sample of 1992 to 2005) to include the options expensing regulations (FAS 123R), using a shorter event window ranging from one to five years before and after a UD law passage, excluding states that adopted UD law relatively early or relatively late during our sample and controlling for other concurrent legal changes that could confound our estimates.

Do the recalibrated risk-taking incentives in managerial compensation contracts in response to UD law adoption yield the intended effect? Prior literature suggests that increasing vega could encourage risk-taking and overcome managerial risk aversion (Coles et al., 2006; Low, 2009; Gormley et al., 2013). As a proxy for beneficial risk-taking, we explore corporate innovation since innovation is risky in nature and failure-intensive (Manso, 2011). We find that for firms that increase vega, UD laws are associated with improvements in innovation output as proxied by changes in patenting activity and the scientific importance of those patents measured by forward citations. There is no such improvement for firms that do not increase vega. This difference is statistically significant. Similarly, firms that increase vega after UD laws experience improvements in the market value of their innovations and market reactions to new product announcements, whereas other firms do not.

Additionally, firms with the post-UD increase in vega generated more extreme innovation outcomes: their patent citations were more likely to be in the right-tail (90th or 95th percentile) of the technology-class-year citations distributions than firms that did not increase vega. The firms with positive vega adjustment also produced more patents that did not garner citations (zero citations) or were "failed patents" than firms that did not increase vega. These patterns are consistent with the higher vega incentives prompting managerial risk-taking – motivating managers to "swing for the fences," increasing the likelihood of both highly successful as well as failed innovations.

We contribute to several strands in the literature. First, we consider the perspective of corporate boards in the aftermath of a quasi-exogenous reduction in derivative litigation risk. The theoretical arguments in Manso (2011) suggest that in the context of managerial compensation, the optimal innovation-motivating incentive scheme can be implemented via a combination of stock options with long vesting periods and 'tolerance for failure' through managerial entrenchment. Following UD laws, Lin et al. (2021) find an increase in firm innovation, which the authors attribute to UD laws improving the "tolerance for failure" (Manso, 2011). However, Lin et al. (2021) and Houston et al. (2018) are silent on the role of incentive compensation in influencing the effects of UD laws on innovation. Our results highlight that, without boards making appropriate adjustments to risk-taking incentives, the improved tolerance for failure associated with UD law adoption could indeed *reduce* corporate innovation. Since we find that the increase in innovation is discernibly visible only among firms that offer more significant risk-taking incentives post-UD laws, our findings allow us to reconcile the literature with reference to the theoretical framework of Manso (2011).

Thus, we emphasize that the positive association between innovation and UD laws is contingent on the board's actions—specifically, that this connection emerges only when boards adjust the risk-taking incentives in management compensation schemes. This finding is one of the major contributions of our study to the extant literature. Our findings also connect the literature on incentive compensation to the broad literature on managerial risk-taking, innovation, and economic growth (Brown et al., 2013).

Second, by utilizing exogenous state-level changes to legal recourse, we advance our understanding of how firms take steps, through reshaping incentive contracting, to encourage risk-taking in an enabling legal regime. Examining the corporate immunity to external market disciplining through hostile takeover for Delaware incorporated firms in the mid-1990s, Low (2009) finds that boards respond to the increased protection accorded by the regime shift by providing managers with greater incentives for risk-taking (compensation Vega) but not performance incentives (compensation Delta). In contrast, a series of quasi-experiments allows us to test the effect of perceived changes in the ability of current shareholders to litigate focal firms' managers. Our findings complement Low (2009) since we find that boards adjust the CEO portfolio vega, not CEO portfolio delta, by increasing the options intensity while simultaneously decreasing the stock intensity in compensation packages to encourage risk-taking.

Third, our study highlights the extent to which the design of managerial incentive contracts is informed and shaped by shareholders' litigation and corporate governance. Dai et al. (2014) find that non-CEO executives' PPS decreases after litigation, which is distinguishable from our results and context. Whereas Dai et al. (2014) focus on how firms respond to litigation (i.e., whether firms 'punish' CEOs, for example), we focus on the threat of future litigation (i.e., the governance aspect of litigation risk influencing corporate decisions). Thus, our study also contributes to the broader corporate governance literature on the role of shareholder litigation in designing managerial incentive contracts.

Finally, we also specifically extend the literature by connecting UD laws and compensation contracts. A recent paper by Donelson et al. (2022) requires some discussion since it reports that the effect of the UD law on litigation incidence becomes statistically insignificant (though it

[3] Donelson et al. (2022) find that *total compensation* does not change around UD Laws adoption. However, our predictions do *not* relate to total compensation per se but to the *structure* of the compensation contract.

[4] Several studies provide findings consistent with this view. (See, for example, Agrawal and Mandelker 1987; DeFusco et al., 1990; Guay 1999; Coles et al., 2006; Low 2009; Chava and Purnanandam 2010; Gormley et al., 2013, Shue and Townsend 2017; Ellul et al., 2016, among others).

remains negative in sign) when extending the sample to 2015.[5] There are, however, good reasons to think that this result might be sample specific. For our sample, UD laws appear to reduce litigation risk over our sample period that ends in 2005, where the end date of 2005 is chosen to specifically exclude the well-documented negative effect of FAS 123R on executive options.[6] While Donelson et al. (2022) find that UD laws have no impact on *total compensation* (cf. compensation components), they do not explore how UD laws impact incentive compensation, which is important due to the differential impact of incentives on managerial behavior. Additionally, while our sample starts in 1992, Donelson et al. (2022) sample period starts in 1997, after 12 states had already adopted UD laws.[7] We further ensure that our results are robust to econometric issues with difference-in-difference methodologies (per Callaway and Sant'Anna, 2021). In so doing, we add additional nuance and insight into the way in which UD laws might impact corporate behavior.

2. Hypotheses

Innovation is important for firms. However, innovation takes place in a broader context and depends upon the CEO propelling it. Herein, there are complications. These include the external environment and how corporate boards incentivize CEOs within this environment. Thus, we argue that litigation risk can influence CEO behavior. Given that innovation often has uncertain and long-dated results, CEOs might fear being penalized for taking risks that appeared prudent *ex-ante* but did not work out *ex-post*. One type of penalty is litigation that alleges managerial wrongdoing. Reducing litigation risk could thus spur innovation. Hereafter, we argue that firms – on average – realize this and adjust compensation to the new equilibrium accordingly. We also argue that the innovation benefits mainly concentrate in those firms that make such changes.

We focus on derivative litigation and exogenous shocks to the level of litigation risk. Derivative litigation involves shareholders suing on behalf of the company for damage caused to the company. The defendant could be a third party (e.g., a customer or supplier) or a company officer, such as the CEO. Universal demand (UD) laws insulate managers and firms from derivative litigations. From an empirical standpoint, this is useful: UD laws that are passed in different states at different times give rise to a staggered difference-in-difference setting. This provides a laboratory through which to analyze the impact of UD laws (and litigation) and how firms might adapt compensation in response.

In the following discussion, we consider the details of derivative litigations, universal demand laws and how firms might respond to UD laws by adjusting compensation vega. As indicated, UD laws reduce derivative litigations. Derivative litigation is a serious risk, and these litigations are generally not frivolous. In a derivative litigation, the shareholder sues on behalf of the company, meaning that the shareholder often bears the cost of the litigation, but the company gains the winnings. The shareholder only gains in proportion to their ownership of the company. Thus, shareholders need to be confident about the litigation's success and to have a sufficient stake or interest for them to launch the litigation. Further, even if the company pays the litigation costs, this still harms the shareholder through the reduction in stock values. This feature contrasts with shareholder class actions, where any compensation goes directly to the shareholders.

UD laws significantly influence derivative litigations. Absent a UD law, shareholders can sue if the directors refuse to sue for the wrong committed to the company or if it would be futile to ask directors. However, under UD laws, shareholders must seek and obtain board approval before being able to litigate. The policy purpose behind UD laws is to prevent shareholders from launching frivolous, ill-informed, or uneconomic litigations.

UD laws do appear to influence managerial behavior. For example, Nguyen et al. (2018) find that UD laws induce firms to reduce cash holdings and increase the value of the remaining cash holdings. They argue that removing the threat of derivative litigations enables firms to free up cash. Similarly, Nguyen et al. (2020) suggest that UD laws are associated with increases in financial leverage and the value thereof. However, the evidence is mixed. For example, Ni and Yin (2018) indicate that UD laws are associated with an increased cost of debt. It is also important to note that the firm itself is not a defendant in derivative litigation, and the cash benefits of removing litigations mainly relate to ancillary costs, such as managers' time and legal fees.

There is the assertion that derivative litigations can discourage risk-taking. To the extent the business judgment rule protects managers from litigation targeting operational decisions, such an impact could be tangential. However, corporate boards may be cautious about having management embroiled in derivative lawsuits since it may, for instance, reflect badly on the quality of decision-making by the board. Hence, prior to the passage of UD laws, some firms might have been reluctant to give strong risk-taking incentive contracts to their managers, even if they came at the cost of risky but valuable investments.

In many instances, derivative actions name officers as defendants. They are designed to punish officers for alleged wrongdoing against the company. This has a disciplinary effect: related literature shows that securities class actions (Humphery-Jenner, 2012; McTier and Wald, 2011), and SEC enforcement actions (Karpoff et al., 2008), can help to discipline CEOs. For example, firms reduce CEOs' compensation after class actions, and CEOs face greater difficulties finding equivalent jobs at other firms (Humphery-Jenner, 2012). Derivative litigations differ from class actions, and they are often targeted at different conduct. However, they have similarities in that they involve alleged wrongdoing potentially involving officers and directors.

Firms do not control whether UD laws are enacted. However, firms can respond to UD laws to help offset their effects. For example, firms might attempt to recruit higher-quality directors to make up for the diminution in the external discipline (Masulis et al., 2019). Additionally, firms can control how they compensate managers. This would manifest in increased convexity in the CEO's compensation (i.e., the sensitivity of wealth to stock return volatility). Ordinarily, this would be achieved by increasing the option-based component of the compensation package, which would reward the CEO for risk-taking while avoiding penalizing the CEO if those risks do not pay off.[8] Note that, as argued above, boards may have (rationally) refrained from offering strong risk-seeking incentives prior to the passage of UD-laws. We capture this in the following hypothesis.

Hypothesis 1. *After UD laws, firms increase the CEOs' compensation vega and the proportion of compensation coming from options.*

We expect that firms with better governance are more apt to respond to such exogenous shocks than are other firms. While it is true that strong governance can help to mitigate regulatory shocks, the operative issue is *how* governance does this. Specifically, we posit, that well

[5] Their sample includes Louisiana, which creates a leverage point. Louisiana passed a UD law late in their sample in 2015. Louisiana has a significant impact on derivative litigation in the pooled sample but represents fewer than 0.5% of companies. As noted, their sample cutoff date of 2015 includes the adoption of FAS 123R that required expensing of executive options, and is documented to have reduced the use of executive options.

[6] This regulation required the expensing of options and reduced option-based compensation. Our findings are, however, robust to extending the sample to 2010.

[7] Indeed, Donelson et al. (2022, Table 4) show that derivative litigation is less common in states that already have a UD law.

[8] As noted, if it is optimal for the firm to increase vega, though not delta, we might observe an increase in option grants, while simultaneously seeing a reduction in stock grants.

Table 1
Universal Demand laws over time
This table notes the year in which each state adopted Universal Demand laws.

Year of UD Law Adoption	State
1989	GA
1989	MI
1990	FL
1991	WI
1992	MT
1992	VA
1992	UT
1993	NH
1993	MS
1995	NC
1996	AZ
1996	NE
1997	CT
1997	ME
1997	PA
1997	TX
1997	WY
1998	ID
2001	HI
2003	IA
2004	MA
2005	RI
2005	SD

governed firms not only monitor executives, but adjust incentive contracts to better direct incentives. Or, phrased differently, well governed firms can wield not just the 'stick' of discipline but the 'carrot' of incentives. These are not mutually exclusive. Thus, if a regulatory shock disrupts the ex-ante equilibrium, well governed firms should adjust incentive contracts accordingly.

