Say on Pay, CEO Pay Sensitivities, Firm Risk and Agency Costs of Debt

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Abstract

I examine how Say on Pay affects firms' agency costs of debt. Using a sample of US listed firms and employing a difference-in-differences framework, I find some evidence that higher CEO delta leads to a decrease in stock return volatilities and lower agency costs of debt, consistent with Brockman, Martin and Unlu (2010). Further, I find some evidence that this decrease in agency costs of debt is concentrated in firms with long CEO tenures and high institutional ownership, within firms that show greater responsiveness to Say on Pay, implying that Say on Pay improves corporate governance in poorly governed firms and strengthens shareholder power. My findings are consistent with Correa and Lel (2016) and Cai and Walking (2011) and suggest that Say on Pay is an effective substitute for a corporate governance mechanism.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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3 August 2022

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Chapter 1

Introduction

1.1 Background on Say on Pay

The growing use of stock option as an incentive tool, and the consequent rapid increase in the level of CEO pay, made headlines and was subject to criticism during the dot-com bubble and associated accounting and governance scandals in the early 2000's (Murphy, 2012). Around this time, shareholder activism and governance intermediaries such as governance rating agencies and proxy advisors arose, with numerous institutional investors becoming more active to the monitoring of companies (Ferri & Gox 2018). Meanwhile, the academic literature reported the impact of corporate governance and its quality on firm value. For example, Bebchuk (2005) argues for empowering shareholders regarding corporate policy choices. Specifically, he argues that charter provisions which introduce shareholder power to make "game-ending" decisions (decisions regarding mergers, sale of assets and dissolving the company) and "scaling-down" decisions (decisions to make cash or in-kind distributions) can reduce distortions and inefficiencies by countering management favouring continuation of the company and retaining excessive fund or empire-building. There have also been increasing levels of executive pay in the UK. As a response to this the UK introduced a governance mechanism in 2002 that empowers shareholders; a mandatory annual non-binding advisory vote on the remuneration report which is known as "Say on Pay" (Ferri & Gox 2018; Bethune 2011). Although it is only advisory Say on Pay exhibited effectiveness, as firms that experienced dissenting votes tended to change their compensation packages (Ferri & Gox, 2018). Observing this effect led to a movement in the US headed by a union pension fund, the American Federation of State, County and Municipal Employees, advocating for the adoption of Say on Pay (Ferri & Gox, 2018). This led to the passage of a Bill in 2007 in the House of Representatives requiring an annual advisory vote on executive compensation (Ferri & Gox, 2018). When the Global Financial Crisis (GFC) broke out and excessive executive pay which induced excessive risk-taking became subject to criticism, President Obama signed the Dodd-Frank Act into law on 21st July 2010 which requires publicly traded firms to mandatorily hold a non-binding shareholder vote on executive compensation at annual meetings held on or after 21st January 2011 (Ferri & Gox, 2018). Similar non-binding mandatory Say on Pay votes have been adopted in Australia (2005), Portugal (2010), Italy (2011), Spain (2011), Belgium (2012), Israel (2012) and France (2014). Switzerland (2007), Germany (2010) and Canada (2012) introduced a voluntary Say on Pay regime (Ferri & Gox, 2018). The Netherlands (2004), Japan (2005), Sweden (2005), Denmark (2007), Norway (2007), Finland (2007) and South Africa (2011) have adopted a binding Say on Pay vote. The European Union has adopted the newly revised Shareholders' Rights Directive published in the Official Journal of the European Union on 20th May 2017. The Member States were required to bring into force the relevant laws and regulations by 10th June 2019, and it was left to the individual countries as to whether it shall be an advisory or binding vote (European Union, 2017). Currently, the Say on Pay regime in the US is due to be revised in the near future. The Financial CHOICE Act which was introduced in 2017 in the House of the Representatives contains an amendment to the Dodd-Frank Act, proposing that the Say on Pay vote to be required only when there are material changes to executive compensation and that the Say on Frequency requirement be eliminated (Breheny et al. 2017; Fisch, Palia & Solomon 2018).

There are two views on the Say on Pay legislation. On the one hand, Kaplan (2008) and Bainbridge (2008) argue that the non-binding nature of Say on Pay would lead to the votes being ignored or even cause suboptimal compensation contracts when directors aim to gratify less sophisticated shareholders. On the other hand, Bebchuk (2005) argues that Say on Pay can help directors to better negotiate with CEOs on behalf of shareholders and result in more efficient compensation contracts by strengthening the board's power during the negotiation process.

Empirical evidence on Say on Pay and its effect on executive compensation generally shows the positive side of Say on Pay. Ferri and Maber (2013) find a significant increase in the sensitivity of CEO pay to poor performance around the adoption of Say on Pay in the UK. More particularly, the increase did not occur in firms that were exempted from Say on Pay (firms traded on the Alternative Investment Market which has a more flexible regulatory system) and is more pronounced in firms with high dissenting votes and an excessive level of CEO pay pre-Say on Pay. Iliev and Vitanova (2015) examine the changes in the composition of executive compensation using the regression discontinuity design. They utilise the exemption period for smaller reporting companies with a public float of $75 million or less as the cut-off for the regression discontinuity design and find a shift from fixed pay to performance-based pay. Conversely, Cunat, Gine and Guadalupe (2016) employing the regression discontinuity design approach but using the 50 percent threshold of approval as the cut-off, find no evidence of change in the composition or level of CEO pay. However, as Ferri and Gox (2018) noted, these firms did not show excess CEO pay or poor governance; hence, the result may not be unexpected and must be interpreted with caution. Correa and Lel (2016) examine a larger sample of firms over 38 countries and find that following the adoption of Say on Pay, pay-for-performance increased and CEO pay growth declined. Ferri and Maber (2013) also find an increase in pay-performance sensitivity after the adoption of Say on Pay, and Collins, Marquardt and Niu (2019) find that shareholders tended to approve compensation packages with high pay-performance sensitivity, while pay-risk sensitivity did not impact the tendency of approval. However, Ertimur, Ferri and Oesch (2013) find that more than 55 percent of the firms that experienced substantial voting dissent responded by making changes to compensation packages the following year.

There are also empirical investigations examining the effect of Say on Pay on firm value. Cai and Walking (2011) conduct an event study and find a positive market rFeaction to the approval by the House of Representatives and greater responsiveness of firms with high abnormal CEO cash pay and suboptimal pay-for-performance sensitivity. However, they do not find evidence for firms with high abnormal equity and total CEO pay, which is consistent with Larcker et al. (2011) who fail to find an impact for firms with high abnormal total CEO pay. In their study, Larcker et al. (2011) suggest that corporate governance events may be value-destroying, in that existing corporate governance practices, including executive compensation arrangements, are already value-maximising contracts agreed upon between shareholders and managers. Thus, any governmental intervention that attempts to regulate such governance practices are, in fact, value-destroying. However, Ferri and Gox (2018) point out that these studies were conducted after the passage of the Say on Pay only by the House of Representatives in 2007, which did not guarantee passage in the Senate and approval by the White House. Therefore, their conclusions drawn after the approval by the House of Representatives but before mandating Say on Pay are not fully convincing. Iliev and Vitanova (2015) observe negative abnormal returns after the full implementation of Say on Pay (around the announcement of the SEC final Say on Pay rule) for smaller reporting companies, evidencing a positive impact from mandating Say on Pay. Ferri and Maber (2013) examine the UK stock market around the adoption of Say on Pay and documented positive abnormal returns. Correa and Lel (2016) examine Say on Pay’s impact on Tobin’s Q and reported an increase of 2.4 percent in firm value, suggesting the increase may be ascribed to either better alignment of pay and performance, or the benefits of reduced pay gap among the management team.

1.2 Research Questions and Thesis Structure

Prior research primarily focused on the impact of Say on Pay on the composition of executive compensation and stock market reactions, but paid little attention to how this regime could affect corporate debt. According to John and John (1993), compensation arrangements need to consider not only the agency costs of equity but also the conflicts of interests arising from the relationships with other parties, since a firm is a nexus of contracts and other parties also influence firm decisions.

The impact of Say on Pay on firms’ agency costs of debt, defined as the reallocation of bondholder wealth to shareholders, is twofold. On the one hand, Say on Pay impacts agency costs of debt via changes in executive compensation and resultant changes in firm policies and risk. Say on Pay better aligns shareholder and manager interests by allowing shareholders to directly intervene in the design of managerial compensation. This follows the shareholder value approach which suggests executive compensation as a tool to resolve agency costs of equity (Rappaport, 1986). Under contract theory and the Black and Scholes (1973) and Merton (1974) models, shareholders attempt to design executive compensation contracts more equity-based in the form of delta (executive pay-performance sensitivity) and vega (executive pay-volatility or pay-risk sensitivity), to maximise their wealth. These incentives are strongly linked to corporate debt policy as they determine managerial risk preference and firm risk (Berger, Ofek & Yermack 1997, Brockman, Martin & Unlu 2010, Chava & Purnanandam 2010, Coles, Daniel & Naveen 2006). Brockman, Martin and Unlu (2010) show that credit rating agency reports (by Moody's and Standard & Poor's) consider the compensation structure and acknowledge the relationship between executive compensation and managerial risk preferences. Empirical literature attempts to find the relationship between executive compensation and corporate policies. Coles, Daniel and Naveen (2006) find that CEO vega is associated with risky investment and financing policies such as higher research and development expenses and higher leverage, while delta is negatively associated with risky policy choices. Hence, any changes in compensation structures following the adoption of Say on Pay will better align shareholder and manager risk preferences, and impact firms’ policy choices and risk, ultimately impacting agency costs of debt. The extant literature consistently documents an increase in delta in the post-Say on Pay period (Correa & Lel 2016; Clarkson, Walker & Nicholls 2011; Ferri & Maber 2013; Ferri & Gox 2018; Collins, Marquardt & Niu 2019), and given that delta is associated with risk aversion and lower levels of firm risk (Coles, Daniel & Naveen 2006), Say on Pay must reduce agency costs of debt. However, although Coles, Daniel and Naveen (2006) documented the negative association between delta and risky policy choices, they found the causality runs in both directions. They found that firm policies and executive compensation are jointly determined, and that delta is positively related to firm risk, consistent with Core and Guay (2002) but contrary to Aggarwal and Samwick (1999). One possible reason for the mixed empirical results on delta may be ascribed to endogeneity. Since the effect of delta on managerial risk preference and firm policies is ambiguous, it is difficult to predict the impact of Say on Pay on agency costs of debt (Tufano 1996; Geczy, Minton & Schrand 1997; Berger, Ofek & Yermack 1997; Rajgopal & Shevlin, 2002).

Furthermore, if Say on Pay impacts agency costs of debt in weakly governed firms, it is expected that strong CEO power over boards during compensation arrangements will be weakened since Say on Pay gives shareholders greater power over executive compensation (Ferri & Gox, 2018). Consistent with this prediction, Correa and Lel (2016) find that changes in compensation packages are concentrated in firms with weak governance (busy boards, low board independence, long CEO tenure, and low institutional ownership). Similarly, Cai and Walking (2011) find a positive market reaction and a greater responsiveness of firms with high abnormal CEO cash pay and suboptimal pay-for-performance sensitivity in the post-Say on Pay period. Since stronger corporate governance reduces agency costs of debt (Bhojraj & Sengupta 2003; Mande, Park & Son 2012), Say on Pay must positively affect weakly governed firms in terms of agency costs of debt.

Despite such insights, how Say on Pay affects agency costs of debt has not been empirically investigated. Thus, I have addressed this gap and aimed to examine the impact of Say on Pay on agency costs of debt, and whether the impact is caused by changes in compensation structure and managerial risk preference (and consequent changes in firm risk) or improvement in corporate governance.

Using all US listed firms in the sample period between 2006 and 2016, I examined changes in CEO pay sensitivities (CEO delta and CEO vega), firm risk and agency costs of debt in the post-Say on Pay period. Following Correa and Lel (2016), I defined the fiscal year 2011 as the beginning of the post-period, as Say on Pay (the Dodd-Frank Act) was mandatory from the first annual meetings in US firms held on or after the fiscal year 2011. Employing a difference-in-differences methodology, I separated firms most affected by Say on Pay (treated firms) from firms least affected (controlled firms). I find that Say on Pay is associated with an increase in CEO delta and CEO vega in the treated firms, consistent with Say on Pay’s impact on better-aligning shareholder and manager best interests by shifting to more equity-based compensation (Correa & Lel 2016; Cai & Walking 2011; Iliev & Vitanova 2019). I find Say on Pay is also associated with a decrease in stock return volatilities and an increase in leverage, implying mixed results on its impact on firm risk. I find no evidence to link the increase in CEO pay sensitivities and changes in firm risk to agency costs of debt. However, I find that the increase in CEO pay sensitivities are concentrated in firms with long CEO tenure and high institutional ownership, evidencing Say on Pay empowers shareholder control over CEO compensation arrangements and its role as a corporate governance mechanism. Consistent with this result, I find evidence of decreasing debt cost in poorly governed firms post-Say on Pay, further suggesting Say on Pay’s impact as a corporate governance mechanism.

I identified two types of treated firms likely to be more impacted by Say on Pay. The Black and Scholes (1973) and Merton (1974) models suggest that a firm’s equity can be viewed as a European call on firm’s assets with the exercise price equal to the face value of outstanding debts. Shareholder wealth depends not only on the equity value but also on the volatility of equity value. Contract theory suggests that the optimal contract where a moral hazard problem is present must link managerial compensation to these two values (equity and volatility of equity value) to maximise shareholder wealth. Hence, if Say on Pay empowers shareholders in managerial compensation arrangements, any existing compensation not adequately tied to stock prices or stock return volatilities must be redesigned, resulting in a greater CEO delta and CEO vega in the post-Say on Pay period. This theoretical prediction is consistent with the findings of Correa and Lel (2016) and Cai and Walking (2011), that Say on Pay's impact is concentrated in firms with suboptimal CEO pay practices (low CEO pay-performance sensitivity pre-Say on Pay) and weak corporate governance (long CEO tenure, low board independence and low institutional ownership). Following this argument, my first group of treated firms is those with below industry median CEO delta in the pre-Say on Pay period, and the second group of treated firms is those with below industry median CEO vega in the pre-Say on Pay period.

My thesis contributes to the literature in the following ways. First, although Kimbro and Xu (2016) and Brunarski, Campbell and Harman (2015) examine the effect of Say on Pay voting outcomes on firm risk measures, to the best of my knowledge there has been no research which examined changes in firm risk measures following the adoption of Say on Pay. My difference-in-differences approach and identifying firms most affected by Say on Pay provide strong causal evidence on the relationship between Say on Pay and firm risk.

In addition, the extant literature primarily focuses on the impact of Say on Pay on compensation changes and firm performance, while there has been no study, to the best of my knowledge, which examines the impact of Say on Pay on firms' debt. Given that Say on Pay's impact can be linked to changes in managerial risk preferences and firm risk through increasing CEO pay and its role as a substitute to corporate governance mechanisms, I examined how this regime impacts debtholders and the cost of debt financing. Say on Pay may result in manager interests being aligned more closely to shareholder interests, resulting in greater costs of debt, or it may enhance corporate governance in poorly governed firms and reduce the cost of debt financing. Thus, my findings will provide legislators and proxy advisors with more aspects and unintended consequences of Say on Pay.