The first governance attribute we consider is institutional ownership. Institutional investors are important monitors. They can help improve governance by scrutinizing managers' actions and then either engaging with managers to improve performance or threatening to sell their stock if managers continue to underperform (McCahery et al., 2016). For example, institutional investors' threats to exit the company can have tangible benefits for firm performance (Chang et al., 2013; Gallagher et al., 2013). We therefore expect that firms with higher levels of institutional ownership are more likely to effectively adjust compensation practices following changes to regulations.

Institutional investors are likely to attempt adapt compensation following UD laws. Superficially, it might appear that if the firm has institutional investors, then the passage of UD laws should not matter because investors are monitoring the firm. However, this ignores an essential mechanism through which that monitoring occurs, pressuring firms to provide appropriate managerial compensation incentives. Indeed, investors monitor CEO compensation and push for greater pay-to-performance sensitivity (David et al., 1998; Hartzell and Starks, 2003). Such incentives might not have been optimal pre-UD laws, as noted above. Institutional investors mainly concentrate on companies that are easier for these investors to monitor (Almazan et al., 2005). Thus, if UD laws insulate managers and enable them to make ill-disciplined decisions, institutional investors could push for better performance-linked compensation. We capture this in the following hypothesis.

Hypothesis 2. *Post-UD law, the increases in risk-taking incentives in CEO compensation are expected to be greater in firms with more institutional ownership.*

We anticipate that CEO power will influence the impact of UD laws. Powerful CEOs have more scope to act self-interestedly, which can exacerbate agency conflicts and enable managers to resist changes to compensation. They can operationalize this by exerting greater control over the board of directors. In turn, this can enable managers to act self-interestedly. In general, such agency conflicts can manifest in higher pay despite worse performance (following Masulis et al., 2009). This implies that entrenched managers have more scope to shape their compensation contracts, potentially avoid incentive-linked compensation structures, and focus more on cash compensation. Thus, an entrenched CEO might be more likely to try to avail themselves of the increase in entrenchment following UD laws and more likely to resist attempts to ameliorate it.

Prior evidence highlights that powerful CEOs can act on agency conflicts and harm firms. For example, firms with more powerful CEOs tend to have worse credit ratings and credit spreads (Liu and Jiraporn, 2010) and potentially adopt sub-optimal capital structures. Powerful CEOs are also associated with worse performance and payout ratios (Onali et al., 2016). Therefore, unsurprisingly a common proxy for CEO power is the CEO's "compensation pay slice": the ratio of the CEO's pay to the aggregate pay of the top-five highest-paid executives (Bebchuk et al., 2011). Such power is also associated with worse pay-to-performance sensitivity (Ntim et al., 2019). Therefore, we expect UD laws to have less impact on compensation structures in firms with powerful CEOs. We capture this in the following hypothesis.

Hypothesis 3. *The impact of UD laws on risk-taking incentives in CEO compensation is lower for firms with powerful CEOs.*

Our discussion suggests that firms with high institutional ownership, and less powerful/entrenched managers, are likely to exhibit meaningful changes in managers' risk-taking incentives and that the firms that adjust compensation will experience the greatest benefit in innovation. Lin et al. (2021) indicate that firms spend more on innovation after UD laws. We suggest that one mechanism of action behind this is increased risk-taking incentives. The more substantial risk-taking incentives could counterbalance the loss of external monitoring provided by shareholder litigation prior to UD laws – contracts that pre-UD might have been sub-optimal in the risk incentives offered to managers. This adjustment could occur if pre-UD corporate boards were sufficiently cautious about providing strong risk-taking incentives that could increase the odds of failure and shareholder lawsuits, inducing managers to forego risky but valuable investments.

The above discussion suggests that firms that increased risk-taking incentives for their managers after UD laws would be associated with a performance improvement. We also expect firms that offer managers more substantial risk incentives to experience improved innovative outcomes. We draw upon the findings reported in Lin et al. (2021) that there was an increase in innovation following UD laws, which the authors argue is consistent with UD laws strengthening 'tolerance for failure'. However, it is plausible that the 'tolerance for failure' combined with risk-taking incentives (Manso 2011) increased innovative outcomes. We state the following hypothesis.

Hypothesis 4. *After the passage of UD laws, firms that substantially increase their CEOs' compensation vega and the proportion of compensation coming from options experience non-negative changes in the quality and value of innovation output.*

We have summarized our arguments and predictions about the impact of UD laws in the Appendix.

3. Data

We start with the standard universe of CRSP/Compustat firms. We collect data on firms listed in the United States from 1992 – 2005. As noted earlier, we end the sample in 2005 in order to avoid contamination from FAS 123R, which increased the expense of paying CEOs with options and reduced option-based compensation (Hayes et al., 2012). Nevertheless, the results are robust to extending the sample. Table 1 details the years in which US states adopt UD laws. Since UD laws are adopted at firms' incorporation level, we collect firm incorporation data from several sources including the historical state of incorporation provided by Bill McDonald and a recent dataset complied by Spamann

Table 2
Summary statistics
This table presents key summary statistics for select variables used in the study. Variable definitions and sources are provided in Appendix Table A1.

Variables	Observations	Mean	SD	Q1	Median	Q3
Log(1+Vega) $_{(t+1)}$	16,576	3.528	1.683	2.570	3.693	4.713
Options Intensity $_{(t+1)}$	16,945	0.314	0.290	0.000	0.277	0.540
Stocks Intensity $_{(t+1)}$	16,945	0.058	0.139	0.000	0.000	0.000
Log ($ Options) $_{(t+1)}$)	16,990	4.744	3.389	0.000	6.129	7.420
Ln(#Options) $_{(t+1)}$	17,155	3.217	2.350	0.000	3.932	5.050
Log ($ Stocks) $_{(t+1)}$)	17,156	1.428	2.761	0.000	0.000	0.000
Log (#Stocks) $_{(t+1)}$)	17,156	0.729	1.495	0.000	0.000	0.000
Log (1+ Delta)	17,021	5.315	1.495	4.354	5.304	6.321
Firm Size	16,990	6.838	1.547	5.735	6.680	7.792
Market to Book	16,945	1.724	2.415	0.500	0.929	1.850
Cash-Flow Volatility	16,990	0.050	0.064	0.019	0.032	0.058
Stock Volatility	16,977	0.450	0.192	0.299	0.405	0.559
Profitability	16,990	0.099	0.103	0.057	0.101	0.151
CAPX	16,970	0.104	0.182	0.028	0.050	0.096
R&D	16,970	0.066	0.180	0.000	0.002	0.055
Free Cashflow	16,990	0.032	0.092	0.005	0.043	0.080
Log (Total Pay)	16,504	7.582	1.084	6.807	7.523	8.310

and Wilkinson (2019).[9] When we fail to identify firms' incorporation states from these two sources, we collect data from Compustat and cross-check the historical incorporation state of the firms from several sources, including the company website, Funding Universe, and Wikipedia to extract information on firms' reincorporation. This process allows us to identify the firms that might reincorporate following the UD adoption, which could introduce selection bias in the analysis. We exclude the firms that switch historical incorporation states (moving from UD law state to non-UD law state or vice-versa) within 5-years of adoption of UD law by a state in our sample. For all firms, we collect data on the myriad firm-level characteristics that can influence compensation levels from Compustat and CRSP. While estimating the effect of UD laws on compensation structure, we control for firm size, market-to-book (as a proxy for firms' growth), cashflow volatility, and stock volatility (Kim and Skinner, 2012). Additionally, we control for firm investment, profitability, and free cashflow since the type of firm and its success from investments can drive the CEO compensation structure. For each executive, we obtain data on the executive's compensation plan from Execucomp. We winsorize continuous variables at 1 %. Variable definitions are in Appendix A1. Since 99 % of litigation events name CEOs (Klausner et al., 2013), our study focuses on CEO compensation structure following UD laws.

We use several metrics in order to analyze CEOs' compensation plans. Our baseline measure is the CEO's compensation vega, i.e., risk-taking incentives (per Core and Guay, 2002), which represents the sensitivity of the CEO's wealth to stock return volatility. We further calculate the CEO's compensation delta, representing the sensitivity of the CEO's compensation to changes in the firm's share price. CEO portfolio Vega and Delta are based on the methodology in Core and Guay (2002).[10] We also calculate the proportion of the CEO's compensation that comes from stock or options and the dollar value of such compensation. Data related to patent filings, patent citations, and market value of patents are sourced from Kogan et al. (2017). The summary statistics are in Table 2 and they are consistent with prior literature using like data. For example, the average market-to-book ratio is 1.72, and the profitability ratio is 9.9 %. Approximately 31 % of compensation comes from options and 6.0 % from stock, on average, consistent with Humphery-Jenner et al. (2016). The CEOs are paid around $1.9 m total compensation on average.

4. Empirical analysis

4.1. UD laws and compensation

We start by exploring how UD laws influence compensation packages. We test the hypothesis that UD laws will cause firms to adopt greater risk-taking incentives. We do this by using the staggered passage of UD laws in different states as a quasi-natural experiment, which gives rise to a difference-in-difference set-up. The regression has the following general form:

$$Compensation_{i,t+1} = \beta UD_{i,t} + \sum_{j=1}^{N} \theta^{(j)} x_{i,t}^{(j)} + FE_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $Compensation_{i,t+1}$ denotes the compensation variable (i.e., compensation vega, option intensity etc.) for the CEO at firm i in year $t+1$. $UD_{i,t}$ denotes an indicator if a UD law exists in firm i's state in year t and equals zero otherwise. To be clear, the UD indicator will always equal one so long as a universal demand law is in place and equal zero otherwise (i.e., it is not just an indicator for the year of the UD law passage). The treated firms are those that presently have a UD law, whereas the control firms are those that do not. The item $x_{i,t}^{(j)}$ denotes the j^{th} control variable for firm i in year t, and $FE_{i,t}$ denotes the fixed effects used in the regression. We use several different fixed effects including executive × firm effects that absorb unobservable time-invariant firm and manager heterogeneities, industry (3-digit SIC) × year effects, and Headquarter-State × year effects to absorb time-varying industry or state-level characteristics. These fixed effects help mitigate concerns that variation in state, industry, firm, or executive factors drive the compensation characteristics. We also cluster standard errors by the state of incorporation.

We first analyze the relationship between the passage of UD laws and compensation vega. The results are in Table 3. The results are consistent with expectations. The passage of UD laws is significantly and positively associated with compensation vega, implying that firms increase risk-taking incentives after the passage of UD laws. In columns 1 and 2, we do not include control variables other than executive fixed effects (column 1) or executive × firm (Spell) fixed effects (column 2) along with industry-year fixed effects. In column 3, we include the various control variables suggested in Kim and Skinner (2012). Column 4 additionally includes Headquarter-state-year fixed effects. In column 5, we include additional relevant firm and CEO-level control variables. The effect is economically meaningful, with UD laws being associated with a 7.20 %−9.01 % increase in compensation vega depending on the regression specification.[11]

The results imply that firms respond to UD laws by increasing the sensitivity of CEOs' compensation to stock return volatility (i.e., by increasing risk-taking incentives). The results contrast with those in Ni and Yin (2018). While Ni and Yin (2018) focus primarily on the cost of debt, one of their tests suggests that reducing litigation risk might be associated with lower compensation vega. However, the major

[9] We thank Bill McDonald (https://www3.nd.edu/~mcdonald/), Spamann and Wilkinson for sharing firms' historical incorporation data (https://doi.org/10.7910/DVN/KBPZ5V).

[10] We thank Lalitha Naveen for making the data available on her website. https://sites.temple.edu/lnaveen/data/.