The remainder of this thesis is organised as follows. Chapter 2 introduces the theoretical framework of this study, explores relevant empirical evidence in the current literature, and develops the hypotheses. Chapter 3 introduces data, variables, methodology and descriptive statistics. Chapter 4 conducts empirical investigations and consists of two parts – the first part examines Say on Pay's impact on CEO pay sensitivities and firm risk and the second part examines Say on Pay's impact on agency costs of debt. Chapter 5 summarises the results and concludes the thesis.

Chapter 2

Literature Review and Hypotheses

2.1 Theoretical Framework

2.1.1 Theory of Incentives under Moral Hazard

Shareholder utility increases with share prices, but this must be done through their agents (managers) due to separation of ownership and control in firms, which creates an agency relationship (Berle & Means, 1932; Jensen & Meckling, 1976). However, managers may not always make decisions in their shareholder interest but use their authority to act in their own interest, resulting in agency costs of equity (Jensen & Meckling, 1976). As such, information regarding manager actions are not verifiable and controllable by the shareholders, with such information asymmetry being defined as a moral hazard problem (Macho-Stadler & Perez-Castrillo, 2001). Theory of incentives (or contract theory) suggests that shareholders may be able to alleviate this concern by designing an appropriate compensation contract that can induce managers to dedicate effort to their work to achieve shareholder desired outcomes (Macho-Stadler & Perez-Castrillo 2001; Lambert 2001). This is consistent with the shareholder value approach which views the role of executive compensation as a mechanism to resolve agency costs of equity by aligning the interests of managers and shareholders (Rappaport, 1986).

Following Macho-Stadler and Perez-Castrillo (2001), the optimal compensation contract in a moral hazard situation is derived by first assuming that the shareholder utility function is of the form:

$$B(x,w) = b(x) - w, \tag{2.1}$$

where b(x) is the shareholder's profit function from an increase in their wealth. Under the informational asymmetry and moral hazard, the variable x should be some variable that is verifiable by the shareholders. The variable w is the compensation paid to the managers. The managers' utility function is of the form:

$$U(w,e) = u(w) - v(e), \tag{2.2}$$

where e ($e \geq 0$) is the effort that the managers put for their work. Assuming that $u' > 0$, $u'' < 0$, $v'' > 0$, $v'' > 0$, $v(0) = 0$, $v'(0) = 0$, and that the density of the distribution of variable x is $f(x;e)$, the second-best optimal contract under the moral hazard situation can be derived by shareholders solving the following maximisation problem:

$$\begin{aligned} &\underset{w(x)}{Max}\ [b(x) - w(x)]f(x;e)dx \\ s.t.\quad & u(w(x))f(x;e)dx\ - v'(e) \geq \underline{U} \\ & u(w(x))f'_e(x;e)dx\ - v'(e) = 0, \end{aligned} \tag{2.3}$$

where $\underline{U}$ is the reservation utility of the managers and thus the first constraint is the participation constraint, and the second is the incentive compatibility constraint. Denoting the participation constraint multiplier as λ and the incentive constraint multiplier as μ, the first order condition for the optimal compensation contract gives:

$$L = [b(x) - w(x)]f(x;e) + \lambda u(w(x))f(x;e) + \mu u(w(x))f'_e(x;e) \tag{2.4}$$

$$\frac{\partial L}{\partial w(x)} = -f(x;e) + \lambda u'(w(x))f(x;e) + \mu u'(w(x))f'_e(x;e) = 0, \tag{2.5}$$

and therefore

$$\begin{aligned} &\lambda u'(w(x))f(x;e) + \mu u'(w(x))f'_e(x;e) = f(x;e) \\ &u'(w(x))[\lambda f(x;e) + \mu f'_e(x;e)] = f(x;e) \\ &u'(w(x)) = \frac{f(x;e)}{\lambda f(x;e) + \mu f'_e(x;e)} \\ &u'(w(x)) = \frac{1}{\lambda + \mu \dfrac{f'_e(x;e)}{f(x;e)}}\ . \end{aligned} \tag{2.6}$$

Given that the incentive compatibility constraint binds ($\mu > 0$), the second-best optimal compensation w is increasing in x, for given effort e, meaning that the optimal managerial compensation is an increasing function of the level of output x.

2.1.2 Black-Scholes-Merton Model

Shareholders' preference can be explained by applying the Black and Scholes (1973) and Merton's (1974) option pricing model which models a firm's equity as a European call on the firm:

$$E = VN(d_1) - De^{-rt}N(d_2) \qquad (2.7)$$

where V is the firm value, E is the value of equity, D is the face value of outstanding debts, r is the risk-free rate, σ_V is the volatility of firm value, d_1 is $[\,ln\left(\frac{V}{D}\right) + t\left(r+\frac{\sigma_V^2}{2}\right)]/\sigma_V\sqrt{t}$ and d_2 is $d_1 - \sigma_V\sqrt{t}$. The shareholder wealth (and utility), E, is monotonically increasing with the underlying firm value (V) and the volatility of firm value (σ_V), since the sensitivities of equity value to the firm value and volatility of firm value are always positive: $\partial E/\partial V > 0$ and $\partial E/\partial \sigma_V > 0$. Thus, shareholders have a monotonic preference for firm value and firm risk.

To apply this conclusion to the optimal contract derived under moral hazard, first, we can suppose that the profit function $b(x)$ (Equation 2.1) is a function of the Merton model and output x is σ_V. The problem is that it may be difficult to verify whether the increased volatility of firm value can be attributed to managers' risk-taking decisions. Since $\sigma_E = \frac{V}{E}N(d_1)\sigma_V$, that is, the volatility of equity is equal to the volatility of firm value adjusted for the probability of the asset survival and the weight of equity, a plausible solution to this problem may be to pay with stock options and induce managers to increase stock price volatility, which in turn increases the volatility of firm value. The potential loss is also limited with a stock option as its value cannot be negative, and thus, it can induce risk-taking. Thus, managers must associate executive pay-volatility sensitivity (vega) with extra risk-taking incentives.

Second, suppose the verifiable output x in the shareholder profit function $b(x)$ in Equation (2.1) is the value of equity (E) itself. In this case, it is optimal to pay the manager with stock, which will increase executive pay-performance sensitivity (delta), or a call option, which will increase both delta and vega. Their compensation increases as the stock price rises. However, increasing delta by paying with stock may have other effects as stock exposes managers to unsystematic risk. Modern portfolio theory (Markowitz, 1952) suggests that the mean-variance efficient portfolio can be achieved by diversification. Unlike shareholders who have diversified portfolios and benefit from extra risk taken by the firm, manager compensation portfolios would depend highly on the value of the firm's stock, thus leading managers to attempt to mitigate firm risk (Guay 1999; Smith & Stulz 1985). Hence, delta must be associated with managerial risk-aversion. This managerial risk aversion is also true even if risk averse managers work for risk averse shareholders with undiversified portfolios (Amihud & Rev, 1981). The following analysis explains such cases and is adopted from Amihud and Rev (1981) but with modifications noted.

Let $U_s(E)$ *and* $U_m(E)$ be the utility functions of shareholders and managers on wealth, E, respectively. Let the measures of Arrow-Pratt absolute risk aversion, $-U_s''(E)/U_s'(E) = -U_m''(E)/U_m'(E)$ for all E (their absolute risk aversion is identical for given wealth, E). Suppose that the manager's wage function, $w(x)$, is nonconvex and as the wage $w(x)$ increases with the level of share price x for given effort of e as in Equation (2.6), it can be rewritten in terms of the shareholder's utility function on share price x, $U_s(x)$, which is $w(U_s(x))$, namely the managerial compensation w is increasing with the shareholder utility. Thus, the shareholder's problem is to maximise $U_s(x)$ and the manager's problem is to maximise $U_m(w(U_s(x))$. Since $U''(x) < 0$ (both managers and shareholders are risk averse due to undiversified portfolio) and $w''(x) \leq 0$ (nonconvex), the Arrow-Pratt measures of absolute risk aversion for the manager and shareholders follow that:

$$-\frac{U''_m(x)}{U'_m(x)} > -\frac{U''_s(x)}{U'_s(x)}. \tag{2.8}$$

Thus, managerial absolute risk aversion is still larger than that of shareholders, even if shareholders are undiversified and risk averse.

However, consider the reward effect of delta by Armstrong et al. (2013). As shareholders have monotonic preference over increased firm risk, risk reduction is viewed as value-destroying by the shareholders. Hence, risk aversion by managers can result in a decrease in equity value. Thus, managers who have portfolio with high sensitivity to stock prices are not free from reducing firm risk to mitigate their exposure to unsystematic risk, as it results in a decrease in their wealth. Hence, delta can be associated with risk-taking, which shows theoretical ambiguity of the effect of delta on managerial risk preference. From a behavioural point of view, when managers are exposed to both potential losses and gains from risk-taking, they are likely to be subject to loss aversion bias which subsequently leads to risk aversion (Kahneman, Knetsch & Thaler 1991; Kahneman & Tversky 1979).

The analysis thus far tells us about the expected impact of Say on Pay on firm risk. First, if shareholders want to increase their wealth, they will compensate managers for an increase in stock price or volatility of stock returns which increases managerial portfolio delta and vega. Therefore, as Say on Pay increases shareholder control or power over managerial compensation arrangements, it is expected that the level of equity-based compensation would increase following the adoption of Say on Pay. Second, changes in delta and vega impact managerial risk preference in the post-Say on Pay period which in turn will affect the riskiness of firm's policies. An increase in vega must be associated with a greater level of firm risk. However, the expected increase in delta remains theoretically ambiguous. Finally, the stock market positively reacts to Say on Pay's introduction in the expectation that it will lead to a better alignment of interests between shareholders and managers. The expected positive stock return is not harmful to debtholders if, and only if, there is no reduction in the market value of debt, since the increased firm value increases the probability of full payment of outstanding obligations in case of liquidation. However, it is unlikely that the market value of debt is unaffected, as changes in firm risk imply changes in agency costs of debt. The following sections further analyse theoretical expectations with respect to the potential effects of Say on Pay on firms' debt concerning increasing firm risk.

2.1.3 Agency Theory and Asset Substitution

John and John (1993) view a firm as a nexus of contracts in which the shareholder-debtholder relationship also plays a part in the managerial compensation arrangement. Jensen and Meckling (1976) define the agency costs of debt as the reductions in firm value and increased monitoring costs ascribed to the managerial incentive to reallocate bondholder wealth to the shareholders by increasing the equity portion of the managerial portfolio. The asset substitution problem pertains to the reallocation of bondholder wealth identified in the definition of agency costs of debt by Jensen and Meckling (1976) (Green & Talmor, 1986). When a firm's equity is a call option on the firm, shareholders incentivise managers to shift into riskier policy choices to increase their wealth (Green & Talmor, 1986). The Black-Scholes-Merton option pricing model can show that the increased riskiness of firms is harmful to debtholders as they are viewed as the writer of the call (Black & Scholes 1973; Merton 1974). If the value of the call increases due to the increased riskiness (volatility) of the firm, debtholders as the writers of the call suffer. Further, in Myers' (2000) model, shareholders may reject positive net present value (NPV) projects if their contribution to capital only pays off debt obligations leaving nothing to them. In extreme cases, shareholders facing bankruptcy can be in favour of 'gambling' by investing in negative risky NPV projects where they may recover their position by a very small chance. If the project fails, their position will not differ much from the initial position. However, due to the shift into risker policies, debtholders' initial evaluation on firm's riskiness which is reflected in the interest rate is no longer reflective of current firm risk, and hence, debtholders are exposed to the asset substitution problem where shareholders benefit at debtholders' expenses. The relationship between the risky investment policies and debt has been modelled in several studies, including Gavish and Kalay (1983), Green (1984) and Green and Talmor (1986). These models show that shareholders have incentives to encourage managerial risk-taking and may benefit at the expense of debtholders. Hence, when there is a change in the perceived riskiness of the firm by the debtholders, debtholders suffer from the asset substitution problem which in turn will increase the cost of debt.

2.1.4 Executive Compensation and Corporate Governance

Unlike the shareholder value approach which focuses on the role of executive compensation as a tool to resolve agency costs of equity and maximise shareholder value, the managerial power approach (or the rent extraction view) of executive pay views executive compensation as a possible source of agency cost of equity. Under this approach, CEOs can influence their own pay and extract rents. Their attempt to camouflage rent extraction results in a suboptimal compensation contract that destroys shareholder value (Bebchuk, Fried & Walker, 2002). Further, weak governance and weak boards shift rents to the CEO at the shareholders' expense by arranging inefficient executive compensation if managers have power and undue influence over their compensation (Bebchuk, Fried & Walker 2002; Bebchuk & Fried, 2003, 2004, 2005). This view is more relevant to corporate governance in that it focuses on the power imbalance between shareholders or the board and managers in the compensation arrangement. Ferri and Gox (2018) construct a simple moral hazard model and show that a more management-friendly board in weak governance firms tends to transfer a non-decreasing part of the total surplus to the managers despite no impact on performance-based pay. Ferri and Gox (2018) also conclude that the optimal contract solution under a weak governance structure is almost always detrimental to shareholders as management-friendly boards shift rents to the CEO by increasing their bonus. Say on Pay can effectively resolve weak governance by letting shareholders to intervene in the board and managers' compensation arrangements directly. This argument is consistent with Bebchuk (2005) who argues for the importance of corporate governance mechanisms that empower shareholders to make "game-ending" and "scaling-down" decisions which alleviate distortions and inefficiencies created by excessive managers' decision-making power.

However, when the board is better aware than shareholders of the CEO's ability and effort in increasing firm value than shareholders, the board is in a better position to design the optimal contract (Ferri & Gox, 2018). In this scenario, relatively uninformed shareholders may not be worse-off with a management-friendly board. Thus, in this case shareholders' dissenting votes may result in less efficient compensation contracts (Ferri & Gox, 2018). Thus, Say on Pay may be viewed as a potential threat to firms with good governance structure. This view is consistent with Larcker et al. (2011) who argue that existing pay practices are already a result of value-maximising contracts, and hence any regulation that interrupts the existing practices may be value-destroying.

Say on Pay can create both a moral hazard problem between managers and shareholders, and an asset substitution problem between debtholders and shareholders. However, Say on Pay plays a role as a corporate governance mechanism that enables shareholders to cast dissenting votes to compensations not tied to equity value and prevent managers from making decisions that will decrease equity value. If Say on Pay leads to managers making better decisions for shareholders and contributing to higher stock prices, it should also benefit debtholders. Bhojraj and Sengupta (2003) argue that good quality corporate governance not only strengthens the shareholders' ability to monitor managers and hence reduces agency costs of equity, but also induces firms to disclose information timelier. This timely information reduces information risk, which is the risk that managers possess private information that can have an adverse effect on the default risk on the loan, which in turn helps produce credible information (Bhojraj & Sengupta, 2003). Thus, debtholders can rely on more timely and credible information and better assess a firm's ability to pay off debt.

The theoretical discussion about the effect of Say on Pay on agency costs of debt and its effect as a corporate governance mechanism on firm's debt can be summarised as follows. First, changes in firms' riskier policy choices will change the riskiness of firms perceived by debtholders. If debtholders expect an increase in the asset substitution problem, they require a higher rate of return as compensation for the increased agency costs of debt. Second, the effect of Say on Pay as a tool to improve corporate governance with respect to managerial compensation arrangements will be greater on firms with poor governance structures. Thus, debtholders in these firms will benefit more from Say on Pay compared to firms with good corporate governance, as Say on Pay is an attribute to producing timely and credible information.