[11] We calculate this using the mean vega value from Table 2 and the coefficient on the UD indicator in Table 3. This yields a range of vega increases from around 7.20% (Column 7) to 9.01% (Column 1).

Table 3
UD laws and compensation vega
This table reports the baseline effect of UD law on the risk-taking incentives, *'log (1+Vega)* $_{(t+1)}$*'* on a CEO's compensation contract. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	(1) Log(1+Vega)$_{(t+1)}$	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UD Law	0.318**	0.258**	0.266**	0.316**	0.321***	0.262***	0.254***	0.283***
	[2.214]	[2.058]	[2.061]	[2.485]	[3.042]	[3.484]	[2.815]	[3.368]
Firm Size			0.331***	0.320***	0.253***	0.198***	0.220***	0.208***
			[19.169]	[23.013]	[18.464]	[12.100]	[11.658]	[8.025]
Market to Book			0.047***	0.047***	0.031***	0.011	0.006	0.009
			[6.776]	[7.225]	[5.407]	[1.404]	[0.601]	[1.021]
Cashflow Volatility			−0.578***	−0.542***	−0.399***	−0.381**	−0.468**	−0.443**
			[−4.308]	[−4.466]	[−3.355]	[−2.077]	[−2.178]	[−2.053]
Stock Volatility			−0.270***	−0.216***	−0.197***	−0.091	−0.135*	−0.125*
			[−3.648]	[−2.946]	[−2.836]	[−1.399]	[−1.846]	[−1.720]
Profitability					0.336	0.166	0.086	0.103
					[1.276]	[0.569]	[0.261]	[0.300]
CAPX					0.100	−0.012	0.053	0.010
					[1.392]	[−0.192]	[0.733]	[0.128]
R&D					−0.088	−0.223***	−0.171***	−0.236***
					[−1.274]	[−4.167]	[−2.775]	[−3.786]
Free Cashflow					0.133	0.009	0.212	0.082
					[0.691]	[0.039]	[0.847]	[0.344]
Log(Total Pay)					0.154***	0.116***	0.122***	0.118***
					[8.126]	[6.121]	[4.487]	[5.330]
Log(1+Delta)						0.170***	0.194***	0.181***
						[12.793]	[13.507]	[12.434]
Executive FE	Y	N	N	N	N	N	Y	Y
Executive X Firm (Spell) FE	N	Y	Y	Y	Y	Y	N	N
Industry X Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Headquarter State X Year FE	N	N	N	Y	Y	Y	N	Y
Observations	16,538	16,538	16,482	16,482	16,002	14,959	14,959	14,959
R-squared	0.874	0.878	0.883	0.891	0.896	0.901	0.891	0.899

differences between our results and those in Ni and Yin (2018) include that they focus on 'raw' vega whereas we analyze the natural log of 'vega' and we include a battery of different fixed effects in order to mitigate econometric issues. Using log vega (rather than raw vega) is important due to the significant skewness in vega and the risk that outliers could dominate the results when analyzing raw vega.[12] Our battery of different fixed effect iterations also helps to mitigate concerns that different unobserved effects might impact the results. For example, we use SPELL fixed effects (cf. mere firm and year effects). Additionally, we ensure that our results are robust to the Callaway and Sant'Anna (2021) difference-in-difference procedures, which mitigate issues that can arise with the parallel trends assumption and the control sample in difference-in-difference papers.

The coefficients on the control variables are interesting but intuitive. Larger firms' CEOs have higher compensation vegas. The coefficient implies that larger firms attempt to provide CEOs with more risk-taking incentives. Additionally, firms with higher market-to-book ratios exhibit higher vegas. This is because such firms are typically more innovative and higher growth-oriented, potentially making option-linked compensation more attractive to their CEOs.

We next examine the components of CEOs' compensation. We expect that firms will prefer to increase option compensation rather than stock compensation following the passage of UD laws. We begin by analyzing option intensity and stock intensity in Table 4, where option intensity is the proportion of total compensation from option grants and likewise for stock intensity. Interestingly, firms increase option intensity but *decrease* stock intensity, following UD laws (compare columns 1–3 with columns 4–6). Options contribute to both vega and delta compensation incentives, and, as we shall see below, the combined effect of an increase in option intensity and decrease in stock intensity is to increase compensation vega while leaving the delta essentially unchanged. The empirical results are both economically and statistically significant and robust across various combinations of fixed effects. For example, UD laws are associated with an increase in option intensity of 18.79 %–25.48 %.[13] These estimates imply that firms shift incentive compensation towards options rather than stock. This evidence is consistent with the idea of increasing risk-taking incentives, which options enable by providing limited downside but significant upside potential. The control variables are consistent with those in Table 3, and those reported regarding option intensity and stock intensity in Humphrey-Jenner et al. (2016).

We further explore the number of options and stocks, and their dollar value, in Table 5. This analysis enables us to check whether firms increase the number of options granted as opposed to (for example) reducing compensation and shifting compensation components. The results indicate that UD laws are associated with a statistically significant increase in both the number and dollar value of options and a decrease in stock grants. These estimates are also economically significant. After UD laws, firms increase both the value and number of options

[12] For raw vega, the skewness is 11.65 and kurtosis is 277.79. By contrast, for log (1+ Vega), skewness is −0.452 and kurtosis is 2.674 for our sample of CEOs during our sample period. This suggests that log vega is a more appropriate dependent variable and is less susceptible to outliers.

[13] We calculate this as follows: The average option intensity in the sample is 0.314 (i.e., 31.4% of compensation comes from options). In Table 4, Columns 1 and 3, the coefficient on the UD law indicator is 0.059 and 0.080, respectively. Therefore, UD laws are associated with a 18.79% (i.e., 0.059/0.314) to 25.48% (i.e., 0.080/0.314) increase in option intensity.

Table 4
UD laws and option intensity and stock intensity
This table contains OLS regressions in which the dependent variable is either the CEO's compensation option intensity (Columns 1 - 3) or Stock intensity (Columns 4 - 6). Option intensity and stock intensity are respectively the proportion of total compensation that comes from options or from stock. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variables	(1) **Option Intensity$_{(t+1)}$**	(2)	(3)	(4) **Stock Intensity$_{(t+1)}$**	(5)	(6)
UD Law	0.059***	0.074***	0.080***	−0.029***	−0.034***	−0.034***
	[4.084]	[5.805]	[5.397]	[−4.297]	[−4.389]	[−3.777]
Firm Size		0.038***	0.036***		0.007***	0.006***
		[8.998]	[7.631]		[3.874]	[2.802]
Market to Book		0.010***	0.011***		−0.000	−0.000
		[7.463]	[6.885]		[−0.539]	[−0.493]
Cashflow Volatility		0.011	−0.006		−0.041**	−0.038**
		[0.194]	[−0.098]		[−2.549]	[−2.034]
Stock Volatility		−0.012	−0.013		−0.038***	−0.035***
		[−0.793]	[−0.709]		[−6.013]	[−4.438]
Profitability		0.400***	0.401***		−0.024	−0.031
		[6.165]	[5.500]		[−1.272]	[−1.348]
CAPX		0.040*	0.043		−0.003	−0.001
		[1.713]	[1.665]		[−0.591]	[−0.227]
R&D		0.012	0.012		−0.001	−0.004
		[0.434]	[0.379]		[−0.176]	[−0.410]
Free Cashflow		−0.166**	−0.165**		0.064***	0.066**
		[−2.207]	[−2.044]		[3.049]	[2.655]
Log(Total Pay)		−0.039***	−0.039***		−0.007***	−0.007***
		[−11.888]	[−10.418]		[−4.937]	[−4.030]
Executive X Firm (Spell) FE	Y	Y	N	Y	Y	N
Executive FE	N	N	Y	N	N	Y
Industry X Year FE	Y	Y	Y	Y	Y	Y
Headquarter State X Year FE	Y	Y	Y	Y	Y	Y
Observations	16,887	16,355	16,355	16,887	16,355	16,355
R-squared	0.604	0.615	0.614	0.609	0.613	0.613

by approximately 20 % (column 1) and 19 % (column 4), respectively.[14] This is consistent with the prediction that UD laws cause firms to increase risk-taking incentives (as opposed to merely restructuring and potentially reducing compensation). These results are robust across various combinations of fixed effects. Conversely, after the UD law adoption, firms reduce stock-based compensation since such compensation might intensify managers' downside risk and exacerbate risk-related agency conflicts. Particularly, after the UD law, the value of stock-based compensation declines sharply (by 42 %, column 7).[15]

We also look at whether compensation delta increases following UD laws. As noted, if firms are mainly concerned with increasing risk-taking incentives, then we would expect no significant change in the compensation delta. We examine this by running the same regression as in Table 3 except with delta as the dependent variable. The results are in Table 6 and are consistent with expectations. UD laws are not statistically significantly related to compensation delta. This effect holds regardless of the fixed effects we use. This suggests that firms respond to UD laws by increasing risk-taking incentives (i.e., respond to UD law by promoting investments that are valuable, though risky), but this is not merely a side-effect of attempting to increase delta. The decrease in stock grants is consistent with firms offsetting the increase in delta when options are granted to maintain the compensation delta.

4.2. The validity of the difference in difference design

Difference in difference designs can be economically complex and results are only as good as their execution. Thus, there have been concerns about 'reusing' natural experiments in multiple contexts (Heath et al., 2023) and about how to properly specify difference-in-difference tests to ensure that the results are robust (Baker et al., 2022; Roth et al., 2023). Therefore, we deploy the difference-in-difference approach from Callaway and Sant'Anna (2021) to ensure that the results are robust. This approach differs from a standard staggered difference in difference approach. In the standard approach, we pool the full set of data to create a pooled panel dataset. In each year, the firm might fit into one of three groups: (a) it might never be treated (i.e., never in any year be subject to a UD law), (b) it might not yet be treated (i.e., the UD law will occur in a future year), or (c) it might already be treated (i.e., the UD law occurred in a past year). The Callaway and Sant'Anna (2021) approach has several innovations, including recalibrating the set of 'control' firms for the 'treated' firms. They focus on comparing treated firms with either never treated, or not yet treated, cohorts (cf., also including 'already treated' firms). This helps to mitigate concerns about the reliability and efficacy of difference-in-difference approaches.

The results are in Table 7 and support our main results. In the odd numbered Columns, we compare treated firms with control sample of firms that were 'never treated'. In the even numbered Columns, we compare the treated firms with a control sample of 'not yet treated' firms. We then explore the impact of UD laws on the compensation variables in our paper. We find that UD laws remain positively and significantly related to compensation vega and to option intensity. This supports the main results and suggests that the results are not a mere quirk of the difference-in-difference design. This ameliorates concerns that our staggered difference-in-difference results might reflect a mere spurious correlation and helps to buttress our foregoing results.

[14] We calculate this based on the average values of the number and value of options in Table 2 and the coefficients on the UD indicator in Columns 1-4 of Table 5.

[15] We calculate this based on the average values of stock options in Table 2 and the coefficients on UD indicator in Table 5. The average value of log($ Stocks)$_{(t+1)}$ in the sample is 1.428. In Table 5, Column7, the coefficient on the UD law indicator is −0.604. Therefore, UD laws are associated with a 42.5% (i.e., 0.604/1.428) decrease in the value of stock options.