2.2 Empirical Evidence

Table 1 summarises the findings of the previous studies on Say on Pay. Say on Pay leading to a greater proportion of equity-based compensation as theory suggests, has been empirically investigated in the literature. Iliev and Vitanova (2019) utilise smaller reporting companies, with a public float of $75 million or less, which were exempted from complying with the SEC's final rule (requiring Say on Pay and Say on Frequency votes) for two years after the adoption of Say on Pay. They employed a regression discontinuity design using $75 million as the cut-off to isolate the effect of Say on Pay on changes in executive compensation. They use hand-collected data from 10-K, 10-Q and 8-K filings and find a statistically significant increase in the performance-based compensation by 10.77 to 15.85 percent around the adoption of Say on Pay. However, their definition of performance-based compensation comprises stock, options, bonus, and non-equity incentive plans, but they do not separate option and stock payments, leaving a question of the respective change in the level of vega and delta. Correa and Lel (2016) investigates the effect of Say on Pay on CEO compensation using a large cross-country sample covering more than 90,000 firm-year observations from 38 countries. They find that following the adoption of Say on Pay laws, pay-for-performance sensitivity increases, and CEO pay growth rates declined. Ertimur, Ferri and Oesch (2013) examine the effect of Say on Pay on compensation practices

Table 1
Summary of empirical literature on Say on Pay

Author(s)	Findings
Brunarski, Campbell and Harman (2015)	Managers with overcompensation and low Say on Pay approval rates in US firms react by increasing dividends, decreasing leverage and increasing corporate investment. However, these changes do not affect subsequent vote outcomes or firm value. They also found excess compensation increases for overpaid managers, regardless of the voting outcome. They argue that Say on Pay does not improve executive contracting.
Cai and Walking (2011)	The US market reacted positively after the House passed the Say on Pay Bill for firms with high abnormal CEO compensation and low pay-performance sensitivity. They argue that Say on Pay creates value for companies with inefficient executive compensations.
Collins, Marquardt and Niu (2019)	US shareholders approve of compensation packages with higher pay-performance sensitivity.
Correa and Lel (2016)	Using a sample of firms from 38 countries over the 2001-2012 period, they found that the adoption of Say on Pay leads to declining CEO pay growth rates and increasing CEO pay-performance sensitivity. These changes are concentrated on firms with problematic pay practices (high excess pay and low pay-performance sensitivity) and poor corporate governance (long CEO tenure and busy and less independent boards).
Cunat, Gine and Guadalupe (2016)	Using a regression discontinuity design, they found that the adoption of Say on Pay in the US results in large increases in market value and long-term profitability. However, it shows limited effects on pay levels and compensation structure.
Ertimur, Ferri and Oesch (2013)	US firms with significant Say on Pay voting dissent make material changes to the executive compensation plan during the subsequent year, including performance-based vesting conditions and the toughening of performance goals.
Ferri and Maber (2013)	Positive abnormal stock returns for UK firms with excess CEO pay, especially where excess CEO pay is combined with poor performance. UK firms respond to negative Say on Pay voting outcomes by removing problematic pay practices and increasing pay-performance sensitivity.
Fisch, Palia, and Solomon (2017)	US shareholders cast negative votes on executive compensation if the firm's performance is poor, suggesting that the Say on Pay vote is Say on Performance.
Iliev and Vitanova (2019)	Utilising the 2-year exemption period from adopting mandatory Say on Pay voting for smaller reporting companies and a regression discontinuity design, they found that adopting Say on Pay results in an increase in pay-performance sensitivity in the US.
Kimbro and Xu (2016)	In the US, boards respond to Say on Pay dissenting votes by reducing the CEO pay growth. Shareholders react positively to these changes in the subsequent period, regardless of firm performance.
Larcker et al. (2011)	A negative stock market reaction after Say on Pay Bill was approved by the House of Representatives in 2007. They argue that any regulation that interrupts the existing practices may be value-destroying.

in the US in 2011 and find that firms that experienced significant voting dissent made material changes to managerial compensation plans during the subsequent year. These findings support the theoretical prediction that the adoption of Say on Pay laws results in a greater linkage between pay and firm performance.

Kimbro and Xu (2016) and Brunarski, Campbell and Harman (2015) examine the relationship between Say on Pay voting outcomes and risk measures and find that the Say on Pay approval is negatively related to leverage and stock return volatility. These results suggest that shareholders dislike increased risk-taking, which is inconsistent with the theoretical predictions that shareholders' utility is monotonically increasing with firm risk. Fisch, Palia, and Solomon (2017) find that shareholder support increases with the firm performance, and the Say on Pay approval rate is not affected by executive compensation unless a firm underperforms. However, Brunarski, Campbell and Harman (2015) find that firms with low Say on Pay approval tend to increase research and development expenses, which is inconsistent with the results on leverage and return volatility. Brunarski, Campbell and Harman (2015) suggest that the increased expenditure in research and development is merely the result of "window-dressing", that is, managers in firms with dissatisfied shareholders tend to make changes to their investment and payout policies to signal confidence in the firm's profitability, without making substantive changes to the firm's net cash flows, firm risk or firm value. However, these findings are related to the impact of Say on Pay approval on firm risk, not the direct impact of the adoption of Say on Pay on firm risk and this has not been investigated by the literature.

With respect to CEO pay sensitivities (CEO vega and CEO delta), CEO portfolio vega is shown to induce riskier policy choices. Coles, Daniel and Naveen (2006) use a simultaneous equations approach and find that riskier firms exhibit more vega and lower delta with increased vega leading to riskier policy choices including more research and development intensity, less investment in property, plant and equipment, less focus and higher leverage. Conversely, the results on the effect of delta on firm policies are empirically mixed. Coles, Daniel and Naveen (2006) also find that delta is negatively related to riskier policy choices. However, they find that the stock return volatility is positively associated with CEO pay-performance sensitivity (delta). Low (2009) uses an exogenous increase in takeover protection to examine the relationship between firm risk and managerial equity-based compensation and finds that a decrease in firm risk is concentrated among firms with lower vega and delta, supporting the prediction that firm risk is induced by equity-based compensation. However, the effect of delta on managerial risk preference is inconclusive with the empirical results being mixed (Tufano 1996; Geczy, Minton & Schrand. 1997; Berger, Ofek & Yermack1997; Rajgopal & Shevlin, 2002). The mixed result on the effect of delta may be due to the mixed incentives provided by it, which are the reward effect and risk effect of delta (Armstrong et al. 2013).

The literature reports evidence that managerial risk-seeking incentives are positively related to debt costs (Barnea, Haugen & Senbet 1980; Daniel, Martin & Naveen 2004; Billett, King & Mauer 2007; Shaw 2012). Chen et al. (2021) argued that risk-taking equity incentives influenced the firm's choice of debt, shifting from bank financing to straight bonds to avoid additional costs such as increased monitoring from the bank. Following the argument by Stiglitz and Weiss (1983) and Rajan (1992), Chen et al. (2021) argued that increasing risk-taking equity incentives resulted in higher agency costs of debt, with banks requiring stricter monitoring and debt covenants. Thus, managers with risk-taking incentives tended to rely less on bank financing to avoid this monitoring and reduce agency costs of debt to obtain lower costs of debt financing. Further, firms may issue or finance with short-term debt to mitigate the increased agency costs of debt. Longer-term debt increases manager incentive to increase firm risk and leads to the asset substitution problem (Leland and Toft, 1996). Conversely, according to Stulz (2000), and Rajan and Winton (1995), short-term debt provides creditors with an effective means to monitor management. Barnea, Haugen and Senbet (1980) argued that shorter-term debt reduces agency costs of debt associated with asymmetric information when the true value of an investment cannot be fairly priced. Brockman, Martin and Unlu (2010) provide empirical evidence to support the argument that short-term maturity debt mitigating agency costs of debt. They find that CEO delta (CEO vega) is negatively (positively) associated with the cost and the proportion of short-term debts. Castro et al. (2019) report that managerial risk-taking incentives are associated with a more concentrated debt structure which acts as a positive signalling mechanism in that creditors have more powers in case of financial distress. Therefore, if CEO delta is associated with risk-taking, it must lead to an increase in debt costs and short-term debt maturities. In contrast, if CEO delta is associated with risk aversion, the opposite impact must be true.

With regards to corporate governance, corporate governance and executive compensation are closely related (Correa & Lel; Core, Holthausen & Lacker; 1999). Ferri and Maber (2013) argue and find that the adoption of Say on Pay has a positive impact on equity value, especially for firms with weak pay-performance sensitivities, indicating Say on Pay is a value-enhancing mechanism as it provides an effective monitoring tool for executive compensation. Their research finds positive abnormal stock returns for UK firms with excess CEO pay, especially where excess CEO pay is combined with poor performance. Their finding indicates that investors expect these firms will improve their remuneration packages and align shareholder interests after the introduction of Say on Pay. This result is consistent with the studies by Cai and Walking (2011) who find a positive stock reaction for firms with greater expected benefits from Say on Pay, namely firms more likely to respond to a Say on Pay vote, that is, firms with more severe compensation issues. Correa and Lel (2016) also find empirical evidence of a declining managerial pay gap consistent with the managerial entrenchment argument in Bebchuk, Cremers and Peyer (2011). They find that the increase in CEO pay-performance sensitivity and the decline in CEO pay growth are concentrated in firms with suboptimal pay-performance sensitivity pre-Say on Pay and firms with poor corporate governance. Their finding suggests that Say on Pay is an effective substitute to a corporate governance mechanism. A contradictory discussion on the effect of Say on Pay on corporate governance is introduced by Larcker et al. (2011). They argue that existing pay practices are already a result of value-maximising contracts, and hence any regulation that interrupts the existing practices may be value-destroying. Larcker et al. (2011) find negative stock market reaction after Say on Pay Bill was approved by the House of Representatives in 2007. However, since the approval by the House does not guarantee passage in the Senate and approval by the White House, their result should be interpreted with caution (Ferri & Gox, 2018), and their result is inconsistent with Cai and Walking (2011) who find a positive stock market reaction for the signing of the Dodd-Frank Act in 2011. Prior studies examined the effect of governance mechanisms, of which Say on Pay can be classified as, on the cost of debt. Bhojraj and Sengupta (2003) find that governance mechanisms reduce default risks in poorly rated firms. They also find that poor corporate governance is associated with lower debt ratings and thus higher costs of debt. Their result is consistent with Mande, Park and Son (2012) who find that good corporate governance reduces the cost of debt financing, consistent with Bohjraj and Sengupta (2003).

2.3 Hypotheses

Say on Pay's impacts agency costs of debt in two ways (see Appendix A for illustration). On the one hand, Say on Pay results in shifting the structure of executive compensation into more performance-based pay (Iliev & Vitanova 2019; Correa & Lel 2016; Cai & Walking 2011) which is strongly linked to firm risk (Coles, Daniel & Naveen 2006; Brockman, Martin & Unlu 2010). And as such, resulting changes in firm risk is linked to agency costs of debt (firm risk channel hereafter). On the other hand, Say on Pay is an effective substitute for a corporate governance mechanism (Correa & Lel, 2016) and which affects agency costs of debt (Bhojraj & Sengupta 2003; Mande, Park and Son 2012) (corporate governance channel hereafter). Hence, I expect that the agency costs of debt will be affected by the adoption of Say on Pay, which has not been investigated in the literature. I address this gap with the following hypotheses.

With regards to the firm risk channel, theories suggest that compensation designs that align shareholder and manager interests better will have both greater delta and vega (Black & Scholes 1973; Merton 1974), and thus, I expect that there will be an increase in both delta and vega post-Say on Pay. However, the impact of both increasing simultaneously is theoretically ambiguous as delta has both the reward effect (managerial risk-taking) and risk effects (managerial risk aversion) (Low 2009; Armstrong et al. 2013), while vega is generally consistent with managerial risk-taking (Coles, Daniel & Naveen 2006; Brockman, Martin & Unlu 2010). Nonetheless, shareholders' monotonic preference over firm risk (Black & Scholes 1973; Merton 1974) suggests there must be an increase in firm risk post-Say on Pay, given Say on Pay better aligns shareholders' and managers' interests. With regards to the firm risk measures, as research and development expenditures are commonly viewed as high-risk investments while investments on tangible assets measured by capital expenditure are viewed as low-risk investments (Bhagat & Welch 1995; Kothari, Languerre & Leone 2002; Coles, Daniel & Naveen 2006), I expect that increased Say on Pay will lead to a greater level of research and development expenses and lower level of capital expenditures. This leads to my first two hypotheses:

H1a. The adoption of Say on Pay results in an increase in research and development expenses.

H1b. The adoption of Say on Pay results in a decrease in capital expenditures.

Further, due to increased vega, they will attempt to increase stock return volatility, which will be apparent in firm's earnings volatility. Moreover, as managers can increase firm risk by altering financial policy (increasing leverage), Say on Pay must be associated with an increase in leverage. The next set of hypotheses is as follows:

H1c. The adoption of Say on Pay results in an increase in stock return volatility.

H1d. The adoption of Say on Pay results in an increase in volatility of return on assets.

H1e. The adoption of Say on Pay results in an increase in leverage.

In summary, I expect that Say on Pay will cause firms to shift to riskier policies. To date, there has been no research that examines changes in firm risk measures following the adoption of Say on Pay. Therefore, I address this gap in the literatue.

Following an increase in firm risk, the level of potential asset substitution problems will increase and hence debtholders will demand a higher return on their investment, leading to higher costs of debt (Barnea, Haugen & Senbet 1980; Daniel, Martin & Naveen 2004; Billett, King & Mauer 2007; Shaw 2012). Furthermore, firms will use more short-term debt to mitigate and better manage the increased agency costs of debt (Leland & Toft 1996; Barnea, Haugen & Senbet 1980; Brockman, Martin & Unlu 2010).

H2a. The adoption of Say on Pay results in an increase in the cost of debt.

H2b. The adoption of Say on Pay results in an increase in the proportion of short-term debt.

As Correa and Lel (2016) suggest, a decline in excess CEO pay and an increase in pay-performance sensitivity post-Say on Pay evidences the governance role of Say on Pay. Therefore, any results on agency costs of debt may, in fact, be impacted by the corporate governance channel of Say on Pay. I expect that firms with poor corporate governance will benefit more from Say on Pay, as the greater impact of Say on Pay on these firms has been documented in the literature (Ferri & Maber 2013; Cai & Walking 2011; Correa & Lel 2011). Thus, there must be a decrease in the cost of debt and a decrease in the proportion of short-term debt when there is no change in the level of delta in the post-period in weakly governed firms.

H3a. The adoption of Say on Pay results in a decrease in the cost of debt in poorly governed firms.

H3b. The adoption of Say on Pay results in a decrease in the proportion of short-term debt in poorly governed firms.

Although all hypotheses are directional and suggest that one-sided statistical tests should be used, I used two-sided tests in the empirical analyses to be more conservative.