Table 5
UD laws and dollar compensation components
This table contains OLS regressions in which the dependent variables represent the components of the CEO's compensation package. Columns 1–3 look at the dollar value of the CEO's options and Columns 4–6 look at the number of options. Similarly, Columns 7–9 look at the dollar value of stock compensation and Columns 10–12 the number of stocks given. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variables	(1) **Log($Options)$_{(t+1)}$**	(2)	(3)	(4) **Log(#Options)$_{(t+1)}$**	(5)	(6)	(7) **Log($Stocks)$_{(t+1)}$**	(8)	(9)	(10) **Log(#Stocks)$_{(t+1)}$**	(11)	(12)
UD Law	0.946***	1.127***	1.210***	0.602***	0.726***	0.784***	−0.604***	−0.691***	−0.650***	−0.357***	−0.402***	−0.391***
	[3.552]	[4.406]	[4.016]	[3.458]	[4.578]	[4.203]	[−3.275]	[−3.200]	[−2.910]	[−3.286]	[−3.440]	[−3.092]
Firm Size		0.445***	0.451***		0.343***	0.353***		0.113***	0.093*		0.053**	0.043
		[7.681]	[6.562]		[8.517]	[7.427]		[2.931]	[1.888]		[2.427]	[1.561]
Market to Book		0.079***	0.078***		0.034***	0.033***		0.010**	0.009		0.004	0.004
		[5.943]	[5.129]		[4.095]	[3.473]		[2.100]	[1.552]		[1.577]	[1.152]
Cashflow Volatility		0.180	0.036		0.078	0.004		−0.784***	−0.685**		−0.470***	−0.412**
		[0.348]	[0.066]		[0.237]	[0.012]		[−3.137]	[−2.339]		[−3.286]	[−2.429]
Stock Volatility		−0.243	−0.333		0.120	0.042		−0.689***	−0.653***		−0.337***	−0.320***
		[−1.550]	[−1.609]		[0.978]	[0.242]		[−5.178]	[−4.229]		[−4.365]	[−3.551]
Profitability		3.552***	3.578***		1.999***	2.043***		−0.630**	−0.761**		−0.405**	−0.481**
		[5.075]	[4.615]		[4.958]	[4.542]		[−2.247]	[−2.386]		[−2.417]	[−2.413]
CAPX		0.483*	0.448*		0.278*	0.241		−0.055	−0.043		−0.068	−0.059
		[1.939]	[1.745]		[1.897]	[1.590]		[−0.490]	[−0.373]		[−1.287]	[−1.056]
R&D		−0.221	−0.248		−0.245	−0.262		0.044	0.002		0.014	−0.012
		[−0.881]	[−0.927]		[−1.452]	[−1.518]		[0.218]	[0.008]		[0.138]	[−0.110]
Free Cashflow		−1.508*	−1.500*		−1.013*	−1.042*		1.097***	1.117***		0.579***	0.584**
		[−1.859]	[−1.720]		[−1.998]	[−1.926]		[3.185]	[2.762]		[2.810]	[2.375]
Log(Total Pay)		−0.457***	−0.449***		−0.340***	−0.335***		−0.124***	−0.114***		−0.077***	−0.072***
		[−9.384]	[−8.060]		[−9.383]	[−8.084]		[−5.583]	[−4.083]		[−6.374]	[−4.729]
Executive X Firm (Spell) FE	Y	Y	N	Y	Y	N	Y	Y	N		Y	N
Executive FE	N	N	Y	N	N	Y	N	N	Y		N	Y
Industry X Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y
Headquarter State X Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y
Observations	16,932	16,373	16,373	17,097	16,482	16,482	17,098	16,483	16,483	17,098	16,483	16,483
R-squared	0.611	0.620	0.619	0.599	0.608	0.606	0.675	0.677	0.676	0.659	0.663	0.663

Table 6
UD laws and delta
This table contains OLS regressions in which the dependent variable is the natural log of the CEO's compensation Delta. Delta is the change in the dollar value of the executive's wealth for a one percentage point change in stock price (following Guay (1999), Core and Guay (2002a) and Coles et al., 2006)). *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	(1) **Log(1+Delta)$_{(t+1)}$**	(2)	(3)	(4)	(5)	(6)
UD Law	−0.077	−0.059	−0.047	−0.029	−0.046	−0.015
	[−1.143]	[−0.777]	[−0.596]	[−0.372]	[−0.608]	[−0.167]
Firm Size		0.030	0.014	−0.024	0.009	0.002
		[1.142]	[0.383]	[−0.726]	[0.258]	[0.049]
Market to Book		0.069***	0.066***	0.048***	0.050***	0.049***
		[11.566]	[11.078]	[7.899]	[7.926]	[6.676]
Cashflow Volatility		−0.375	−0.316	−0.153	−0.280	−0.193
		[−1.539]	[−1.075]	[−0.541]	[−1.135]	[−0.640]
Stock Volatility		−0.392***	−0.356***	−0.265***	−0.316***	−0.295***
		[−6.846]	[−6.520]	[−4.392]	[−4.850]	[−4.873]
Profitability				1.189***	1.238***	1.164***
				[8.249]	[8.082]	[7.078]
CAPX				0.113***	0.188***	0.128***
				[2.979]	[3.473]	[2.983]
R&D				0.091*	0.118*	0.095
				[1.839]	[1.717]	[1.562]
Free Cashflow				0.099	0.228*	0.168
				[1.048]	[1.720]	[1.460]
Log(Total Pay)				0.074***	0.084***	0.074***
				[13.719]	[15.898]	[13.363]
Executive FE	N	N	N	N	Y	Y
Executive X Firm (Spell) FE	Y	Y	Y	Y	N	N
Industry X Year FE	Y	Y	Y	Y	Y	Y
Headquarter State X Year FE	Y	N	Y	Y	N	Y
Observations	15,762	15,707	15,707	15,267	15,267	15,267
R-squared	0.899	0.895	0.902	0.907	0.897	0.905

Table 7
Alternative estimation using Callaway and Sant'Anna (2021) method
This table contains results related to static effect estimates from Callaway and Sant'Anna (2021) approach to obtain the average treatment effect on the treated (ATT) for all groups across all periods using the 'clean' controls: *Never treated* (odd-numbered columns) and *Not-yet-treated* group (even numbered columns). The dependent variables are log(1+Vega) $_{(t+1)}$ in columns 1 and 2, log (1+Delta) $_{(t+1)}$ in columns 3 and 4, Option Intensity $_{(t+1)}$ in columns 5 and 6, and Stock Intensity $_{(t+1)}$, in columns 7 and 8. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *Delta* is the change in the dollar value of the executive's wealth for a one percentage point change in stock price (following Guay (1999), Core and Guay (2002a), and Coles, Daniel, and Naveen 2006)). Option intensity and stock intensity are, respectively, the proportion of total compensation that comes from options or from stock. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. Standard errors are clustered at the Incorporation State of the firm and firm-executive (Spell) level. *Z*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively. Regressions include Executive-Firm (Spell) Fixed Effects. The estimation uses Sant'Anna and Zhao (2020) DiD estimator based on doubly robust stabilized inverse probability weighting (DRIPW) and ordinary least squares. We implement these estimators using the Stata package (csdid) written by Rios-Avila et al. (2021).

Variable	Log(1+Vega)$_{(t+1)}$		Log(1+Delta)$_{(t+1)}$		Option Intensity$_{(t+1)}$		Stock Intensity$_{(t+1)}$	
Sample	1992–2005							
Control Group	Never Treated	Not-Yet-Treated	Never Treated	Not-Yet-Treated	Never Treated	Not-Yet-Treated	Never Treated	Not-Yet-Treated
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ATT	0.231**	0.172**	−0.088	−0.088	0.072***	0.071***	−0.011**	−0.010**
	(1.98)	(2.07)	(−1.51)	(−1.52)	(3.42)	(3.29)	(−2.23)	(−2.09)
Observation	12,898	12,903	13,128	13,135	14,137	14,150	14,137	14,150
Pre-treatment Static control Var.	Y	Y	Y	Y	Y	Y	Y	Y
CS estimator:	Callaway and Sant'Anna (2021): Doubly robust inverse probability weighting (DRIPW)							

4.3. Impact of institutional investors and CEO power

We next test our hypotheses about how various governance characteristics could influence firms' response to UD laws. For each governance characteristic, we split the sample into above and below median sub-samples (in terms of that governance characteristic). We then analyze whether the UD law coefficient is statistically different between subsamples. These results are in Table 8. At the base of the table, we include t-ratios for the difference in the UD law coefficients across the subsamples. The difference in subsample coefficients is consistent with predictions, though the differences are not always statistically different.

We first consider the impact of institutional investors on firms' reactions to UD laws. Institutional investors ordinarily engage with corporations about governance arrangements (McCahery et al., 2016). One way institutional investors oversee firms is by monitoring executive compensation (following Correa and Lel, 2016). Thus, firms with greater institutional ownership are likely to take a more proactive approach to responding to UD laws. Therefore, we expect that firms that increase risk-taking incentives will tend to be those that have high levels of institutional ownership.

Table 8
UD Law on risk-taking incentives in compensation: moderating effect of external and internal governance and CEO power
This table presents split-sample results based on the quality of external governance measured based on Institutional Ownership, Institutional Block-owners, and Board Independence besides split sample analysis based on measure of CEO power- CEO Pay Slice (CPS). High (low) Institutional Ownership and Institutional Block-Ownership are defined based on the sample medians of Institutional Ownership and Institutional Block Ownership, respectively. High Board Independence sample consists of firm-year observations with above median proportion of Independent Directors. High CPS sample consists of firm-year where CPS is above the sample median of CPS. CEO—Chair duality and Overconfident CEOs include the subsections of firms where the CEOs are also the chairman of the boards or overconfident, respectively. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Models	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Institutional Ownership Log(1+Vega)$_{(t+1)}$	Institutional Block Ownership	Proportion of Independent Directors	CPS	CEO—Chair Duality	Overconfident CEOs
Panel A: Sample 1	**High**	**High**	**High**	**Low**	**No**	**No**
UD Law	0.497***	0.500***	0.403***	0.692***	0.601***	0.428***
	[3.966]	[4.902]	[4.520]	[5.005]	[9.674]	[3.613]
Observations	6030	5721	3491	7367	5559	5302
R-squared	0.908	0.927	0.931	0.919	0.912	0.903
Panel B: Sample 2	**Low**	**Low**	**Low**	**High**	**Yes**	**Yes**
UD Law	0.266	−0.009	0.053	0.069	0.184	0.185
	[1.466]	[−0.065]	[0.287]	[0.681]	[0.893]	[0.863]
Observations	6024	6334	4343	7368	10,173	8094
R-squared	0.936	0.941	0.947	0.927	0.915	0.914
Baseline Controls	Y	Y	Y	Y	Y	Y
Executive X Firm (Spell) FE	Y	Y	Y	Y	Y	Y
Industry X Year FE	Y	Y	Y	Y	Y	Y
Headquarter State X Year FE	Y	Y	Y	Y	Y	Y
p-value difference (*t*-stat)	0.226 (1.23)	0.010 (2.72)	0.111 (1.63)	0.003 (3.16)	0.082 (1.79)	0.318 (1.01)

Table 9
UD laws, compensation, and innovation
This table reports the effect of UD law on Corporate Innovation Quantity and Corporate Innovation Quality conditional on changes in the provision of risk-taking incentives in compensation contracts. %*Change in Innovation Quantity* is the difference in the Log (1+ # of Patents) at time ($t+2$) and the Log (1+ # of Patents) at time ($t+1$). Similarly, %*Change in Innovation Quality* is the difference in the Log (1+ # of Forward Citations) at time ($t+2$) and the Log (1+ # Forward Citations) at time ($t+1$). Panel A presents the estimates for sample where the difference in Log (1+ Vega) at ($t+1$) and Log (1+ Vega) at (t) is positive. Panel B presents the estimates for sample where the difference in Log (1+ Vega) at ($t+1$) and Log (1+ Vega) at (t) is zero or negative. Columns (1) through (4) present the estimates for the full sample. Columns (5) and (6) present the estimates for the sample of firms with positive patenting activity (i.e., firms with at least one granted patent from the USPTO during the sample period). *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Sample	Full Sample				Patenting firm Sample	
Variable	%Change in Innovation Quantity	%Change in Innovation Quality	%Change in Innovation Quantity	%Change in Innovation Quality	%Change in Innovation Quantity	%Change in Innovation Quality
	Panel A - Positive Change in Vega: YES					
	(1)	(2)	(3)	(4)	(5)	(6)
UD Law	0.081**	0.149**	0.078*	0.149**	0.102*	0.186**
	[2.171]	[2.679]	[2.008]	[2.434]	[1.790]	[2.080]
Baseline Controls	N	N	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	8341	8341	8312	8312	5863	5863
R-squared	0.178	0.170	0.181	0.172	0.185	0.165
	Panel B - Positive Change in Vega: NO					
UD Law	−0.065	−0.029	−0.058	−0.009	−0.091	−0.026
	[−1.138]	[−0.319]	[−1.080]	[−0.097]	[−1.472]	[−0.207]
Baseline Controls	N	N	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	5540	5540	5494	5494	3821	3821
R-squared	0.239	0.229	0.242	0.230	0.248	0.224
p-value difference (t-stat)	0.030 (2.24)	0.163 (1.42)	0.042 (2.10)	0.232 (1.21)	0.039 (2.14)	0.276 (1.11)

The results are in Columns 1 and 2 of Table 8 and are generally consistent with our hypotheses. Column 1 (Panels A and B) stratifies the sample by whether the firm's institutional ownership is above or below the median. Column 2 splits the sample by whether the firm's institutional block ownership is above or below the median. In all cases, the data is from the Thomson 13f filings. We include the same set of controls as in Table 3 (unreported for brevity) and a full complement of fixed effects (as noted in the column footer).