Chapter 3

Data and Variables

3.1 Data Sources and Methodology

The data was mainly drawn from the Compustat Capital IQ database and incorporates all US publicly listed firms between 2006 and 2016, providing a 5-year window for pre- and post-Say on Pay, similar to the 11-year period used in Correa and Lel (2016). The sample period was chosen to provide sufficient time for observing changes in firms' policies pre- and post- Say on Pay, and to match the available data from different databases. CEO incentives data (delta, vega) are from Coles, Daniel and Naveen (2006) who use data from Standard & Poor's Execucomp database that covers S&P 500 firms[1]. Their computation method for vega and delta follows Guay (1999) and Core and Guay (2002), who use the Black-Scholes-Merton (1973) option pricing model, consistent with other studies (Yermack 1995; Aggarwal & Samwick 1999; Brockman, Martin & Unlu 2010). I first merged the Compustat Capital IQ database with other data from Execucomp, and ISS Directors and Corporate Governance databases. Additional data such as stock returns and volatility obtained from the Centre for Research in Security Prices (CRSP) was then included. Consistent with prior research, financial firms (SIC codes between 6000 and 6999) were excluded from the sample as their capital structure is different from other firms (Denis & Mihov 2003; Coles, Daniel and Naveen 2006). I also excluded utility firms (SIC codes between 4900 and 4999) because their capital structure decisions are subject to regulatory supervision. The final sample contains 26,156 firm-year observations.

Like other studies that examined the relationship between executive compensation and corporate debt, endogeneity is an issue (Chen et al. 2021). I employ the difference-in-differences methodology following similar studies such as Chen et al. (2021), Correa and Lel (2016) and Canil and

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[1] Data was downloaded from the personal website of Associate Professor Lalitha Naveen, one of the authors of Coles, Daniel and Naveen (2006). The data is publicly available at https://sites.temple.edu/lnaveen/data/.

Karpavicius (2022) to address the potential endogeneity issues, utilising the adoption of Say on Pay as a quasi-natural experiment. Control variables were included and year fixed effects were applied to eliminate year-by-year extraneous shock, and firm fixed effects applied to address the concern for possible omitted variables bias. Chen et al. (2021) and Canil and Karpavicius (2022) are specifically unique in that they also examined the effect of implementation of an accounting rule (Financial Accounting Standard (FAS) 123R) on firms' policies. Thus, the regression model throughout this study is in the form of:

$$Y = \alpha_0 + \beta_1 TREAT \times POST + \beta_i X_i + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon, \tag{3.1}$$

where Y is the dependent variable, and each firm is exposed to a binary treatment $TREAT \in \{1, 0\}$; $TREAT = 1$ if a firm is affected by the treatment and $TREAT = 0$ otherwise. $POST$ is a binary indicator with $POST \in \{1, 0\}$; $POST = 1$ if the firm-year observation belongs to the post-Say on Pay period and $POST = 0$ otherwise. I define the fiscal year 2011 as the beginning of the post-Say on Pay period in the US, consistent with Correa and Lel (2016). $TREAT \times POST$ is the interaction term that captures the difference-in-differences effect and X_i is a vector of covariates. Standard errors are clustered by firm or industry-year depending on the dependent variables.

3.2 Variable Descriptions

3.2.1 Firm Risk Regressions

3.2.1.1 Investment Policy Regression

3.2.1.1.1 Dependent Variables: R&D expenses and Capital Expenditure. Following Coles, Daniel and Naveen (2006), research and development expenses (*RD*) are defined as research and development expenses scaled by total assets, and capital expenditure (*CAPEX*) is defined as net capital expenditure (capital expenditure less sale of property, plant and equipment) scaled by total assets. I test hypotheses 1 and 2, and examined changes in firms' investment policies post-Say on Pay, by estimating the coefficients on the interaction term (*TREAT×POST*) of research and development expenses (*RD*) and capital expenditure (*CAPEX*).

3.2.1.1.2 Control Variables: Following Coles, Daniel and Naveen (2006) who examined the relationship between CEO compensation and firm risk, I control for CEO cash compensation (*CASHCOMP*), defined as sum of CEO's salary and bonus in thousands of dollars, market-to-book ratio (*MB*), defined as market value of equity plus total assets minus book value of equity, scaled by total assets, stock return (*AVGRET*), defined as the average of daily stock returns over the preceding 180 days, firm size (*SIZE*), defined as log of net sales, asset tangibility (*TAN*), leverage (*LEV_M*), defined as total debt divided by market value of the firm, surplus cash (*SCASH*), defined as cash from assets-in-place scaled by total assets, sales growth (*SGROWTH*), defined as log of growth in sales and CEO tenure in years (*CEOTENURE*). With respect to CEO delta and CEO vega, any changes in these values are captured by the dummy variable *POST*. These control variables are included to control for forces that influence the composition of CEO portfolio (vega and delta) together with a firm's investment and financing policies (Coles, Daniel & Naveen 2006).

3.2.1.2 Return Volatility Regression

3.2.1.2.1 Dependent Variables: Volatility of Stock Returns and Volatility of Return on Assets. Following Coles, Daniel and Naveen (2006), stock return volatility (*VOLSTR*) is defined as a standard deviation of daily stock returns during the fiscal year. I also use the volatility of return on assets (*VOLROA*) as a measure of earnings volatility, which is defined as a standard deviation of return on assets in the fiscal year (*ROA*), where return on assets is defined as operating income before depreciation scaled by assets. For the earnings volatility measure, I test with a 5-year rolling standard deviation of return on assets as an alternative measure.

3.2.1.2.2 Control Variables: Control variables follow Coles, Daniel and Naveen (2006) and include CEO cash compensation (*CASHCOMP*), firm size (*SIZE*), market-to-book ratio (*MB*), CEO tenure (*CEOTENURE*), research and development expenses (*RD*), capital expenditures (*CAPEX*) and market leverage (*LEV_M*). The definitions for these variables are identical to the ones defined previously. As there are a significant number of missing values for research and development expenses, all missing values are set to 0 and the research and development expenses dummy variable (*RD_DUM*) is included to differentiate these observations (Kayhan & Titman, 2007). These covariates are included to control forces that influence the composition of CEO portfolio (vega and delta) and a firm's investment and financing policies (Coles, Daniel & Naveen 2006).

3.2.1.3 Leverage Regression

3.2.1.3.1 Dependent Variable: Leverage. Leverage is measured in two variables. *LEV_M* is market leverage which is defined as total debt divided by total assets less book value of equity plus the market value of equity. *LEV_B* is book leverage which is defined as total debt divided by total assets. I focus on market leverage as a proxy of a firm's financial risk, for the following reasons. As Welch (2004) argues, although book leverage may be attractive in that it has lower volatility than market leverage and thus makes corporate issuing activity more important, the book value of equity is merely a plug number which can even be a negative value, and small firms exhibit less correlation between book values and market values. Further, book value of equity decreases with depreciation of assets and increases with historical cash flows. Conversely, market value of leverage is ideal to measure a firm's risk, therefore this is the aim of this study, as it is used as an input for WACC computation which measures the cost of capital, namely the total firm risk. Studies that use market leverage due to the criticism of book equity include Frank and Goyal (2009), Shyam-Sunder and Myers (1999), Welch (2004), Faulkender and Peterson (2006) and Antoniou et al. (2008). However, despite the criticisms against the use of book leverage, it is still widely adopted in the literature to measure a firm's leverage and financial risk (e.g., Coles, Daniel & Naveen 2006; Degryse et al. 2012; Karpavicius & Yu 2019).

3.2.1.3.2 Control Variables: Control variables follow Coles, Daniel and Naveen (2006), and include CEO cash compensation (*CASHCOMP*), firm size (*SIZE*), market-to-book ratio (*MB*), return on assets (*ROA*), asset tangibility (*TAN*), defined as total property, plant and equipment scaled by total assets, CEO tenure in years (*CEOTENURE*), research and development expenses (*RD*), research and development dummy variable (*RD_DUM*) and Altman's (1968) Z-score (*ZSCORE*). These variables are determinants of firm's capital structure and factors that affect firms' financing policies (Coles, Daniel & Naveen 2006; Kayhan & Titam 2007).

3.2.2 Agency Costs of Debt Regressions

3.2.2.1 Cost of Debt Regression

3.2.2.1.1 Dependent Variable: Cost of Debt. I first compute cost of debt as total interest expense divided by total debt. As borrowing costs (interest rates) have decreased since July 2007 (FRED, 2022), lower market interest rates also have contributed to lower cost of debt in the post-Say on Pay period. Thus, to ensure that the results do not capture decreasing market rates, I deduct Moody's Seasoned AAA corporate bond yield from the cost of debt and use this measure (*COST*) as the cost of debt.

3.2.2.1.2 Control Variables: Control variables follow Brockman, Martin and Unlu (2010), who examine the relationship between executive compensation and agency costs of debt and include leverage (*LEV_M*), profitability (*PROF*), interest coverage (*INTCOV*), stock return (*AVGRET*) and stock return volatility (*VOLSTR*). I do not include CEO delta to ensure the identical settings as in Chapter 3. That is, the dummy variable *POST* captures the increasing trend in CEO delta which led to a decrease in firm risk, and thus allows creditors to observe these changes. Other control variables include *LMAT,* defined as the natural logarithm of average debt maturities, S&P bond rating (*RATING*), which is the number between 1 and 22 (1 for AAA+ and 22 for D), and issue size (*ISSUESIZE*), defined as the natural logarithm of the sum of face value of the bond. These variables are found by the literature to influence cost of debt at both the firm and market level (Brockman, Martin & Unlu 2010).

3.2.2.2 Debt Maturity Regression

3.2.2.2.1 Dependent Variables: Debt Maturity Structure. Following Brockman, Martin and Unlu (2010), *ST3* is defined as the proportion of total debt maturing in 3 years or less and *ST5* is defined as the proportion of total debt maturing in 5 years or less. *AMAT* is the weighted average maturity of outstanding debts, calculated as sum of outstanding balance of debt multiplied by its maturity divided by sum of total outstanding balance of debt. In the sample there are some problematic values for *ST3* and *ST5*, such as the amount of debt maturing in 3 years or less exceeding the amount of total debt. To ensure that my results are not biased by errors in the data, I removed such problematic observations.

3.2.2.2.2 Control Variables: Control variables follow Brockman, Martin and Unlu (2010) and include the logarithmic transformation of CEO vega (*LCEOVEGA*), leverage (*LEV_M*), market-to-book ratio (*MB*), stock return volatility (*VOLSTR*). I include a firm size variable (*LSIZE*) which is different from *SIZE* (log of sales) and follows the definition of Brockman, Martin and Unlu (2010), defined as the log of total assets minus book value of equity plus market value of equity and include a quadratic variable (*LSIZE2*) defined as the square of *LSIZE*, to ensure that my setting is as close as possible to that of Brockman, Martin and Unlu (2010). Other control variables include asset maturity (*ASSETM*), defined as the book value-weighted average of the maturities of property, plant and equipment and current assets, computed as property, plant and equipment divided by total assets, multiplied by total gross property, plant and equipment divided by depreciation expense, plus current assets divided by total assets multiplied by current assets divided by cost of goods sold, abnormal earnings (*ABNEARN*), defined as earnings in year t+1 minus earnings in year t divided by the share price, multiplied by the number of outstanding shares in year t, *Z_DUM,* a dummy variable that is equal to 1 if Altman's (1986) *Z*-score is greater than 1.81 and 0 otherwise, and *CEOOWN,* the value of shares owned by the CEO scaled by total market value of equity.

3.2.3 Treatment and Control Group

An issue in my study is that all US firms are impacted by the adoption of Say on Pay, making it difficult to divide them into treated and controlled firms[2]. I overcome this issue by utilising the literature reviewed in Chapter 2 and distinguishing firms most affected by Say on Pay from firms least affected. Per the optimal contract derived under contract theory and the Black-Scholes-Merton Model (see Section 2.1), Say on Pay must shift problematic executive pays (which are not adequately linked to stock prices or stock return volatilities and thus not maximising shareholder wealth) to equity-based compensations. This expectation is consistent with empirical results in Correa & Lel (2016) and Cai and Walking (2011) who find that Say on Pay's impact (a decline in excess pay and an increase in pay-performance sensitivity) is concentrated in firms with suboptimal pay-performance sensitivities and consistent with findings by Iliev and Vitanova (2019) who find an increase in performance-based compensation in the post-Say on Pay period. Hence, I distinguish firms with low CEO pay-performance sensitivity (low CEO delta) and low CEO risk-taking incentives (low CEO vega) in the pre-Say on Pay period from the rest and define them as treated firms. However, sorting firms in terms of CEO pay sensitivities compared to the industry median without scaling may lead to distinguishing small firms from large firms, since firms categorised as control firms due to very high CEO delta or high CEO vega may be due to the greater absolute value of total compensation. To address this concern, I scale CEO pay sensitivities by total compensations. Since Correa and Lel (2016) examine firms in 38 countries while I focus on the US listed firms, I first conduct difference-in-differences regressions to test changes in CEO pay sensitivities in the post-period to examine whether Correa and Lel's (2016) results apply to the sample with the US firms only. I compute the averages of CEO delta and CEO vega of each firm scaled by total compensation and the industry median in the pre-Say on Pay period and create dummy variables $LOWDELTA \in \{1, 0\}$; $LOWDELTA = 1$ if a firm's CEO has CEO delta scaled by total compensation below industry median pre-Say on Pay and $LOWDELTA = 0$ otherwise, and $LOWVEGA \in \{1, 0\}$; $LOWVEGA = 1$ if a firm's CEO has CEO vega scaled by total compensation below industry median pre-Say on Pay and $LOWVEGA = 0$ otherwise.

[2] In an unreported test, I divided treated and controlled firms by using Iliev & Vitanova's (2019) methodology, i.e., dividing firms based on the cut-off of $75 million public float. I first compute the public float as market value of equity less market values of shares excluding those held by close affiliates (executives, directors and blockholders). However, unlike Iliev & Vitanova (2019) who hand-collected data, there are only a few firms that are below the $75 million threshold in my sample (this is because ExecuComp covers top 1500 firms that are unlikely to have public float smaller than $75 million) and thus could not adopt their methodology.

3.3 Descriptive Statistics

Table 2 reports summary statistics for the sample. CEO vega in dollar value terms is positively skewed, and thus I used a natural logarithmic transformation of CEO vega (*LCEOVEGA*), defined as ln(1+*CEOVEGA*). The mean CEO vega in dollar terms (*CEOVEGA*) is 163.345, which is higher than Coles, Daniel and Naveen (2006) who report the mean CEO vega of 80, possibly due to the differing sample period. Coles, Daniel and Naveen (2006) cover the sample period between 1992 and 2002. With regards to CEO delta, mean CEO delta is 539.735, while it is 600 in Coles, Daniel and Naveen (2006). This shows that firms tend to shift toward paying stock options from stock payments. Brockman, Martin and Unlu (2011) covered the sample period between 1992 and 2005, which is similar to Coles, Daniel and Naveen (2006), but instead used logarithmic transformation of CEO vega and CEO delta. They reported a mean CEO vega of 1.108 and mean CEO delta of 6.914, while in my sample they are 3.913 and 5.629, respectively. It consistently shows that firms have increased CEO vega while reducing CEO delta over time. However, cash compensation has not changed much over time. In my sample, the mean cash compensation in thousand dollars is 1123.864, while in Coles, Daniel and Naveen (2006) the mean is 1140.

Turning to the investment policy variables, the means of *RD*, *CAPEX*, *LEV_B* and *LEV_M* are 0.014, 0.049, 0.100, 0.334 and 0.240, respectively, in my sample. In Coles, Daniel and Naveen (2006), the corresponding means are 0.04, 0.07, 0.23 and 0.15, respectively. It shows that firms have reduced these measures over time, but it can also imply a greater increase in the denominator, the book value of total assets. This seems to be the case as the market-to-book (*MB*) in my sample has a mean of 1.600 while it is 2.24 in Coles, Daniel and Naveen (2006).

With respect to the agency costs of debt variables the mean cost of debt is 1.8%, similar to that reported in Brockman, Martin and Unlu (2010) of 1.64%. The slight difference may come from the differing sample period. The average proportion of debt maturing in 3 years or less (*ST3*) is 0.269 in my sample, whereas it is 0.398 in Brockman, Martin and Unlu (2010). The mean value of *ST5* is 0.517 while in Brockman, Martin and Unlu (2010) it is 0.583. These results show that firms tend to rely less on short-term debts in the 2006 and 2016 sample period compared to 1992 and 2005, implying lower agency costs of debt in my sample period.

Table 2
Summary Statistics

This table shows the summary statistics for the dependent and right-hand-side variables in the difference-in-differences (DiD) regressions. All samples cover the 2006 to 2016 period. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B.

Variable	Obs.	Mean	Std. Dev.	Min	Max
ABNEARN	26,156	0.004	0.111	-0.297	0.343
ASSETM	26,156	4.545	32.741	0.002	2833.697
AVGRET	26,156	0.0004	.002	-0.005	0.005
BOARDIND	26,156	0.810	0.108	0	0.917
CASHCOMP	26,156	0.965	0.461	0.373	2.227
CAPEX	26,156	0.049	0.045	0	0.181
CEODELTA	26,156	539.7	606.7	14.2	2164.6
CEOOWN	26,156	0.001	.001	0	0.005
CEOTENURE	26,156	9.011	7.611	1.000	29.000
CEOVEGA	26,156	163.3	184.7	0	586.4
COST	26,156	0.018	0.030	-0.028	0.233
INSTOWN	26,156	65.621	64.900	0.096	200.152
INTCOV	26,156	11.861	16.018	-27.105	91.222
ISSUESIZE	26,156	20.479	1.211	16.678	24.635
LCEODELTA	26,156	5.629	1.261	2.719	7.680
LCEOVEGA	26,156	3.913	2.067	0	6.376
LEV_B	26,156	0.334	0.156	0.007	0.612
LEV_M	26,156	0.240	0.145	0.002	0.544
LMAT	26,156	3.886	0.462	2.485	4.331
LSIZE	26,156	9.061	1.523	4.730	13.871
LSIZE2	26,156	84.429	28.439	22.371	192.409
MB	26,156	1.600	0.703	0.739	4.428
MVE	26,156	9515.335	11194.420	8.602	33107.540
PROF	26,156	0.033	0.078	-0.480	0.151
RATE_DUM	26,156	0.999	0.035	0	1
RATING	26,156	12.151	3.370	0	22
RD	26,156	0.014	0.028	0	0.174
RD_DUM	26,156	0.433	0.495	0	1.000
ROA	26,156	0.126	0.070	-0.348	0.250
SCASH	26,156	0.078	0.068	-0.245	0.249
SGROWTH	26,156	0.052	0.255	-8.103	3.895
ST3	26,156	0.269	0.257	0	1
ST5	26,156	0.517	0.295	0.057	1
VOLROA	26,156	0.022	0.029	0.001	0.160
VOLSTR	26,156	0.006	0.014	0.0002	0.062
ZSCORE	26,156	6.296	18.797	-0.714	220.162
Z_DUM	26,156	0.816	0.388	0	1

Chapter 4

Empirical Results

4.1 Say on Pay, CEO Pay Sensitivities, and Firm Risk

4.1.1 Changes in CEO Pay Sensitivities

I begin with difference-in-differences regressions to see how changes in CEO delta and CEO vega differ between the treated and controlled firms. I control for the determinants of CEO delta and CEO vega adopted from Coles, Daniel and Naveen (2006) and apply firm- and year- fixed effects to address potential omitted variable bias and year-by-year extraneous shocks. The model is as follows:

$$\begin{aligned}&LCEODELTA_t(LCEOVEGA_t) = \alpha_0 + \beta_1 TREAT \times POST + \\&\beta_2 LCEOVEGA_t(LCEODELTA_t) + \beta_3 SIZE_t + \beta_4 MB_t + \beta_5 AVGRET_t + \beta_6 LEV\_M_t + \\&\beta_7 SCASH_t + \beta_8 SGROWTH_t + \beta_9 RD_t + \beta_{10} CAPEX_t + \\&\beta_{11} VOLSTR + \textit{Firm fixed effects} + \textit{Year fixed effects} + \varepsilon,\end{aligned} \tag{4.1}$$

where *TREAT* refers to either *LOWDELTA* or *LOWVEGA*. Table 3 Panel A reports the results with t-statistics based on standard errors robust to clustering by firm. Consistent with Correa and Lel (2016), I found evidence of a significant increase in CEO delta for firms with low delta pre-Say on Pay, implying that firms with poor link to stock prices or stock return volatilities pre-Say on Pay shift to greater CEO pay sensitivities to stock (CEO delta) and volatility (CEO vega) post-Say on Pay. However, since treated and controlled firms are divided based on the level of pre-Say on Pay CEO pay sensitivities, there is a concern for potential violations of the parallel trend assumption. The parallel trend assumption is a key assumption in the difference-in-differences framework that in the absence of treatment, the coefficient on the interaction term is statistically not different from 0. The assumption requires similar trends in the pre-treatment period for both treated and controlled firms. Lemmon and Roberts (2010) translate this as similar growth rates in the dependent variables in the pre-treatment period. Violations of the parallel trend assumption imply that any trend found in my analysis will be subject to bias and may be spuriously driven by the features of data. Thus, I calculated the mean growth rates of CEO delta and CEO vega in the pre-Say on Pay period to test for the potential violation. Panel B reports the results. Firstly, with respect to the low CEO delta group, it indicates that the mean growth rates of CEO delta and CEO vega in the pre-Say on Pay period for treated and controlled firms are not significantly different from 0, implying that increase in CEO delta post-Say on Pay is not driven by the inherent differences in the trend of changes in CEO delta pre-Say on Pay between the two groups. This group shows a significant increase in CEO delta (0.331, t = 4.74) while there is no change in CEO vega (t = 0.17). With respect to the low CEO vega group, while there is weakly significant increase in CEO delta (t = 1.95), there is a significant increase in CEO vega (0.282, t = 2.11). Overall, my results suggest that firms with suboptimal pay practices respond more greatly to Say on Pay by increasing CEO pay sensitivities.

4.1.2 Difference-in-Differences on Firm Risk

4.1.2.1 Results on Investment Policies

I move on to testing the hypotheses regarding Say on Pay's impact on firm risk (*H1a – H1e*). First, I turn to difference-in-differences tests for firm risk measures. The model of the difference-in-differences test on firms' investment policies are as follows:

$$RD_t\ (CAPEX_t) = \alpha_0 + \beta_1 TREAT \times POST + \beta_2 CASHCOMP_t + \beta_3 SIZE_t + \beta_4 MB_t + \beta_5 AVGRET_t + \beta_6 LEV\_M_t + \beta_7 CEOTENURE_t + \beta_8 SCASH_t + \beta_9 SGROWTH_t + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon. \tag{4.2}$$

Table 4 reports the results with t-statistics based on standard errors robust to clustering by firm. No statistically significant increase in research and development expenses and capital expenditures were found. Panel B reports the mean growth rates of the dependent variables in the pre-Say on Pay and shows that the difference between the growth rates of the dependent variables are not statistically different from 0 in treated and controlled firms in the pre-Say on Pay period, implying non-violation of the parallel trend assumption. Thus, Say on Pay does not result in an increase in firm risk in terms of investment policies.

Table 3
Changes in CEO delta and CEO vega around the adoption of Say on Pay

This table presents the coefficients and t-statistics of the DiD regression for CEO vega and CEO delta around the adoption of Say on Pay. Column (1) reports the results with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel reports the results of the DiD regressions. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on CEO delta and CEO vega

	Treated Firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
	Dependent variables:			
Independent variables	*LCEODELTA*	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST	0.331***	0.024	0.154*	0.282**
	[4.74]	[0.17]	[1.95]	[2.11]
LCEOVEGA	0.313***		0.315***	
	[14.67]		[14.59]	
LCEODELTA		0.843***		0.833***
		[12.80]		[13.39]
SIZE	0.393***	-0.081	0.351***	-0.077
	[4.25]	[-0.53]	[3.74]	[-0.51]
MB	0.449***	-0.456***	0.468***	-0.445***
	[10.59]	[-6.01]	[10.92]	[-5.93]
AVGRET	33.784***	-3.973	33.313***	-3.800
	[4.55]	[-0.35]	[4.43]	[-0.34]
LEV_M	-0.901***	0.305	-0.858***	0.315
	[-3.45]	[0.77]	[-3.16]	[0.80]
SCASH	-0.322	0.427	-0.311	0.398
	[-0.98]	[1.01]	[-0.94]	[0.95]
SGROWTH	0.083	-0.115	0.108	-0.109
	[1.15]	[-1.24]	[1.49]	[-1.20]
RD	-5.223***	4.609**	-5.369***	4.598**
	[-4.78]	[2.16]	[-4.89]	[2.17]
CAPEX	1.169	-0.770	1.269	-0.817
	[1.29]	[-0.63]	[1.36]	[-0.68]
VOLSTR	-1.146**	-0.721	-1.167***	-0.624
	[-2.56]	[-1.02]	[-2.57]	[-0.90]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,251	3,251	3,253	3,253
Adjusted R^2	0.8157	0.7634	0.8128	0.7646

Panel B: Mean growth rates of CEO delta and CEO vega pre-Say on Pay

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
LCEODELTA growth	-0.016	-0.005	-0.011	-1.60	-0.024	-0.049	0.025	0.51
LCEOVEGA growth	-0.011	-0.010	-0.001	-0.14	-0.003	-0.082	0.080	1.62

Table 4
Changes in investment policies around the adoption of Say on Pay

This table presents the coefficients and t-statistics of the DiD regression for investment policies (R&D expenses and CAPEX) around the adoption of Say on Pay. Panel A column (1) reports the results of the DiD regressions with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on R&D expenses and CAPEX

	Treated firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
	Dependent variables:			
Independent variables:	*RD*	*CAPEX*	*RD*	*CAPEX*
TREAT×POST	-0.0004	0.001	0.001	0.001
	[-0.43]	[0.73]	[1.32]	[0.43]
CASHCOMP	-0.001	0.0002	-0.001	0.0002
	[-1.04]	[0.10]	[-1.02]	[0.09]
SIZE	-0.003*	0.007***	-0.003*	0.007***
	[-1.81]	[2.69]	[-1.75]	[2.68]
MB	0.006	0.004***	0.006	0.004***
	[0.82]	[2.92]	[0.86]	[2.99]
AVGRET	-0.237*	-1.513***	-0.237*	-1.515***
	[-1.79]	[-5.89]	[-1.79]	[-5.89]
CEOTENURE	0.00002	0.00005	0.00001	0.00004
	[0.43]	[0.52]	[0.31]	[0.50]
SCASH	0.044***	-0.004	0.044***	-0.004
	[5.60]	[-0.30]	[5.62]	[-0.31]
SGROWTH	-0.005***	-0.002	-0.005***	-0.001
	[-3.18]	[-0.54]	[-3.25]	[-0.49]
LEV_M	-0.005	-0.029***	-0.005	-0.029***
	[-0.88]	[-3.02]	[-0.89]	[-3.02]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4,000	2,784	4,003	2,787
Adjusted R^2	0.9449	0.6851	0.9450	0.6851

Panel B: Mean growth rates of R&D expenses and CAPEX pre-Say on Pay

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
RD growth	-0.017	-0.006	-0.010	-0.69	-0.017	-0.007	-0.010	-0.69
CAPEX growth	-0.078	-0.114	0.036	0.88	-0.070	-0.118	0.048	1.16

4.1.2.2 Results on Return Volatilities

Secondly, I run a difference-in-differences regressions for return volatilities with the model as follows:

$$VOLSTR_t(VOLROA_t) = \alpha_0 + \beta_1 TREAT \times POST + \beta_2 CASHCOMP_t + \beta_3 SIZE_t + \beta_4 MB_t + \beta_5 LEV\_M_t + \beta_6 RD_t + \beta_7 RD\_DUM_t + \beta_8 CAPEX_t + \text{Firm fixed effects} + \text{Year fixed effects} + \varepsilon. \quad (4.3)$$

The results are presented in Table 5 with t-statistics based on standard errors robust to clustering by firm. There is a statistically significant decrease in the volatility of stock returns (0.143%) in the *LOWDELTA* group (t = -2.48). In terms of economic significance, the decrease of 0.143% in these groups is economically significant as this decrease implies a 22.64% of reduction in stock return volatilities compared to pre-Say on Pay average stock return volatility which is 0.632%. This is inconsistent with the expectation that Say on Pay will result in an increase in firm risk. A possible reason for the decrease in the low CEO delta group (*LOWDELTA*) may be the risk effect of CEO delta, which means that since CEO delta increases post-Say on Pay in this group (while there was no increase in CEO vega), a decrease in volatility of stock return is consistent with managers being more risk-averse due to their increased exposure to unsystematic risk (Low 2009; Armstrong et al. 2013). If this interpretation is applied to the low CEO vega group (*LCEOVEGA*), no significant changes in the volatility of stock returns may imply that the impact of risk aversion from increased CEO delta is offset by the increased risk-taking incentives from increased CEO vega. However, the reduced risk may have resulted from the impact of the corporate governance channel, suggesting that Say on Pay is a corporate governance mechanism that helps enhance corporate governance and reduce risk. Hence, it is important to determine whether these decreasing volatilities of stock returns can be attributed to the increases in CEO pay sensitivities. A further analysis will be provided in the following section (4.1.2.4). Panel B shows t-test for growth rates in the dependent variables and implies non-violation of the parallel trend assumption. No evidence of changes in volatilities of return on assets was found.