The results highlight that UD laws drive statistically significant increases in vega, but primarily in firms with high levels of institutional

Table 10
UD laws, compensation, and value implications
This table reports the effect of UD law on firm performance conditional on changes in provision of risk-taking incentives in compensation contracts. % *Change in Innovation Value* is the difference in scaled market value of innovation at time ($t+2$) and scaled market value of innovation at time ($t+1$). The market value of innovation is scaled by book value of assets (Kogan et al. 2017). % *Change in Product Announcement CAR* is the difference between Product Announcement CAR) at ($t+2$) and Product Announcement CAR at ($t+1$). Panel A presents the estimates for sample where the difference in Log(1+ Vega) at ($t+1$) and Log(1+ Vega) at (t) is positive. Panel B presents the estimates for sample where the difference in Log(1+ Vega) at ($t+1$) and Log(1+ Vega) at (t) is zero or negative. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

	Full Sample		Patenting Firm Sample	Full Sample	
Variable	%Change in Innovation Value			%Change in Product Announcement CAR	
	Panel A - Positive Change in Vega: YES				
	(1)	(2)	(3)	(4)	(5)
UD Law	0.044***	0.042***	0.049***	0.008***	0.008***
	[6.275]	[5.316]	[3.523]	[3.748]	[3.345]
Baseline Controls	N	Y	Y	N	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Observations	8341	8312	5863	8058	8030
R-squared	0.233	0.283	0.253	0.135	0.137
	Panel B- Positive Change in Vega: NO				
UD Law	0.006	0.007	0.015	−0.003	−0.003
	[0.794]	[0.715]	[1.307]	[−0.745]	[−0.774]
Baseline Controls	N	Y	Y	N	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Observations	5540	5494	3821	5317	5279
R-squared	0.311	0.325	0.331	0.192	0.196
p-value difference (t-stat)	0.001 (3.60)	0.000 (5.06)	0.001 (3.72)	0.012 (2.63)	0.010 (2.70)

ownership. This result holds regardless of whether we look at institutional ownership per se or institutional block ownership, though estimated coefficients are statistically different across subsamples only for block ownership. This evidence suggests that one channel through which UD laws influence compensation is pressure from institutional investors to help mitigate managerial agency conflicts and to better tie managers' compensation to value-creating risk-taking.

In Column 3, we proxy for corporate governance and oversight by the proportion of independent directors. As shown in the literature, independent boards can significantly improve corporate governance and can mitigate CEOs' behavioral biases (Banerjee et al., 2015; Guo and Masulis, 2015). Our results are reported in Column 3, Panel A for firms with an above-median proportion of independent directors and Panel B for firms that are below median. Consistent with expectations, our finding is that UD laws cause an increase in vega only for firms with an above-median proportion of independent directors, though subsample coefficients are not statistically different.

Next, we explore whether adjustments in compensation structure following UD laws are contingent on certain CEO characteristics. In particular, we explore the moderating impact of CEO power. Powerful CEOs can exploit their power to design corporate strategies and compensation, which can subsequently exacerbate agency conflicts. Therefore, we expect UD laws to influence firms with relatively low CEO power as these are the firms in which CEOs have less scope to resist changes to compensation adjustment by the corporate boards.

In Column 4, we measure CEO power by using the CEO's compensation pay slice (see Bebchuk et al., 2011). The Compensation Pay Slice (CPS) is the ratio of the CEO's pay to the aggregate pay of the next five highest-paid executives. The CPS aims to represent how much of the firm's compensation payout the CEO can capture; and, thus, how powerful the CEO is. As an additional measure of CEO power, in column 5, we exploit CEO-chair duality (Graham et al., 2020), using Execucomp data to construct these measures.

Columns 4 and 5, Panel A report the regression results for the low CEO power sub-sample, and Panel B, the high CEO power sub-sample results. As indicated, we find that UD laws cause an increase in vega for firms with relatively less powerful CEOs but have no significant impact for firms with high CEO power. The coefficients are statistically different across subsamples. This evidence implies that the impact of UD laws depends on CEO power and corporate governance and, thus, the CEO's ability to resist compensation change.

We also explore whether an adjustment in vega following UD laws differs depending on the CEO's overconfidence. The extant literature suggests that CEOs that are overconfident receive more options-heavy compensation compared to other CEOs. These CEOs are also inclined to take more risks (Humphery-Jenner et al., 2016). Thus, after UD laws, we would not expect a substantial increase in compensation vega since overconfident CEOs tend to be less risk-averse and unlikely to shift to lower-risk investments. On the other hand, for non-overconfident CEOs, we would expect an increase in compensation vega since they may exploit the opportunity to play safe when litigation risk declines. We find significant adjustments in risk-taking incentives for less overconfident CEOs following UD laws (Column 6 in Panel A) and not for overconfident CEOs (Column 6 in Panel B), though subsample coefficients are not statistically different.

4.4. UD laws, compensation, and innovation quantum

We next investigate whether the change in risk-taking incentives following the adoption of UD laws has any value implications for firm performance. Lin et al. (2021) highlights that innovation increases after UD laws. We explore the extent to which this might relate to the changes in the compensation structure documented above. We do this by examining whether firms with a greater increase in vega generate more patents and patent citations after UD laws than other firms. To do this, we use a firm-year panel sample of firms. The dependent variable is the percentage change in the firm's patent quantity or patent quality between the periods $t+1$ and $t+2$. Patent quantity is the natural logarithm of one plus the annual number of patents applied for and subsequently granted in each sample year for a firm. Patent quality is measured by the natural logarithm of one plus the number of forward citations received by these patents. We split the sample by whether the firm increases vega in the period $t+1$ following conditional on UD law adoption in the year t. We include firm and year fixed effects[16] (as denoted in Table footer in Table 9). The regression has the following form:

$$\Delta Innovation_{i,t+2,t+1} = \beta UD_{i,t} + \sum_{j=1}^{N} \theta^{(j)} x_{i,t}^{(j)} + FE_{i,t} + \varepsilon_{i,t}$$

where, $\Delta Innovation_{i,t+1}$ represents the firm's innovation measure (i.e., the percentage change in the firm's number of patents or in the forward citations to those patents between the periods $t+1$ and $t+2$). $UD_{i,t}$ is an indicator that equals one if the firm's state has a UD law in effect in year

[16] In an unreported test, we also include firm and industry-year fixed effects and find qualitatively similar results, although the subsample difference is not always significant at conventional levels.

Table 11
UD laws, incentive compensation, highly successful and failed innovation
This table reports the effect of UD law on highly cited and non-cited patents conditional on changes in provision of risk-taking incentives in compensation contracts. % Change in Highly Cited Patents is the difference in the Log (1+ # of Highly Cited Patents) at time ($t+2$) and the Log (1+ # of Highly Cited Patents) at time ($t+1$). Similarly, %Change in Non-cited Patents is the difference in the Log (1+ # of Patents without Forward Citations) at time ($t+2$) and the Log (1+ # of Patents without Forward Citations) at time ($t+1$). Panel A presents the estimates for sample where the difference in Log (1+ Vega) at ($t+1$) and Log (1+ Vega) at (t) is positive. Panel B presents the estimates for sample where the difference in Log (1+ Vega) at ($t+1$) and Log (1+ Vega) at (t) is zero or negative. Columns (1) through (4) present the estimates for the full sample. Columns (5) and (6) present the estimates for the sample of firms with positive patenting activity (i.e., firms with at least one granted patent from the USPTO during the sample period). Vega is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. UD Law is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. level of fixed effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. t-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Sample	Full Sample				Patenting firm Sample	
Variable	%Change in Highly Cited Patents	%Change in Non-cited Patents	%Change in Highly Cited Patents	%Change in Non-cited Patents	%Change in Highly Cited Patents	%Change in Non-cited Patents
	Panel A - Positive Change in Vega: YES					
	(1)	(2)	(3)	(4)	(5)	(6)
UD Law	0.025*	0.039*	0.024*	0.036*	0.034*	0.057**
	[1.920]	[1.915]	[1.853]	[1.758]	[1.833]	[2.089]
Baseline Controls	N	N	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	8291	8167	8263	8139	5830	5752
R-squared	0.159	0.159	0.162	0.16	0.164	0.164
	Panel B - Positive Change in Vega: NO					
UD Law	−0.032	−0.092*	−0.029	−0.088*	−0.047	−0.134**
	[−0.791]	[−1.721]	[−0.734]	[−1.711]	[−0.894]	[−0.207]
Baseline Controls	N	N	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	5498	5393	5452	5350	3797	3731
R-squared	0.246	0.251	0.249	0.254	0.252	0.263
p-value difference (t-stat)	0.278 (1.10)	0.028 (2.28)	0.302 (1.04)	0.030 (2.24)	0.245 (1.18)	0.010 (2.73)

t. We also include the control variables per Table 3 and fixed effects, as explained above. We test whether the $UD_{i,t}$ indicator is significantly different between the sample of firms that experienced positive change in compensation vega and the sample of firms that did not. *Change in Vega* is difference in the natural log of one plus the CEO's compensation vega between periods *t* and period $t+1$.

The results are presented in Table 9 and generally support our hypotheses. Panel A analyzes the impact of UD laws in the sample of firms that increase compensation vega and Panel B, those that do not increase compensation vega. The bottom row contains the test statistics for whether the $UD_{i,t}$ indicator differs significantly between the two panels. From Panel A, for firms that increase compensation vega, UD laws are positively and statistically significantly associated with increases in patent quantity and quality. The effects are economically significant as well. The regression models in columns (3) and (4), which include various control variables (as per Table 3), show that firm that increases incentive compensation exhibit a 7.8 % increase in the number of patents and a 14.9 % increase in the quality of patents. The coefficients are larger in columns (5) and (6) when we restrict the sample to firms that have positive patenting activity. As indicated, firms that incentive compensation exhibit a 10.2 % increase in the quantity of patents and 18.6 % increase in the quality of patents.

However, for firms that do not increase compensation vega (Panel B), UD laws are negatively, but statistically insignificantly, related to innovation outcomes. As noted in the table footer, the difference in coefficients between Panels A and B have the predicted signs, though the difference is not always statistically significant. Overall, the results indicate that changes in incentive compensation that induce managerial risk-taking are conduits through which UD laws are associated with increases in innovation. Our findings on the increase in innovation only among the sample of firms that increased vega post-UD laws can be interpreted in the theoretical framework of Manso (2011). While UD laws decrease litigation risk and, hence, increase 'tolerance for failure' (Lin et al., 2021), our results show that this occurs only in conjunction with managerial incentive contracts that reward risk-taking. This is consistent with Manso (2011) that emphasizes *both* an increase 'tolerance for failure' and rewards for long-term success via a combination of stock options with long vesting periods and managerial entrenchment.