Table 5
Changes in return volatilities around the adoption of Say on Pay

This table presents the coefficients and t-statistics of the DiD regression for return volatilities (volatility of stock return and volatility of return on assets) around the adoption of Say on Pay. Panel A column (1) reports the results of the DiD regressions with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on volatility of stock returns and volatility of ROA

	Treated firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
	Dependent variables:			
Independent variables:	*VOLSTR*	*VOLROA*	*VOLSTR*	*VOLROA*
TREAT×POST	-0.001**	-0.002	-0.0009	0.0002
	[-2.48]	[-0.95]	[-1.43]	[0.10]
CASHCOMP	0.0005	-0.0004	0.001*	-0.0004
	[1.60]	[-0.19]	[1.91]	[-0.16]
SIZE	0.0001	-0.009***	0.0003	-0.009***
	[0.27]	[-3.23]	[0.56]	[-3.19]
MB	0.0005*	0.001	0.004	0.001
	[1.72]	[0.70]	[1.46]	[0.62]
CEOTENURE	0.00001	-0.0001	0.00001	-0.0001
	[0.52]	[-1.00]	[0.42]	[-1.11]
RD	0.0005	0.008	0.001	0.008
	[0.08]	[0.17]	[0.13]	[0.15]
RD_DUM	-0.001	0.007*	-0.001	0.007*
	[-0.37]	[1.96]	[-0.35]	[1.92]
CAPEX	-0.002	-0.059*	-0.002	-0.059*
	[-0.39]	[-1.94]	[-0.43]	[-1.94]
LEV_M	0.007***	0.046***	0.007***	0.046***
	[3.01]	[4.37]	[2.94]	[4.37]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4,580	4,149	4,589	4,155
Adjusted R^2	0.7334	0.3801	0.7325	0.3795

Panel B: Mean growth rates of return volatilities pre-Say on Pay

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
VOLSTR growth	0.012	0.062	-0.050	-1.28	0.014	0.059	-0.046	-1.18
VOLROA growth	0.063	0.073	-0.010	-0.18	0.054	0.082	-0.029	-0.50

4.1.2.3 Results on Leverage

Third, I run a difference-in-differences regressions for leverage with the model as follows:

$$LEV\_M_t(LEV\_B_t) = \alpha_0 + \beta_1 TREAT \times POST + \beta_2 CASHCOMP_t + \beta_3 SIZE_t + \beta_4 MB_t + \beta_5 ROA_t + \beta_6 TAN_t + \beta_7 CEOTENURE_t + \beta_8 RD_t + \beta_9 RD\_DUM_t + \beta_{10} ZSCORE_t + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon. \quad (4.4)$$

The results are presented in Table 6 with t-statistics based on standard errors robust to clustering by firm. I find a statistically significant decrease in market leverage and a weakly significant decrease in book leverage in the low CEO delta firms (*LOWDELTA*) post-Say on Pay, implying a greater use of leverage and thus greater risk in these firms. This is consistent with hypothesis *1e* but inconsistent with the negative coefficients on stock return volatilities (which indicate less risk post-Say on Pay). Further, this decrease seems economically significant as a 1.2% decrease in market leverage implies 6.45% of reduction compared to the pre-Say on Pay average market leverage of 18.64%. Similarly, a 1.3% decrease in book leverage is a 5.04% reduction compared to the pre-Say on Pay mean book leverage of 25.80%. A possible explanation is that this increase in the level of debt is not associated with an increase in firm risk, but rather firms are adding debts that do not materially affect or increase the current level of financial risk of the firms. I do not find evidence of increased leverage in the low CEO vega group (*LOWVEGA*). Panel B shows that the difference in the growth rates of market and book leverage in treated and controlled firms are statistically not different from 0, implying non-violation of the parallel trend assumption.

4.1.2.4 Impact of Delta and Vega on Firm Risk

To isolate Say on Pay's impact through the firm risk channel from the corporate governance channel, I test whether any changes in firm risk found in the preceding analysis interact with CEO pay sensitivities. I re-estimate models (4.2), (4.3) and (4.5) with triple interaction terms between treatment group (*LOWDELTA* or *LOWVEGA*), *POST*, and CEO pay sensitivities (*LCEODELTA* and *LCEOVEGA*) to see whether the increase or decrease in firm risk measures interact with the level of CEO delta and CEO vega within the treated firms. The results are presented in Table 7. For brevity, only the coefficients and t-statistics of the interaction terms are provided. Overall, I do not find any significant evidence of the changes in firm risk measures interacting with the level of CEO pay sensitivities within these treated firms. The result suggests that the decrease in stock return volatilities and the increase in leverage are not linked to the level of CEO pay sensitivities in the treated firms. My results suggest that these changes must have been impacted by factors other than CEO pay sensitivities captured in the dummy variable *POST*, most likely by Say on Pay's impact through the corporate governance channel.

Table 6
Changes in leverage around the adoption of Say on Pay

This table presents the coefficients and t-statistics of the DiD regression for leverage (in market and book values) around the adoption of Say on Pay. Panel A column (1) reports the results of the DiD regressions with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on leverage

	Treated firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT* = *LOWDELTA*)		Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)	
	Dependent variables:			
Independent variables:	*LEV_M*	*LEV_B*	*LEV_M*	*LEV_B*
TREAT×POST	0.012**	0.013*	0.003	-0.002
	[2.15]	[1.85]	[0.55]	[-0.29]
CASHCOMP	-0.001	0.0006	-0.002	0.0003
	[-0.31]	[0.12]	[-0.43]	[0.06]
SIZE	0.023***	0.009	0.022***	0.008
	[3.57]	[1.22]	[3.40]	[1.10]
MB	-0.031***	-0.001	-0.032***	-0.001
	[-7.53]	[-0.44]	[-7.56]	[-0.44]
ROA	-0.423***	-0.326***	-0.419***	-0.324***
	[-12.22]	[-9.47]	[-12.09]	[-9.35]
TAN	0.050	-0.056	0.049	-0.057
	[1.47]	[-1.20]	[1.40]	[-1.23]
CEOTENURE	0.0002	0.0005	0.0002	0.001*
	[0.81]	[1.62]	[1.05]	[1.84]
RD	-0.272**	-0.373**	-0.271**	-0.369**
	[-2.54]	[-2.45]	[2.54]	[-2.41]
RD_DUM	0.011	0.007	0.010	0.007
	[0.97]	[0.52]	[0.88]	[0.49]
ZSCORE	-0.0004***	-0.001***	-0.0004***	-0.001***
	[-8.83]	[-15.39]	[-8.78]	[-15.40]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	6,668	6,668	6,695	6,695
Adjusted R^2	0.8046	0.7892	0.8039	0.7896

Panel B: Mean growth rates of R&D expenses and CAPEX pre-Say on Pay

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
LEV_M growth	0.025	0.023	0.002	0.10	0.041	0.006	0.034	1.40
LEV_B growth	0.001	-0.005	0.006	0.29	0.012	-0.016	0.027	1.38

Table 7
Impact of CEO Delta and CEO Vega on Firm Risk

This table presents the results of the DiD regression for all dependent variables with triple interaction terms, *TREAT×POST×LCEODELTA(LCEOVEGA)* around the adoption of Say on Pay. Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWVEGA*). Panel A reports the results of the baseline DiD regressions (*TREAT×POST*). Panel B reports the results with the triple interaction term, *TREAT×POST×LCEODELTA* and Panel C reports the results with *TREAT×POST×LCEOVEGA*. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable

	Treated firms:											
	(1) Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA*)						(2) Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)					
Independent variables:	Dependent variables: *RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST	-0.0004	0.001	-0.001**	-0.002	0.012**	0.013*	0.001	0.001	-0.0009	0.0002	0.003	-0.002
	[-0.43]	[0.73]	[-2.48]	[-0.95]	[2.15]	[1.85]	[1.32]	[0.43]	[-1.43]	[0.10]	[0.55]	[-0.29]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Results on *TREAT×POST×LCEODELTA* for each dependent variable

	(1)						(2)					
Independent variables:	Dependent variables: *RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST ×LCEODELTA	-0.002*	-0.001	-0.001	0.0001	-0.002	-0.006	-0.0002	-0.002	-0.001	-0.001	-0.0001	-0.004
	[-1.74]	[-0.42]	[-1.49]	[0.06]	[-0.42]	[-1.09]	[-0.29]	[-1.08]	[-1.50]	[-0.32]	[-0.02]	[-0.71]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Results on *TREAT×POST×LCEOVEGA* for each dependent variable												
	(1)						(2)					
Independent variables:	Dependent variables:											
	RD	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST ×LCEOVEGA	-0.0001 [-0.23]	-0.002* [-1.67]	-0.002 [-1.01]	-0.0001 [-0.10]	-0.004 [-1.48]	-0.006 [-1.64]	0.0004 [0.52]	-0.002 [-1.44]	-0.003 [-1.44]	-0.004 [-1.46]	-0.001 [-0.27]	-0.002 [-0.40]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

4.1.3 Robustness

4.1.3.1 Propensity Score Matching

Although the mean growth rates in the pre-Say on Pay period in the treated and controlled firms have been tested for potential violations of the parallel trend assumption, there is still a concern that the results are driven by other characteristics that differ between the two groups. To address such concerns, I create propensity score matched samples and run the difference-in-differences tests with the matched samples. My matching procedure follows Lemmon and Roberts (2010) and relies on the nearest matching method originally developed by Rosenbaum and Rubin (1983)[3]. However, my method differs from Lemmon and Roberts (2010) in producing propensity scores to address potential self-selection bias in my sample. Since Say on Pay votes in the US are advisory and firms have discretion in choosing compensation policies, sorting firms into the treatment and control groups in terms of CEO pay sensitivities pre-Say on Pay may be non-random, resulting in self-selection bias. I address this concern by using the Heckman and Todd (2009) method. In the case of a logit regression, Heckman and Todd (2009) show that a monotonic transformation of the propensity score, which is a log odds ratio given as $ln\frac{\widetilde{P}r(TREAT=1|x)}{\widetilde{P}r(TREAT=0|x)}$, can be used to the propensity score matching procedure for choice-based samples to address potential selection bias. Therefore, I first run a logit regression at the firm level of a binary variable indicating whether a firm is categorised as a treated firm or a controlled firm. Following Lemmon and Roberts (2010), the covariates are mean values in the pre-Say on Pay period. As I want to ensure that the parallel trend assumption is not violated, I also include mean growth rates of each dependent variable in the pre-Say on Pay period. In the logit regression, industry fixed effects and year fixed effects are applied following Lemmon and Roberts (2010) and Canil and Karpavicius (2022). Second, I transform the propensity scores into the log odds ratio and match samples based on this ratio. Finally, I run the difference-in-differences regression based on the matched sample. I remove observations that are off-common support. Although the propensity score matching procedure removed many observations and the number of firms categorised as treated firms reduces, I have adequate observations to match each treated firm with one controlled firm[4]. Table 8 presents the mean growth rates of each dependent variable pre- and post- matching procedure, and the difference-in-differences tests with the matched sample. The results are similar to the preceding analyses with unmatched samples.

[3] Full results are provided in Appendix C1.

[4] Propensity score matching results in a reduction of approximately 45% in sample size for each regression. Refer to Appendix C1.

4.1.3.2 Sensitivity Tests

To further assess the robustness of the main results, I conduct two sensitivity tests, the results of which are presented in Table 9 in separate Panels A and B. First, I include corporate governance variables as additional covariates to control for their potential impact on firm risk. The variables are adopted from Correa and Lel (2016) and include CEO tenure (*CEOTENURE*), board independence (*BOARDIND*) and the percentage of institutional ownership (*INSTOWN_PERC*)[5]. Second, I remove the fiscal year 2008 in my sample and repeat the main tests to control any GFC effects. For brevity, only the coefficients on the interaction term (*TREAT×POST*) and t-statistics are reported. When corporate governance variables are controlled for (Panel A), significance in the increase in CEO vega disappears in the *LOWVEGA* group. Furthermore, the decrease in stock return volatilities become significant in the *LOWVEGA* group. Since the two treated firms both exhibit a statistically meaningful increase in CEO delta while there are no changes in the level of CEO vega, I interpret this result as the causal impact of CEO delta on stock return volatilities. This is consistent with higher CEO delta resulting in managerial risk aversion (the risk effect) as in Coles, Daniel and Naveen (2006). In terms of leverage, controlling for corporate governance variables remove statistical significance of the results in the *LOWDELTA* group, implying that the increase in leverage is not impacted by the firm risk channel. I expect that the increase in leverage is due to decreased agency costs of debt which enable firms to add cheaper debts or debts that do not materially impact firms' financial risk. Panel B shows little impact of removing the fiscal year 2008 (removing the GFC effect) from the sample on the main results.

4.1.4 Section Summary

Section 4.1 shows that firms with low CEO delta and CEO vega exhibit greater responsiveness to Say on Pay by increasing CEO delta in the post-Say on Pay period, evidencing better alignment of interests between shareholders and managers in firms with suboptimal pay practices. However, the

[5] CEO duality and board size can also be considered as corporate governance variables. However, I do not include these two measures as their impact is ambiguous. With respect to CEO duality, there are two conflicting views on its impact on corporate governance. Proponents of duality argue that CEO duality is associated with superior leadership ascribed to greater authority over formulation and implementation of strategies (Stoeberl & Sherony 1985; Anderson & Anthony 1986; Donald & Davis 1991; Davis et al. 1997). Opponents argue that CEO duality constrains board independence and weakens the monitoring power of the board over the CEO (Lorsch & Maclver 1989; Fizel & Jensen 1983; Fizel & Louie 1990; Dobrzynski 1991; Millstein 1992; Levy 1981; Dayston 1984). Empirical evidence is also inconclusive. Donaldson and Davis (1991) and Lin (2005) report the positive impact of CEO duality on firm performance while Rechner and Dalton (1991) and Pi and Timme (1993) report the negative impact on shareholder wealth. With respect to board size, Yermack (1996) finds that a smaller board is more effective in that there is better communication and decision-making and support for the agency theory view by Jensen (1993) and Lipton and Lorsch (1992). Conversely, Sanders and Carpenter (1998) and Dalton et al. (1999) document the positive impact of board size on firm performance supporting the resource dependent theory view by Pfeffer and Salanick (1978).

results on firm risk are mixed. While firms show some evidence of increased leverage, they also show a decrease in stock return volatilities and no changes in other firm risk measures (research and development expenses, capital expenditure and volatility of return on assets). Furthermore, when corporate governance variables are additionally controlled for, only CEO delta and the volatility of stock returns remain significant. Overall, hypotheses *H1a – H1e* are rejected. Since I do not find evidence that the level of CEO delta within the treated firms affects the volatility of stock returns (see Section 4.1.2.4), I challenge the view that there is a causal relation between higher CEO delta and lower volatility of stock return, inconsistent with Coles, Daniel and Naveen (2006) and the risk effect of delta in Low (2009) and Armstrong et al. (2013).