4.5. UD laws, compensation, and value of innovation

We supplement the above results by examining the impact of UD laws and vega on firm performance. Appel (2019) highlights that UD laws can harm shareholders by enabling managers to entrench themselves further. In order to explore whether changes in incentive compensation can mitigate sub-optimal corporate policies, we additionally explore the effect of changes in vega following UD law adoption on firms' performance. We do this by analyzing the market value of innovation changes following UD laws, contingent on whether firms increase compensation vega. The regression specifications are similar to those used for analyzing the relation between UD laws and innovation. The dependent variable is the change in the market value of innovation, defined as the difference between the scaled total market value of patents of a firm granted in the year $t+2$ and those in the year $t+1$. The market value of innovations is the total dollar value of all patents applied for during each sample year by the firm scaled by the lagged book value of assets and is sourced from Kogan et al. (2017).

The results are in 10 and are consistent with our expectations. Panel A reports regressions for the sub-sample of firms that increase vega, while Panel B has results for the subsample of firms that do not increase vega following the passage of UD laws. From Panel A, for firms that increase Vega, the UD laws are associated with a statistically significant increase in the market value of innovation of 4.2 % to 4.9 %, depending on model specification. However, from Panel B, we see that UD laws are not statistically significantly associated with the change in the market value of innovation for firms that do not increase Vega. The final row of the table reports test statistics for the difference in the market value of innovation between these samples and indicates that the impact of UD

Table 12
Effect of UD Law on risk-taking incentives in compensation contracts: parallel trend examination
This table reports estimates from firm-panel OLS regressions exploring the pre and post-treatment trends of the effect of UD law on the risk-taking incentives, *'log (1+Vega)* $_{(t+1)}$*'* on a CEO's compensation contract. 'UD Law^{-2}', 'UD Law^{-1}', and 'UD Law^{0}' are equal to one if the firm is incorporated in a state that will adopt UD law in three years, two-years, one-year, respectively and zero otherwise. 'UD Law^{4+}', 'UD Law^{+3}', 'UD Law^{+2}', and 'UD Law^{+1}' are equal to one if the firm is incorporated in a state that adopted UD Law three or more years ago, two-years ago, one-year ago, and current year respectively, and zero otherwise. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	(1) Log(1+Vega)$_{(t+1)}$	(2)	(3)	(4)
UD Law $^{(-2)}$	−0.065	−0.035	−0.046	0.000
	[−0.659]	[−0.359]	[−0.560]	[0.001]
UD Law $^{(-1)}$	0.063	0.102	0.095	0.132
	[0.635]	[1.036]	[1.057]	[1.383]
UD Law $^{(0)}$	0.087	0.103	0.059	0.107
	[0.922]	[1.143]	[0.729]	[0.993]
UD Law $^{(1)}$	0.330**	0.338**	0.298***	0.413***
	[2.339]	[2.381]	[2.748]	[3.070]
UD Law $^{(2)}$	0.281*	0.314*	0.290**	0.421**
	[1.731]	[1.968]	[2.061]	[2.585]
UD Law $^{(3)}$	0.330*	0.376*	0.336*	0.420*
	[1.799]	[1.941]	[1.877]	[1.705]
UD Law $^{(4+)}$	0.225	0.272	0.262	0.340
	[1.152]	[1.365]	[1.353]	[1.436]
Firm Size		0.331***	0.265***	0.254***
		[19.361]	[21.784]	[18.446]
Market to Book		0.047***	0.030***	0.031***
		[6.760]	[4.851]	[5.363]
Cashflow Volatility		−0.573***	−0.434***	−0.393***
		[−4.265]	[−3.489]	[−3.228]
Stock Volatility		−0.268***	−0.227***	−0.194***
		[−3.545]	[−3.051]	[−2.749]
Profitability			0.400	0.332
			[1.547]	[1.237]
CAPX			0.124**	0.100
			[2.083]	[1.379]
R&D			−0.044	−0.089
			[−0.642]	[−1.291]
Free Cashflow			0.191	0.138
			[0.934]	[0.707]
Log(Total Pay)			0.158***	0.154***
			[6.924]	[8.171]
Executive X Firm (Spell) FE	Y	Y	Y	Y
Industry X Year FE	Y	Y	Y	Y
Headquarter State X Year FE	N	N	N	Y
Observations	16,538	16,482	16,002	16,002
R-squared	0.879	0.883	0.888	0.896

laws is statistically significantly different between the set of firms that increase vega and those that do not.

For additional evidence on the value implication of changes in compensation structure following UD law adoption, we explore the market reaction following the announcement of firms' breakthrough products (Mukherjee et al., 2017). If the risk-taking incentives through incremental vega following the adoption of UD laws have value implications for shareholders, we would expect the firms that adjusted vega positively to launch commercially successful products associated with the valuable technological innovation (patents). Thus, we expect the stock-market to greet the announcement of breakthrough products more favorably. Consistent with our conjecture, we find that firms that increase vega after UD law experience a more favorable stock-market response to new product announcements. Conversely, no significant effect is found for firms that do not increase vega following UD adoption. The difference in the estimates for the two sets of firms (firms that increase vega and firms that do not) is statistically significant at the 5 % level. Our evidence suggests that restructuring incentive compensation can be an effective response by corporate boards to elicit desirable managerial response in the shadow of regulatory change and these can indeed be value-enhancing. Table 10

Convex compensation structures can induce higher risk-taking by managers (Coles et al., 2006; Manso, 2011). Such an elevated risk-taking level can ultimately result in firms' generating 'technological breakthrough' patents. Conversely, corporate technological innovation effort that seeks technological breakthroughs is also likely to fail often. Thus, we also examine the propensity of firms' registering highly successful patents (i.e., cited in the 90th percentile of the technology-class-year citations distribution) and patents that failed to garner any forward citations (indicative of failed technology that are scientifically less relevant).[17] In Table 11, we show that firms that positively adjusted incentive compensation post-UD laws are associated with an increase in the number of highly cited patents (i.e., those whose citations are in the right-tail of the technology-class-year citations distribution), though difference in subsample coefficients is not significant. However, these firms also experienced an increase in the number of 'failed patents' (i.e., patents that did not receive any forward citations). These findings in innovation outcomes are observed in the 'tails' of the scientific quality distributions and are generally consistent with the notion that positive adjustments in the incentive compensation indeed incentivized managers to `swing for the fences'.

4.6. Robustness tests and alternative explanations

4.6.1. Are UD laws an exogenous shock?

This paper uses the staggered passage of universal demand laws as an exogenous shock to litigation risk. This is consistent with the approach in Adhikari et al. (2022), Appel (2019) and Houston et al. (2018). However, there is some argument that either UD laws did not reduce litigation risk after 2010 and/or they had limited impact on corporate behavior and statistically insignificant effect on *total compensation* (see Donelson et al., 2022).

As noted earlier, there are nevertheless good reasons to use UD laws in this context. First, as indicated, Donelson et al. (2022) analyze *total compensation*. They do not analyze the nature of that compensation. It is well known that cash, stock, and options have different incentive effects and can be used in different contexts. Thus, even if UD laws do not influence *total compensation*, it need not follow that they do not influence the nature of that compensation.

Second, Adhikari et al. (2022) indicate that Louisiana, that adopted the UD law in 2015, has a significant outlier impact on UD law results reported in Donelson et al. (2022). In the absence of Louisiana, for instance, UD laws do reduce litigation risk. Similarly, we find that UD laws reduce litigation risk in our *main* sample that ends in 2005 to avoid the contaminating impact of FAS 123R on option grants.[18] It is worth noting that the perceived risk of litigation is important in this context, meaning that even if the impact of UD laws on litigation is unknown, the fact that there is a probability that UD laws influence litigation is likely sufficient to influence management behavior (i.e., much like the chance of any negative corporate event can influence corporate actions).

Further, our sample includes several UD law passages that are not in the Donelson et al. (2022) sample. Specifically, the Donelson et al. (2022) sample starts in 1997. By contrast, our main sample starts in

[17] In unreported tests, we alternatively used 95th percentile of the technology class-year citations distribution as the threshold to define highly cited patents and find qualitatively similar results.

[18] Results are robust to extending the sample to 2010.

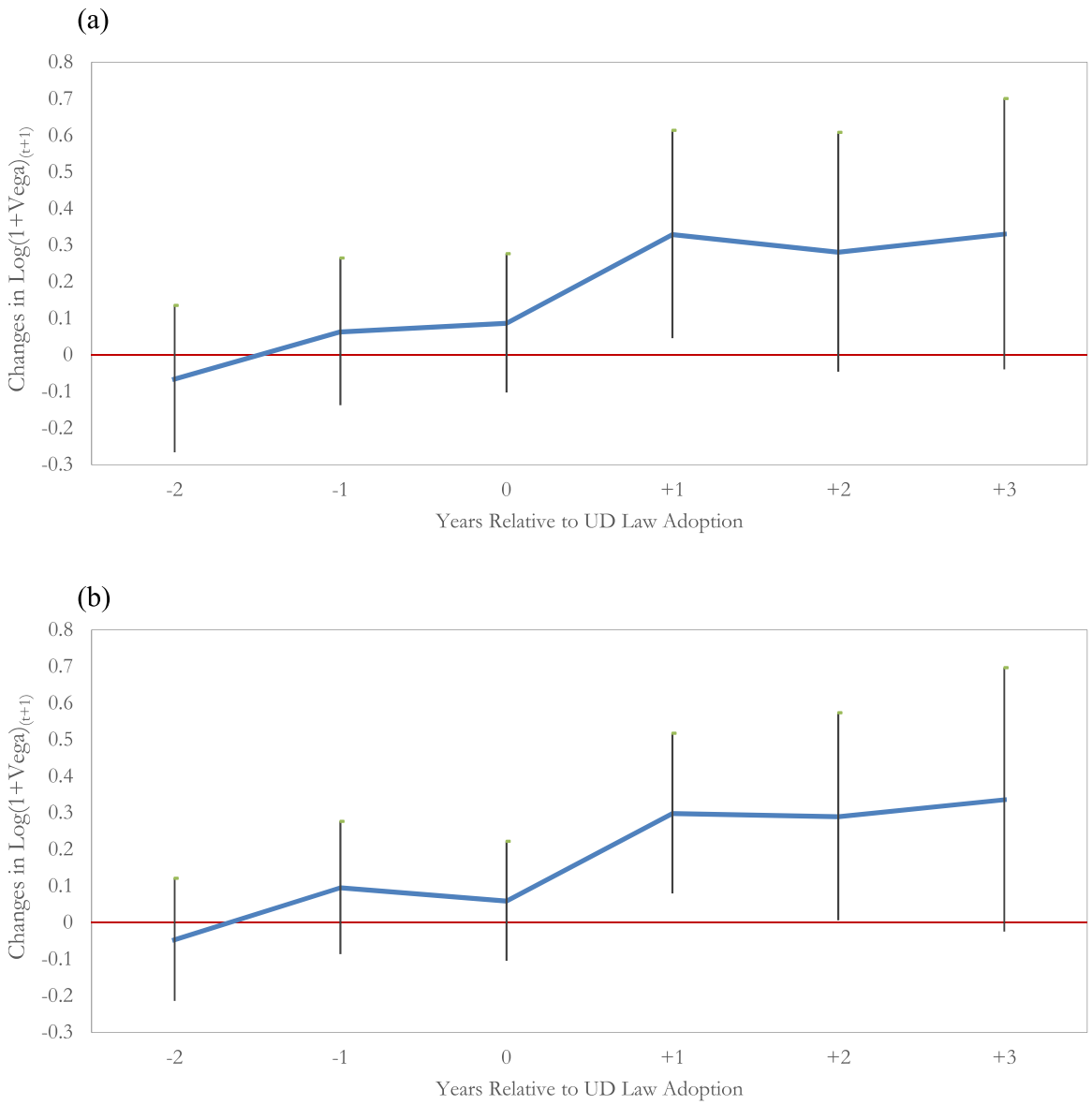

Fig. 1. UD Law and risk-taking incentives in compensation contracts
The figure plots point estimates of '*Log(1+Vega)* $_{(t+1)}$' from panel regression around the years of UD law adoption. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. The panel regression in Fig. 1a does not include any control variables. The panel regression in Fig. 1b includes baseline control variables. The panel regression includes Executive X Firm (Spell) FE and Industry X Year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the incorporation state-level. Effects of UD law on compensation are reflected through 2 years prior to UD law adoption and 3 years after UD law adoption. 95 % confidence intervals are also plotted.