Table 8
DiD with the matched samples

This table summarises trends in the dependent variables in the pre-Say on Pay period after propensity score matching and difference-in-differences results with the matched samples. Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWVEGA*). Panel A reports the results of the baseline DiD regressions (*TREAT×POST*). Panel B reports the results with the triple interaction term, *TREAT×POST×LCEODELTA* and Panel C reports the results with *TREAT×POST×LCEOVEGA*. Panel D reports the differences in the mean growth rates of dependent variables between the treated firms and controlled firms in the pre-intervention period. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Full results and diagnostics of the propensity score matching procedure are provided in Appendix C1.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable

	Treated firms:											
	(1)						(2)					
	Low CEO delta pre-Say on Pay as treated firms (*TREAT* = *LOWDELTA*)						Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)					
Independent variables:	Dependent variables: *RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST	-0.0003	0.002	-0.002**	-0.002	0.012**	0.014*	0.002	0.001	-0.001	0.0003	0.003	-0.0002
	[-0.19]	[1.03]	[-2.55]	[-0.98]	[2.17]	[1.91]	[1.22]	[0.54]	[-1.45]	[0.13]	[0.59]	[-0.03]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Results on *TREAT×POST×LCEODELTA* for each dependent variable

	(1)						(2)					
Independent variables:	Dependent variables: *RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST	-0.002*	-0.001	-0.001	0.001	-0.002	-0.007	-0.001	-0.002	-0.001	-0.0002	0.001	-0.003
×LCEODELTA	[-1.72]	[-0.32]	[-0.55]	[0.35]	[-0.42]	[-1.17]	[-0.52]	[-0.92]	[-0.59]	[-0.09]	[0.16]	[-0.57]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Results on *TREAT×POST×LCEOVEGA* for each dependent variable												
	(1)						(2)					
Independent variables:	Dependent variables:											
	RD	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*	*RD*	*CAPEX*	*VOLSTR*	*VOLROA*	*LEV_M*	*LEV_B*
TREAT×POST ×LCEODELTA	-0.001	-0.001*	-0.002	0.001	-0.004	-0.006	-0.0001	-0.002	-0.003	-0.003	0.001	-0.001
	[-0.73]	[-1.36]	[-1.53]	[0.31]	[-1.47]	[-1.64]	[-0.05]	[-1.40]	[-1.53]	[-1.07]	[0.24]	[-0.24]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel D: Mean growth rates of the dependent variables in the pre-Say on Pay period

D1: Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA*)

	Pre-Match				Post-Match			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
RD growth	-0.017	-0.006	-0.010	-0.69	-0.015	-0.021	0.005	0.32
CAPEX growth	-0.078	-0.114	0.036	0.88	-0.011	-0.081	-0.029	-0.62
VOLSTR growth	0.012	0.062	-0.050	-1.28	0.008	0.085	-0.077	-1.63
VOLROA growth	0.063	0.073	-0.010	-0.18	0.035	0.062	-0.027	-0.38
LEV_M growth	0.025	0.023	0.002	0.10	0.025	0.024	0.001	0.04
LEV_B growth	0.001	-0.005	0.006	0.29	-0.004	-0.008	0.004	0.17

D2: Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)

	Pre-Match				Post-Match			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
RD growth	-0.017	-0.007	-0.010	-0.69	-0.018	-0.008	-0.011	-0.65
CAPEX growth	-0.070	-0.118	0.048	1.16	-0.070	-0.130	0.060	1.31
VOLSTR growth	0.014	0.059	-0.046	-1.18	0.018	0.070	-0.053	-1.12

VOLROA growth	0.014	0.113	-0.098	-1.72*	-0.006	0.099	-0.105	-1.52
LEV_M growth	0.041	0.006	0.034	1.40	0.041	0.004	0.037	1.42
LEV_B growth	0.012	-0.016	0.027	1.38	0.006	-0.020	0.027	1.24

Table 9
Sensitivity tests

This table shows the coefficients and t-statistics for the sensitivity analyses conducted as a robustness test to the main findings. Panel A presents the results with corporate governance variables (*BOARDIND* and *INSTOWN_PERC*) as additional control variables. Panel B reports the results with the fiscal 2008 removed from the sample to control any GFC effect. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Full results are presented in Appendix C2 Table C2.1.

Panel A: Controlling for corporate governance

	Treated firms:	
	(1)	(2)
Dependent variables:	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*	Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)
LCEODELTA	0.277***	0.158*
	[3.53]	[1.70]
LCEOVEGA	0.022	0.170
	[0.13]	[1.01]
RD	-0.00002	0.002*
	[-0.01]	[1.77]
CAPEX	0.002	0.002
	[0.82]	[0.85]
VOLSTR	-0.002**	-0.001**
	[-2.50]	[-2.17]
VOLROA	-0.002	0.0001
	[-0.86]	[0.03]
LEV_M	0.008	0.001
	[1.47]	[0.24]
LEV_B	0.011	-0.002
	[1.49]	[-0.21]

Panel B: Removing fiscal year 2008 (GFC)

	(1)	(2)
Dependent variables:	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*	Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)
LCEODELTA	0.327***	0.179**
	[4.75]	[2.30]
LCEOVEGA	0.002	0.224*
	[0.01]	[1.68]
RD	-0.001	0.001
	[-0.50]	[1.36]
CAPEX	0.001	0.001
	[0.39]	[0.41]
VOLSTR	-0.001**	-0.001
	[-2.54]	[-1.34]
VOLROA	-0.003	0.0002
	[-1.27]	[0.08]
LEV_M	0.013**	0.004
	[2.33]	[0.79]
LEV_B	0.012*	-0.002
	[1.68]	[-0.28]

4.2 Say on Pay and Agency Costs of Debt

4.2.1 Methodology

First, the model of the difference-in-differences test on the cost of debt and debt maturities are as follows:

$$COST_t = \alpha_0 + \beta_1 TREAT \times POST + \beta_2 LMAT_t + \beta_3 LEV\_M_t + \beta_4 PROF_t + \beta_5 VOLSTR_t + \beta_6 AVGRET_t + \beta_7 ISSUESIZE_t + \beta_8 INTCOV_t + \beta_9 RATING + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon. \tag{4.5}$$

Although *COST* is measured as the difference between cost of debt and Moody's Seasoned Aaa corporate bond yield to ensure that *COST* does not capture the decreasing market rates in the sample period, I apply year fixed effects to further address any year-by-year extraneous shocks in the sample. This is consistent with Brockman, Martin and Unlu (2010) whose models control for the yearly term structure of interest or the slope of the yield curve. I also apply firm fixed effects to address potential omitted variables bias and standard errors are clustered at the firm level.

Second, the model of the difference-in-differences test on debt maturity is as follows:

$$ST3_t(ST5_t) = \alpha_0 + \beta_1 TREAT \times POST + \beta_2 LSIZE_t + \beta_3 LSIZE2_t + \beta_4 LEV\_M_t + \beta_5 ASSETM_t + \beta_6 CEOOWN_t + \beta_7 MB_t + \beta_8 ABNEARN_t + \beta_9 VOLSTR_t + \beta_{10} Z\_DUM_t + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon. \tag{4.6}$$

I follow Brockman, Martin and Unlu (2010) and apply Rogers (1994) industry-year clustered standard errors and firm fixed effects (Datta et al. 2005) to account for potential omitted variables bias.

4.2.1.1 Firm Risk channel

To examine Say on Pay's impact on agency costs of debt through the firm risk channel, I use settings identical to the ones in Section 4.1 and run difference-in-difference regressions with agency costs of debt measures (*COST, ST3, ST5*) as dependent variables. In Section 4.1, I found a significant increase in CEO delta and a decrease in the volatility of stock returns post-Say on Pay and hence, hypotheses *H1a* – *H1d* were rejected. Thus, hypotheses *H2a* and *H2b* which were stated based on the expectation that hypotheses *H1a* – *H1d* are true are no longer valid. Following Brockman, Martin and Unlu (2010) who find a negative association between CEO delta and the cost and proportion of short-term debts, I expect that the increased CEO delta will reduce the cost and proportion of short-term debts in the post-Say on Pay period.

4.2.1.2 Corporate Governance Channel

To test Say on Pay's impact as a corporate governance mechanism (hypotheses *H3a – H3b*), I begin with examining whether changes in CEO delta and CEO vega are impacted by corporate governance characteristics, using triple interaction terms, *TREAT×POST×CORPGOV* with *CORPGOV* representing different corporate governance variables which are adopted from Correa and Lel (2016). Specifically, I examine whether CEO pay sensitivities and agency costs of debt measures interact with CEO tenure, institutional ownership and board independence within the treated firms. As a robustness test, I define alternative treatment and control groups formed based on corporate governance characteristics and conduct difference-in-differences tests, aiming to examine whether agency costs of debt differ in these firms post-Say on Pay.

4.2.2 Results on Firm Risk Channel

4.2.2.1 CEO Pay Sensitivity, Firm Risk and Agency Costs of Debt

The difference-in-differences results for the firm risk channel are presented in Table 10. The results show no statistically meaningful results. A lack of change in cost of debt despite the increased level of debt (see Table 6) is consistent with my interpretation that these firms add debts that do not materially increase financial risk in these firms. Lack of indication of changes in the cost of debt despite a decrease in stock return volatilities (see Table 5) and an increase in CEO delta is inconsistent with Brockman, Martin and Unlu (2010), who find a negative association between CEO delta and the cost of debt. Thus, my result challenges the view that higher CEO delta reduces firms' cost of debt, and implies that the previously documented negative association may be ascribed to endogeneity rather than causality. However, I find negative and significant coefficients on the proportion of short-term debts, consistent with Brockman, Martin and Unlu (2010). Specifically, I find that there is a 5.5% decrease in *ST5* in the *LOWDELTA* firms at a 5% significance level. This is economically significant, as it implies a 10.04% reduction in *ST5* from the pre-Say on Pay average *ST5* of 0.551. With regards to *ST3,* although a decrease of 3.9% within the *LOWDELTA* firms is only significant at 10% (*p-value* = 0.064), this decrease is economically significant as it implies a 13.08% of reduction in *ST3* from the pre-Say on Pay average *ST3* of 0.297. However, I fail to find evidence that Say on Pay decreases agency costs of debt in the *LOWVEGA* firms. The insignificant result in the *LOWVEGA* firms may be due to the offsetting effects of increased CEO vega (managerial risk-taking incentives) and increased CEO delta (risk effect of delta). The test satisfies the parallel trend assumption as the mean growth rates of the dependent variables in the pre-Say on Pay period show no difference between treated and controlled firms (see Table 10, Panel B).

Despite the significant decrease in the proportion of short-term debt in the *LOWDELTA* firms (see Section 4.2.2.1), further evidence is required to conclude a causal relationship between higher CEO delta and lower proportion of short-term debts, as shown in Brockman, Martin and Unlu (2010). For example, in Section 4.1, I concluded that despite an increase in CEO delta and a decrease in the volatility of stock returns post-Say on Pay, there is lack of evidence to conclude a causal relationship since the triple interaction term *TREAT×POST×LCEODELTA* was insignificant (see Section 4.1.2.4).

4.2.2.2 Robustness

4.2.2.2.1 Triple interaction terms: It is possible that the results on agency costs of debt are driven by differences in the level of riskiness within the treated firms. To address this concern, I test whether the results on agency costs of debt can be linked to firm risk, by using the triple interaction term *TREAT×POST×FIRMRISK*, with *TREAT* being either *LOWDELTA* or *LOWVEGA* and *FIRMRISK* being the firms risk measures that show significant increase or decrease in Section 4.1 (*VOLSTR*, *LEV_M* and *LEV_B*). The results are presented in Table 11 which shows no impact of the level of firm risk pre-Say on Pay on agency costs of debt.

4.2.2.2.2 Propensity Score Matching: There is a possibility that the results are driven by the underlying firm characteristics across the sample. I address this concern by propensity score matching procedures with the dependent variables as *COST*, *ST3* and *ST5*. The matching procedure is identical to the one in Section 4.1.3.1. The results are presented in Table 12 and I consistently find evidence of Say on Pay's impact through the firm risk channel, albeit at a lower significance level.

4.2.2.2.3 *Sensitivity Tests:* I first test with corporate governance variables as additional covariates to control for the impact of corporate governance on agency costs of debt. Second, I exclude the fiscal year 2008 in my sample to control for GFC and find no impact of GFC. The results are quantitatively consistent with the main findings (for full results, see Appendix C2 Table C2.2).

Table 10
Changes in agency costs of debt around the adoption of Say on Pay

This table presents the coefficients and t-statistics of the DiD regression for agency costs of debt (cost of debt and proportion of short-term debts) around the adoption of Say on Pay. Panel A column (1) reports the results of the DiD regressions with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level (*COST*) and industry-year clustered standard errors (*ST3, ST5*). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on cost of debt and proportion of short-term debts

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT* = *LOWDELTA*)			Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.003	-0.039*	-0.055**	0.003	-0.011	-0.043
	[0.93]	[-2.11]	[-2.47]	[1.04]	[-0.46]	[-1.31]
LMAT	0.003**			0.003**		
	[2.26]			[2.37]		
LEV_M	-0.125***	-0.437***	-0.486**	-0.120***	-0.427***	-0.458**
	[-7.72]	[-3.82]	[-2.61]	[-7.33]	[-3.70]	[-2.42]
PROF	-0.017			-0.015		
	[-0.99]			[-0.90]		
VOLSTR	0.073***	-0.138	0.273	0.069**	-0.131	0.269
	[2.61]	[-0.71]	[1.70]	[2.56]	[-0.69]	[1.77]
AVGRET	-0.963**			-0.868**		
	[-2.18]			[-1.98]		
ISSUESIZE	-0.003***			-0.004***		
	[-4.42]			[-4.49]		
INTCOV	-0.0003			-0.0003		
	[-1.52]			[-1.42]		
RATING	-0.004***			-0.004***		
	[-3.34]			[-3.37]		
LSIZE		-0.189	-0.261		-0.189	-0.219
		[-1.04]	[-1.32]		[-1.03]	[-1.10]
LSIZE2		0.011	0.013		0.011	0.011
		[1.11]	[1.29]		[1.12]	[1.05]
ASSETM		0.008	0.014*		0.007	0.014*
		[1.36]	[1.95]		[1.29]	[1.95]
CEOOWN		9.786	29.903*		9.226	29.715*
		[0.63]	[1.89]		[0.60]	[1.88]
MB		-0.014	-0.010		-0.016	-0.014
		[-0.77]	[-0.44]		[-0.84]	[-0.61]
ABNEARN		-0.062	0.002		-0.060	0.007
		[-1.38]	[0.04]		[-1.33]	[0.16]
Z_DUM		-0.029	-0.018		-0.026	-0.011
		[-1.30]	[-0.65]		[-1.20]	[-0.39]

Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,432	2,890	2,890	1,450	2,911	2,911
Adjusted R^2	0.4971	0.2793	0.4168	0.4963	0.2811	0.4195

Panel B: Mean growth rates of cost of debt and proportion of short-term debts pre-Say on Pay

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
COST growth	-0.008	-0.002	-0.006	-0.33	0.002	-0.014	0.016	0.84
ST3 growth	0.074	-0.010	0.084	1.19	0.083	-0.029	0.11	1.59
ST5 growth	0.033	0.007	0.026	0.76	0.023	0.017	0.006	0.17

Table 11
Changes in agency costs of debt around the adoption of Say on Pay and firm risk

This table presents the results of the DiD regressions for agency costs of debt with triple interaction terms, *TREAT×POST×FIRMRISK* round the adoption of Say on Pay, with *FIRMRISK* being the firms risk measures that show significant increase or decrease in Section 4.1 (*VOLSTR*, *LEV_M* and *LEV_B*). Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT = LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT = LOWVEGA*). Panel A reports the results of the baseline DiD regressions. Panel B reports the results with the triple interaction term, *TREAT×POST×VOLSTR*, Panel C reports the results with *TREAT×POST×LEV_M* and Panel D reports the results with *TREAT×POST×LEV_B*. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*			Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.003	-0.009	-0.045	0.003	-0.011	-0.043
	[0.93]	[-0.47]	[-1.47]	[1.04]	[-0.46]	[-1.31]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Results on *TREAT×POST×VOLSTR* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST×VOLSTR	0.015	0.182	-0.420	0.026	0.041	0.135
	[0.55]	[0.43]	[-0.75]	[0.94]	[0.09]	[0.33]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Results on *TREAT×POST×LEV_M* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST×LEV_M	0.004	0.527	0.383	0.009	0.151	0.378
	[0.45]	[1.51]	[1.67]	[1.08]	[0.72]	[1.79]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Results on *TREAT×POST×LEV_B* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST×LEV_B	0.008	0.382	0.313	0.009	0.218	0.288
	[1.25]	[1.79]	[1.62]	[1.34]	[1.14]	[1.60]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 12
DiD with the matched samples

This table presents the coefficients and t-statistics of the DiD regression for agency costs of debt (cost of debt and proportion of short-term debts) around the adoption of Say on Pay with propensity score matched samples. Panel A column (1) reports the results of the DiD regressions with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. Panel B reports mean growth rates of the dependent variables in the pre-Say on Pay period to check for the potential violation of parallel trend assumption, following Lemmon and Roberts (2010). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Propensity score matching diagnostics are presented in Appendix C1.