1992. We start in 1992 because we require Execucomp data. This is important because 12 states in the Donelson et al. (2022) sample had already passed UD laws prior to the start of their sample. And, as they indicate (in Table 4) the "always UD law" states indeed have lower derivative litigation risk.

4.6.2. Parallel trend assumption

The results presented rely on a staggered difference-in-difference design. This staggered nature of these multiple shocks (as opposed to an isolated shock) makes it harder to argue that the parallel trend assumption is violated for every single shock (see e.g., Atanasov and Black, 2016). Nevertheless, we still examine whether the parallel trend assumption is satisfied here to assuage such a concern. Specifically, we address this both graphically and through formal tests.

First, we test the parallel trend assumption in Table 12. Here, we regress compensation vega onto indicators for whether the year is one or two years before the UD law, in the year of a UD law's passage, or the one, two, three or four and more years after the UD law (for seven indicators in total). If the parallel trend assumption holds, then the pre-UD indicators should be statistically insignificant. Reassuringly, we find this pattern for the pre-UD indicators. More importantly, we find that the effect of UD laws on vega is statistically significant and positive only in the post-UD period. This is consistent with our main results and implies that the parallel trend assumption is likely satisfied in our sample.

To visualize the findings in Table 12, we plot the estimates from column 1 (column 3) in Fig. 1A (Fig. 1B). These figures illustrate the changes in risk-taking incentives in relation to the dynamics of UD law passage. The solid line in Fig. 1A represents the difference in Log $(1+\text{Vega})_{(t+1)}$ between the treatment and control firms based on the difference-in-difference regressions in column 1 of Table 12. The figure

Table 13
Timing of the effect: shorter event window and tests for treatment surrounding periods
This table contains OLS regressions in which the dependent variable is the natural log of one plus compensation Vega of CEOs. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. The table uses a restricted time-frame around a short period surrounding the passage of UD laws. This is one year, two years, three years, four years or five years surrounding the law, as denoted in the Column header. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	(1)	(2)	(3)	(4)	(5)
	Log(1+Vega)$_{(t+1)}$				
	1-year window	**2-year window**	**3-year window**	**4-year window**	**5-year window**
UD Law	0.256***	0.184**	0.209**	0.228**	0.239**
	[2.824]	[2.116]	[2.427]	[2.568]	[2.541]
Firm Size	0.254***	0.253***	0.254***	0.256***	0.255***
	[23.309]	[22.246]	[22.964]	[25.732]	[22.654]
Market to Book	0.029***	0.029***	0.030***	0.029***	0.029***
	[3.804]	[3.991]	[4.104]	[4.043]	[4.073]
Cashflow Volatility	−0.407**	−0.430***	−0.434***	−0.399**	−0.382**
	[−2.658]	[−2.977]	[−3.044]	[−2.552]	[−2.439]
Stock Volatility	−0.318***	−0.300***	−0.267***	−0.275***	−0.274***
	[−3.655]	[−3.925]	[−4.173]	[−4.100]	[−3.668]
Profitability	0.590***	0.577***	0.561***	0.575***	0.521**
	[3.158]	[3.079]	[2.936]	[3.058]	[2.508]
CAPX	0.120*	0.122**	0.121*	0.115*	0.122**
	[1.969]	[2.028]	[1.986]	[1.869]	[2.057]
R&D	0.002	−0.003	−0.010	−0.008	−0.028
	[0.041]	[−0.070]	[−0.247]	[−0.206]	[−0.471]
Free Cashflow	0.132	0.151	0.144	0.111	0.161
	[0.642]	[0.736]	[0.708]	[0.548]	[0.765]
Log(Total Pay)	0.141***	0.142***	0.144***	0.148***	0.148***
	[10.358]	[9.959]	[9.450]	[8.375]	[8.156]
Executive X Firm (Spell) FE	Y	Y	Y	Y	Y
Industry X Year FE	Y	Y	Y	Y	Y
Observations	13,733	13,959	14,167	14,387	14,600
R-squared	0.888	0.889	0.889	0.889	0.889

indicates that vega increases significantly after UD law adoption but has a flat (or random) trend before UD law adoption, providing visual support for the notion that the parallel trend holds in our setting.

4.6.3. Including only treated firms

A potential concern might be that firms in states that never adopted UD law are systematically different from those in states that adopted UD law at some point. Therefore, in an untabulated test, we check that our results are robust to including only "treated" firms in the sample. Here, our sample includes all firms in a state that enacts a UD law. The main finding is that the UD law indicator remains positively and statistically significantly related to compensation vega, implying that UD laws are associated with increased managers' risk-taking incentives in this sample of 'treated' firms.

4.6.4. Years surrounding the passage of UD law

We ensure that the results are robust to looking at different time periods surrounding the passage of UD laws. One concern with the core results is that other extraneous factors – distant from the passage of the UD law itself – could influence the compensation structure. The core results mitigate this concern by including several fixed effects, including executive × firm, state × year, and industry × year effects. Nevertheless, we test whether the results are robust to restricting the sample to be one to five years before and after a UD law passage (where one occurs); these are provided in Table 13, respectively.

The results in Table 13 are consistent with the baseline results in Table 3. UD laws influence compensation vega positively and statistically significantly in these different specifications. The results support the idea that firms react to UD law by increasing managers' risk-taking incentives.

4.6.5. Extending the sample

We also verify that the results are robust to extending the sample. Our core sample extends to 2005 because of the impact of FAS123R, which altered how firms account for options, and, thus, how firms pay executives (Hayes et al., 2012). Nevertheless, we check that the results are robust to extending the sample to 2010 (i.e., five years after the last UD laws in 2005). The results in Table 14 are qualitatively the same as the core results: the UD laws are associated with a statistically significant increase of 6.15 %–7.6 % in compensation vega.

4.6.6. Sensitivity to states

We also test for whether results are sensitive to which states we include in the tests. Appel (2019) suggests that UD-law related results can be sensitive to which states the tests include. We, therefore, investigate whether the results are robust to excluding certain states. When excluding these states, we exclude all firm-year observations for firms incorporated in that state. Thus, in Table 15, Column 1, we drop firms incorporated in states that adopt UD law relatively early in our sample: such as firms incorporated in Georgia, Michigan, Florida, Wisconsin, Montana, Virginia, Utah, New Hampshire, Mississippi, North Carolina, Arizona, and Nebraska. In column 2, we drop firms incorporated in states that adopt UD law relatively late during our sample, such as firms incorporated in South Dakoda, Rhode Island, and Massachusetts. In column 3, we exclude all UD law adopting states except Pennsylvania since Pennsylvania state supreme court mandated UD in 1997. Appel (2019) argues that the effects of lobbying by the affected firms in UD law adopting states are likely muted for Pennsylvania incorporated firms given the role of the state supreme court in adoption of the UD law. We find that the results are qualitatively similar to the baseline results in both statistical significance and economic magnitude. This implies that our results are not driven by the impact of specific states.

4.6.7. Controlling for other legal changes and omitted variable bias

We also ensure that the results are robust to controlling for other concurrent legal changes. A possible concern is that other legal changes

Table 14
UD laws and vega (sample extended to 2010)
This table contains OLS regressions in which the dependent variable is the natural log of the CEO's compensation Vega. This table extends the sample to 2010. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2010. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	(1)	(2)	(3)	(4)
	Log(1+Vega)$_{(t+1)}$			
UD Law	0.251**	0.268***	0.217***	0.250***
	[2.130]	[2.715]	[3.112]	[3.262]
Firm Size	0.325***	0.258***	0.190***	0.198***
	[12.086]	[9.137]	[6.705]	[6.656]
Market to Book	0.044***	0.027***	0.000	−0.002
	[7.480]	[4.904]	[0.044]	[−0.233]
Cashflow Volatility	−0.415***	−0.276**	−0.308	−0.297
	[−3.541]	[−2.132]	[−1.671]	[−1.325]
Stock Volatility	−0.177**	−0.148**	0.011	−0.006
	[−2.593]	[−2.331]	[0.174]	[−0.085]
Profitability		0.411**	0.094	0.036
		[2.254]	[0.473]	[0.151]
CAPX		0.094	0.009	0.050
		[1.411]	[0.143]	[0.632]
R&D		−0.233***	−0.365***	−0.361***
		[−4.377]	[−8.079]	[−7.434]
Free Cashflow		−0.119	−0.160	−0.084
		[−0.738]	[−0.957]	[−0.444]
Log(Total Pay)		0.164***	0.115***	0.115***
		[13.127]	[11.989]	[10.584]
Log(1+Delta)			0.211***	0.225***
			[13.813]	[13.137]
Executive FE	N	N	N	Y
Executive X Firm (Spell) FE	Y	Y	Y	N
Industry X Year FE	Y	Y	Y	Y
Headquarter State X Year FE	Y	Y	Y	Y
Observations	22,583	22,030	20,909	20,909
R-squared	0.878	0.882	0.888	0.886

might cause confounding effects. These include Business Combination (BC) laws that influence managerial entrenchment (Karpoff and Wittry, 2018). However, only two states (Iowa and Texas) passed BC laws during our sample period. Thus, we do not expect BC laws' passage to significantly influence our results. Nevertheless, our results are robust to controlling for these legal changes. We also include controls for Headquarter-state GDP growth rate and political balance as the additional state-level features in columns 5 and 6.

Our reported results include a broad array of control variables and high-dimensional fixed effects. Nevertheless, we ensure that the results are robust to controlling for the firm life cycle since it could be argued that firm's risk-taking strategy may depend on its life cycle. Similarly, firms' leverage, dividend, and tangibility could influence CEOs' risk-taking. Thus, we control for these additional firm-level attributes in columns 4 and 6. The main finding is that the UD law indicator remains positively and significantly related to compensation vega even after controlling for these additional features.

5. Conclusion

This paper shows that the impact of various governance mechanisms is complex and often conditional on the structure of other governance mechanisms. We highlight that the impact of litigation risk – or the lack thereof – can depend on how firms set compensation contracts in response. We analyze this within the context of derivative litigations. We focus on exogenous regulatory changes that curb derivative litigation. In particular, we argue that "universal demand" laws (UD laws), that significantly impede derivative litigation will cause firms to increase risk-taking incentives.

UD laws by themselves are hypothesized to have a nuanced impact. On the one hand, reducing litigation risk might convey some innovation benefits. Before UD laws, officers and directors faced greater peril of being sued if a risky investment failed. Consequently, directors might have preferred to offer compensation contracts that limited risk-taking by managers. After passage of UD laws, we expect firms to increase risk-taking incentives, with corporate governance attributes moderating, or influencing, this response. We argue that such compensation changes are a key channel through which UD laws are associated with an increase in innovation.

We expect that boards would increase CEOs' compensation vega and the proportion of compensation coming from options to encourage valuable risk-taking. We test this hypothesis by collecting data on US-listed firms from 1992 (the commencement of Execucomp coverage) to 2005 (when FAS 123R was implemented and significantly changed compensation practices). We use the staggered passage of UD laws to conduct a staggered difference-in-difference test with multiple different exogenous shocks affecting different firms at different times. Using this data, we find that firms significantly increase risk-taking incentives after the passage of UD laws. Specifically, there is an increase in compensation coming from options, the dollar amount of options, and compensation vega. We find that the increase in executive options is accompanied by firms decreasing stock grants to CEOs, such that there is no significant change in the delta of the compensation contracts.

We further explore factors that moderate how boards adjust CEO compensation. We hypothesize and show that compensation is mainly adjusted in firms with higher levels of institutional ownership as such institutional investors would actively monitor the firm, and engage with officers and directors. By contrast, we also hypothesize and show that firms adjust compensation significantly less when the CEO is 'powerful' and might be expected to have greater input into board-decision making and compensation arrangements. We further find that firms that increase vega after UD laws experience improvements in innovation output and value, whereas those that do not increase vega do not see these gains.

We take steps to ensure that the results are robust to econometric concerns. We ensure that endogeneity concerns do not drive the results by using a staggered difference-in-difference design. This helps to assuage identification issues as each of 23 states passes UD laws at different times, giving rise to a set of natural experiments. We also mitigate unobserved effects by using different combinations of high-dimensional fixed effects. We further check that the results are robust to restricting the sample to different windows surrounding the passage of UD laws to ensure that the results are not driven by extraneous or distant events.

Our paper makes a significant contribution to the literature in several key areas. The literature highlights that compensation contracts, internal governance, and external governance can have a complex and interrelated role. For example, Manso (2011) argues that firms can encourage innovation by *both* properly structuring incentive compensation *and* by increasing their tolerance for failure. This is consistent with the idea expressed in Stein (1988, 1989) that a low tolerance for failure might reduce risk taking and innovation. Indeed, Lin et al. (2021) indicate that innovation increases after UD laws, which reduce litigation risk and might indirectly increase firms' tolerance for failure. However, Lin et al. (2021) is silent on the role of incentive compensation. Thus, Lin et al. (2021) leaves unexplored whether such an effect might be conditional on how firms react to UD laws. Thus, we explore how firms restructure compensation after UD laws and how corporate governance moderates this effect. Our results could thus be generalizable to other governance mechanisms – in addition to UD laws – that could increase firms' tolerance for failure. In so doing, we connect several areas of the literature and highlight the inter-related nature of compensation contracts, external governance through litigation, internal governance attributes,

Table 15
Additional robustness tests
This table contains the results of additional robustness tests. The regression specification is broadly as per the baseline tables (Table 3). The Column header describes the robustness test. Column 1, we drop firms incorporated in states that adopt UD law relatively early in our sample, such as, firms incorporated in Georgia, Michigan, Florida, Wisconsin, Montana, Virginia, Utah, New Hampshire, Mississippi, North Carolina, Arizona, and Nebraska. Column 2, we drop firms incorporated in states that adopt UD law relatively late in our sample, such as, firms incorporated in South Dakoda, Rhode Island, and Massachusetts. Column 3 focuses the treatment effect on Pennsylvania and excludes all other UD adopting states. Columns 4–6 include additional firm- and State-level control variables. Column 4 includes additional firm-level features, such as, *Dividend Payer, Tangibility, Firm age, and Leverage*. Column 5 includes additional state-level features, such as, *BC Law* adoption by Incorporation -State of the firm, *GDP Growth Rate and Political Balance* of the Headquarter-State of the firm. Column 6 includes additional control variables from columns 4 and 5. *Vega* is the change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. *UD Law* is an indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise. Level of Fixed Effects are indicated. All models include a constant (suppressed). The standard errors are clustered by Incorporation State of the firm. The sample period covers 1992–2005. See Appendix Table A1 for variable definitions. *t*-statistics are in parentheses. ***, **, and * denote significance levels at 1 %, 5 %, and 10 %, respectively.

Variable	$Log(1+Vega)_{(t+1)}$					
	(1)	(2)	(3)	(4)	(5)	(6)
	Excluding Early Adopters	**Excluding Late Adopters**	**Treatment limited to Pennsylvania Only**	**Additional Control Variables**		
UD Law	0.205**	0.296**	0.258**	0.205**	0.205***	0.258**
	[2.241]	[2.070]	[2.070]	[2.241]	[3.888]	[2.070]
Firm Size	0.248***	0.263***	0.248***	0.248***	0.248***	0.248***
	[16.341]	[22.330]	[17.104]	[16.341]	[16.516]	[17.104]
Market to Book	0.030***	0.030***	0.030***	0.030***	0.030***	0.030***
	[4.710]	[4.776]	[4.449]	[4.710]	[4.448]	[4.449]
Cashflow Volatility	−0.431***	−0.441***	−0.428***	−0.431***	−0.411**	−0.428***
	[−3.061]	[−3.481]	[−2.973]	[−3.061]	[−2.748]	[−2.973]
Stock Volatility	−0.240***	−0.272***	−0.275***	−0.240***	−0.228***	−0.275***
	[−3.113]	[−3.587]	[−3.084]	[−3.113]	[−2.914]	[−3.084]
Profitability	0.533**	0.472**	0.610***	0.533**	0.529**	0.610***
	[2.431]	[2.134]	[3.287]	[2.431]	[2.372]	[3.287]
CAPX	0.122**	0.113*	0.118*	0.122**	0.127**	0.118*
	[2.190]	[1.725]	[1.944]	[2.190]	[2.319]	[1.944]
R&D	−0.034	−0.022	−0.008	−0.034	−0.036	−0.008
	[−0.539]	[−0.404]	[−0.179]	[−0.539]	[−0.586]	[−0.179]
Free Cashflow	0.130	0.158	0.122	0.130	0.148	0.122
	[0.640]	[0.793]	[0.597]	[0.640]	[0.721]	[0.597]
Log(Total Pay)	0.147***	0.158***	0.146***	0.147***	0.147***	0.146***
	[8.692]	[6.606]	[8.962]	[8.692]	[9.018]	[8.962]
Firm-level variables						
Dividend Payer				−0.057		−0.059
				[−1.478]		[−1.516]
Tangibility				0.475***		0.477***
				[4.177]		[4.176]
Firm Age				−0.023		−0.022
				[−0.371]		[−0.360]
Leverage				−0.284***		−0.283***
				[−3.577]		[−3.577]
State-level variables						
BC Law					−0.327**	−0.328**
					[−2.489]	[−2.517]
GDP Growth Rate					0.032	0.020
					[0.095]	[0.060]
Political Balance					0.018	0.020
					[0.110]	[0.124]
Executive X Firm (Spell) FE	Y	Y	Y	Y	Y	Y
Industry X Year FE	Y	Y	Y	Y	Y	Y
Observations	14,582	15,634	13,801	16,002	16,002	16,002
R-squared	0.888	0.888	0.888	0.888	0.888	0.888

and innovation.

In addition, our paper highlights certain policy trade-offs: one is that UD laws can impact executive risk taking and when implementing such laws, it is important to consider potential unintended consequences. A second is that firms respond to new regulations in a heterogenous manner, with good governance playing a key role in the quality of the response.

CRediT authorship contribution statement

Mark Humphery-Jenner: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Emdad Islam:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Vikram Nanda:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lubna Rahman:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Acknowledgement

We acknowledge the helpful feedback of the anonymous referees and of the editor, Edith Hotchkiss. We thank the conference participants at the Australasian Finance and Banking Conference (2020) and the Australian Law and Economics Conference (2020). We also thank the seminar participants at the Adelaide Business School and UNSW Business School. Humphery-Jenner would like to thank the Australian Research Council grant DE150100895. Islam and Rahman would like to acknowledge the New Academic Staff Grants from Monash Business

School.

Appendix A1. Variable definitions

Compensation Variables	
#Options	The number of stock options granted to the executives.
#Stocks	The number of shares of restricted stock granted to the executives.
$ Options	The value of stock options granted to the executives.
$ Stocks	The value of restricted stock granted to the executives
Delta	The change in the dollar value of the executive's wealth for a one percentage point change in stock price (following Guay (1999), Core and Guay (2002a) and Coles, Daniel, and Naveen (2006))
Options Intensity	The proportion of executive's total annual compensation that comes from option grants. This is the value of annual option awards (ExecuComp: "option_awards_blk_value" before FAS 123R and "option_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1").
Stock Volatility	The square root of the sum of squared daily returns over the year.
Stocks Intensity	The proportion of executive's total annual compensation that comes from stock grants. This is the value of restricted stock granted to the executives (ExecuComp: "rstkgrnt" before FAS 123R and "stock_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1").
Total Pay	The dollar value of the executive's total annual compensation (ExecuComp: "tdc1")
Vega	The change in the dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. (following Guay (1999), Core and Guay (2002a) and Coles, Daniel, and Naveen (2006)) Source: Coles, Daniel, and Naveen (2006)
Firm-level features	
Block Ownership	Institutional owners that hold at least 5 % ownership in the firm. Source: Thomson-Reuters 13f.
CAPX	The Capital expenditures to lagged sale.
Cash-Flow Volatility	The standard deviation of a firm's Return on assets over the previous five years (firms are required to have at least three years of data during the prior five years to enter the sample).
Dividend payer	An indicator equals to one if the firm pays dividends.
Firm Age	The natural logarithm of one plus firm age.
Firm Size	The natural logarithm of total assets (at).
Free Cashflow	Operating income before depreciation less interest related expenses, taxes and capital expenditures scaled by assets.
Innovation Quality	The natural logarithm of one plus the number of citations attributable to patents filed with USPTO in a year. Source: Kogan et al. (2017)
Innovation Quantity	The natural logarithm of one plus the number of patents filed with USPTO in a year. Source: Kogan et al. (2017)
Innovation Value	Total value of innovation in a year scaled by lagged book value of assets. Source: Kogan et al. (2017)
Highly-cited Patents	The natural logarithm of one plus number of patents applied for that are cited in the 90th percentile of the technology-class-year citations distribution. Source: KPSS (2017)
Non-Cited Patents	The natural logarithm of one plus number of patents applied for that did not garner any forward citations. Source: KPSS (2017)
Institutional Ownership	Proportion of institutional ownership in a firm. Source: Thomson-Reuters 13f.
Leverage	The book value of long-term debt (dltt) plus debt in current liabilities (dlc) divided by book value of assets (at) .
Market to Book	The market value of assets (market value of equity plus book value of assets minus book value of equity minus deferred taxes) divided by book value of assets ((prcc_f × csho+at-ceq-txdb)/at).
Product Announcement CAR	The natural logarithm (1+the sum of all positive cumulative abnormal returns over the year). Source: Mukherjee et al. (2017)
Profitability	Earnings before interest and taxes (ebit) divided by the book value of assets (at).
Proportion of Independent Directors	Number of independent directors scaled by the total number of directors.
R&D	The R&D expenses to lagged sale.
Tangibility	The property, plant, and equipment (ppent) divided by the book value of assets (at).
CEO-level features	
CEO—Chair	An indicator equals to one if the CEO is also the chairman of the corporate board. Source: Execucomp and hand-collected data
CPS	The fraction of total compensation of top 5 executives' pay that is captured by the CEO
Overconfident CEO	An indicator variable equal to one if the CEO is overconfident. We create a variable 'Holder67' following Malmendier, Tate, and Yan (2011). A CEO is overconfident if 'Holder67' is equal to one. Holder67 equals one from the first year in which the confidence level of a CEO is equal to 0.67 on at least two occasions.
State-level features	
BC Law	An indicator variable equal to one if the firm is incorporated in a state that adopts Business Combination law, and zero otherwise.
GDP Growth Rate	The annual GDP growth rate in the Headquarter-state
Political Balance	The fraction of a state's Congress members representing their Headquarter-state in the US House of Representatives that belong to the Democratic Party
UD Law	An indicator variable equal to one if the firm is incorporated in a state that adopts UD law, and zero otherwise.

Data availability

The authors do not have permission to share data.

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