Panel A: DiD on cost of debt and proportion of short-term debts with the PS matched samples

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT* = *LOWDELTA*)			Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.001	-0.040*	-0.056*	0.001	-0.006	-0.050
	[0.50]	[-2.10]	[-2.18]	[0.35]	[-0.22]	[-1.64]
LMAT	0.003**			0.003**		
	[2.05]			[2.22]		
LEV_M	-0.122***	-0.452***	-0.512**	-0.112***	-0.441***	-0.477**
	[-6.81]	[-3.62]	[-2.61]	[-6.45]	[-3.52]	[-2.46]
PROF	-0.015			-0.005		
	[-0.71]			[-0.26]		
VOLSTR	0.072**	-0.314	0.239	0.068**	-0.272	0.233
	[2.49]	[-1.61]	[1.45]	[2.44]	[-1.51]	[1.28]
AVGRET	-0.760*			-0.466		
	[-1.92]			[-1.17]		
ISSUESIZE	-0.003***			-0.004***		
	[-4.06]			[-4.50]		
INTCOV	-0.0004**			-0.0004**		
	[-2.21]			[-2.15]		
SP	-0.003***			-0.003***		
	[-3.06]			[-3.17]		
LSIZE		-0.340	-0.279		-0.251	-0.229
		[-1.82]	[-1.31]		[-1.45]	[-1.08]
LSIZE2		0.017	0.013		0.013	0.011
		[1.76]	[1.20]		[1.44]	[0.98]
ASSETM		0.002	0.014		0.004	0.014*
		[0.44]	[1.75]		[1.00]	[1.96]
CEOOWN		8.200	31.047		9.556	29.274
		[0.47]	[1.79]		[0.58]	[1.82]
MB		-0.018	-0.006		-0.022	-0.014
		[-0.94]	[-0.26]		[-1.14]	[-0.59]
ABNEARN		-0.071	-0.007		-0.067	-0.022
		[-1.61]	[-0.19]		[-1.24]	[-0.54]
Z_DUM		-0.024	-0.021		-0.030	-0.015
		[-1.26]	[-0.68]		[-1.17]	[-0.48]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,258	2,469	2,547	1,292	2,548	2,605
Adjusted R^2	0.5237	0.2744	0.4056	0.5196	0.2727	0.4080

Panel B: Mean growth rates of dependent variables pre-Say on Pay in the PS matched samples

	(1)				(2)			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
COST growth	-0.014	0.007	-0.021	-0.88	-0.006	-0.002	-0.004	-0.17
ST3 growth	0.043	0.006	0.037	0.43	0.068	-0.050	0.118	1.37
ST5 growth	-0.002	0.009	-0.011	-0.27	-0.001	0.009	-0.010	-0.26

4.2.3 Results on Corporate Governance Channel

4.2.3.1 CEO delta and CEO vega and Corporate Governance

Table 13 reports the results of the difference-in-differences tests of triple interaction terms with corporate governance characteristics. In the *LOWDELTA* group I find statistically significant association between an increase in CEO delta and CEO tenure (in years) and the percentage of institutional ownership. I find no significant association between CEO pay sensitivities and board independence. Specifically, with respect to CEO tenure, within the *LOWDELTA* group, the longer the CEO tenure in years, the greater the increase in CEO delta post-Say on Pay. This is consistent with Correa and Lel (2016), who find that an increase in CEO pay performance sensitivity is concentrated in firms with long CEO tenure, evidencing greater impact of Say on Pay in poorly governed firms. With respect to institutional ownership, within the *LOWDELTA* group the higher the institutional ownership in percentage, the greater the increase in CEO delta post-Say on Pay. I interpret this result as greater shareholder power post-Say on Pay in executive compensation arrangements, consistent with Correa and Lel (2016). Within the *LOWVEGA* group, I do not find any of the corporate governance characteristics are associated with the increase in CEO vega in the post-Say on Pay period. However, CEO tenure and institutional ownership still play important roles in the increase of CEO delta within this group. Overall, my results support greater responsiveness to Say on Pay for firms with poor corporate governance, consistent with the view in Correa and Lel (2016) that Say on Pay is a corporate governance mechanism.

Table 13
Changes in CEO delta and CEO vega around the adoption of Say on Pay and corporate governance

This table presents the results of the DiD regression for CEO pay sensitivities (*LCEODELTA* and *LCEOVEGA*) with triple interaction terms, *TREAT×POST×LCEODELTA(LCEOVEGA)* around the adoption of Say on Pay. Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWVEGA*). Panel A reports the results of the baseline DiD regressions (*TREAT×POST*). Panel B reports the results with the triple interaction term, *TREAT×POST×CEOTENURE*. Panel C reports the results with *TREAT×POST×BOARDIND*. Panel D reports the results with *TREAT×POST×INSTOWN_PERC*. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable

	Treated firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
Independent variables:	Dependent variables:			
	LCEODELTA	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST	0.331***	0.024	0.154*	0.282**
	[4.74]	[0.17]	[1.95]	[2.11]
Control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Panel B: Results on *TREAT×POST×CEOTENURE* for each dependent variable

	(1)		(2)	
Independent variables:	Dependent variables:			
	LCEODELTA	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST ×CEOTENURE	0.018**	-0.011	0.014*	0.002
	[2.21]	[-0.78]	[1.68]	[0.11]
Control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Panel C: Results on *TREAT×POST×BOARDIND* for each dependent variable

	(1)		(2)	
	Dependent variables:			
Independent variables:	*LCEODELTA*	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST ×BOARDIND	-1.028	0.373	0.429	-1.290
	[-1.33]	[0.31]	[0.52]	[-0.98]
Control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Panel D: Results on *TREAT×POST×INSTOWN_PERC* for each dependent variable

	(1)		(2)	
Independent variables:	Dependent variables:			
	LCEODELTA	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST	0.747**	-0.523	0.986***	-0.666

×*INSTOWN_PERC*	[2.14]	[-0.78]	[3.00]	[-1.03]
Control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

4.2.3.2 Corporate Governance and Agency Costs of Debt

I test whether Say on Pay impacts agency costs debt as a corporate governance mechanism which reduces firm risk (Bhojraj & Sengupta, 2003) and thus agency costs of debt (Mande, Park & Son, 2012). I do this by examining whether agency costs of debt are impacted by CEO tenure and institutional ownership, using triple interaction terms. The results are presented in Table 14. With respect to the *LOWDELTA* group, I find that the greater the CEO tenure in years, the greater the decrease in the cost of debt post-Say on Pay, evidencing reduced agency costs of debt in poorly governed firms. However, there is no evidence in terms of the proportion of short-term debts, and therefore my evidence is limited only to the *LOWDELTA* group and provides a partial evidence of Say on Pay's impact through the corporate governance channel. I find strong evidence that within the *LOWVEGA* group the greater the institutional ownership in percentages, the greater the reduction in the cost of debt and the proportion of short-term debts (maturing in 3 years or less) post-Say on Pay, evidencing a decrease in agency costs of debt in these firms. The result is inconsistent with Correa and Lel (2016) who find that firms with low institutional ownership are impacted more greatly by Say on Pay. However, my result suggests that institutional investors utilise strengthened power in compensation arrangements, evidencing its role as a corporate governance mechanism and that Say on Pay strengthens shareholder power. Since *LOWDELTA* and *LOWVEGA* groups represent firms with problematic CEO pay practices in the pre-Say on Pay period, my results provide some evidence of Say on Pay's impact as a corporate governance mechanism that reduces agency costs of debt in firms with problematic pay practices and poor corporate governance.

Further, the increase in CEO delta is concentrated among firms with long CEO tenure and high institutional ownership, which also show a decrease in the proportion of short-term debts. Hence, my result support the causal relationship between higher CEO delta and lower proportion of short-term debts in Brockman, Martin and Unlu (2010).

Table 14
Changes in agency costs of debt around the adoption of Say on Pay and corporate governance

This table presents the results of the DiD regressions for agency costs of debt (costs of debt and proportion of short-term debts) with triple interaction terms, *TREAT×POST×CORPGOV* around the adoption of Say on Pay, with *CORPGOV* being corporate governance variables (CEO tenure in years, board independence and institutional ownership in percentage of total ownership). Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWVEGA*). Panel A reports the results of the baseline DiD regressions (*TREAT×POST*). Panel B reports the results with the triple interaction term, *TREAT×POST×CEOTENURE.* Panel C reports the results with *TREAT×POST×BOARDIND.* Panel D reports the results with *TREAT×POST×INSTOWN_PERC.* All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*			Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.003	-0.009	-0.045	0.003	-0.011	-0.043
	[0.93]	[-0.47]	[-1.47]	[1.04]	[-0.46]	[-1.31]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Results on *TREAT×POST×CEOTENURE* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST×CEOTENURE	-0.001**	0.001	-0.002	0.0003	0.004	0.004
	[-2.69]	[0.47]	[-0.50]	[1.21]	[1.18]	[1.13]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Results on *TREAT×POST×BOARDIND* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.022	-0.177	-0.027	-0.002	0.072	-0.119
×BOARDIND	[0.95]	[-0.82]	[-0.14]	[-0.010]	[0.54]	[-0.73]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel D: Results on *TREAT×POST×INSTOWN_PERC* for each dependent variable

	(1)			(2)		
	Dependent variables:					
Independent variables:	*COST*	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST×INSTOWN_PERC	-0.005	0.011	0.053	-0.022**	-0.251**	-0.123
	[-0.38]	[0.06]	[0.31]	[-1.98]	[-2.52]	[-0.84]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

4.2.3.4 Robustness

4.2.3.4.1 *Propensity Score Matching:* I test whether Say on Pay's impact on reducing agency costs of debt in firms with poor pay practices and poor governance continues to hold in the propensity score matched samples. The matching procedure is identical to the one in Section 4.1.3.1. The results are presented in Table 15 and are quantitatively similar to those reported in Table 14 and therefore the main findings continue to hold.

4.2.3.4.2 *Credit Ratings:* Since speculative graded firms generally show poor corporate governance (Ashbaugh-Skaife et al. 2006) and corporate governance mechanisms have a greater impact on poorly rated firms in reducing default risk (Bhojraj & Sengupta, 2003), I test the impact of Say on Pay on speculative graded firms. The alternative treated firms for this test are *JUNK* ∈ {1, 0}; *JUNK* = 1 if a firm's S&P credit rating is BB+ or below pre-Say on Pay and *JUNK* = 0 otherwise. Since speculative graded firms have significantly higher growth rates in *COST* (*t* = -1.91), *ST3* (*t* = -2.23) and *ST5* (*t* = -4.67) in the pre-Say on Pay period than investment graded firms, I use propensity score matched samples to address concerns for the violation of the parallel trend assumption. Further, selecting only firms with S&P credit ratings raises a concern for potential self-selection bias. I adopt the Heckman and Todd (2009) method as in Section 4.1.3.1 to address this concern. The results are presented in Table 16. Panel A compares summary statistics of corporate governance characteristics between the treated and controlled firms. Firms in the treatment group (speculative grade firms) show lower institutional ownership, higher CEO tenure and lower board independence. These characteristics are consistent with poor corporate governance identified in Correa and Lel (2016). Other studies also support that lower institutional ownership (Chung & Zhang, 2011), higher CEO tenure (Hill & Phan, 1991) and lower board independence (Gupta & Fields, 2009) are consistent with poor corporate governance. The summary statistics are also consistent with the findings of Ashbaugh-Skaife et al. (2006), who find these characteristics to be prevalent in firms with poor credit ratings. I find weak evidence of improved agency costs of debt in speculative graded firms post-Say on Pay, suggesting the view that Say on Pay is a corporate governance mechanism. The negative coefficient of 0.01% in speculative graded firms implies a 5.6% reduction in average *COST* which is economically significant.

Table 15
Changes in CEO delta and CEO vega around the adoption of Say on Pay and corporate governance (PS matched samples)

This table presents the results of the DiD regressions with the PS matched samples for agency costs of debt (costs of debt and proportion of short-term debts) with triple interaction terms, *TREAT×POST×CORPGOV* around the adoption of Say on Pay, with *CORPGOV* being corporate governance variables (CEO tenure in years, board independence and institutional ownership in percentage of total ownership). Column (1) reports the results for firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWDELTA*). Column (2) reports the results for firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms (*TREAT* = *LOWVEGA*). Panel A reports the results of the baseline DiD regressions (*TREAT×POST*). Panel B reports the results with the triple interaction term, *TREAT×POST×CEOTENURE*. Panel C reports the results with *TREAT×POST×BOARDIND*. Panel D reports the results with *TREAT×POST×INSTOWN_PERC*. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline results (*TREAT×POST*) for each dependent variable						
	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT* = *LOWDELTA*)			Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)		
Independent variables:	Dependent variables:					
	COST	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.001	-0.032	-0.056	0.001	-0.006	-0.050
	[0.50]	[-1.50]	[-1.69]	[0.35]	[-0.22]	[-1.64]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Results on *TREAT×POST×CEOTENURE* for each dependent variable						
	(1)			(2)		
Independent variables:	Dependent variables:					
	COST	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	-0.0005**	0.002	-0.001	0.0003	0.005	0.006
×CEOTENURE	[-2.16]	[0.54]	[-0.24]	[1.14]	[1.18]	[1.53]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Results on *TREAT×POST×INSTOWN_PERC* for each dependent variable						
	(1)			(2)		
Independent variables:	Dependent variables:					
	COST	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	-0.005	0.024	-0.012	-0.021*	-0.263**	-0.154
×INSTOWN_PERC	[-0.38]	[0.12]	[-0.07]	[-1.96]	[-2.32]	[-1.05]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 16
Say on Pay's impact on agency costs of debt in firms with speculative graded debts

This table presents the coefficients and t-statistics of the DiD regression for cost of debt and proportion of short-term debts around the adoption of Say on Pay, in firms with S&P credit ratings less than or equal to BB+ *(TREAT = JUNK).* Panel A reports the summary statistics of corporate governance characteristics (*INSTOWN*, *CEOTENURE* and *BOARDIND*)) across the subsample. Panel B reports the results of the DiD regressions, and Panel C reports mean growth rates of the dependent variables in the pre-Say on Pay period. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Full results are provided in Appendix C2 Table C2.3.

Panel A: Summary statistics: Corporate governance characteristics by S&P ratings

	Treated firms (Speculative grade firms, *JUNK* = 1)				Controlled firms (Investment grade firms, *JUNK* = 0)			
Variables:	Mean	Median	Min	Max	Mean	Median	Min	Max
INSTOWN	47.088	24.753	0.003	617.208	109.626	51.478	0.003	617.208
CEOTENURE	10.476	8.000	0	45.000	8.294	6.000	0	45.000
BOARDIND	0.780	0.800	0.222	0.923	0.819	0.846	0	0.923

Panel B: DiD results with speculative graded firms as treated firms (*TREAT* = *JUNK*)

	Dependent variables:		
Independent variables:	*COST*	*ST3*	*ST5*
JUNK×POST	-0.001*	0.018	0.034
	[1.91]	[0.74]	[1.00]
Control variables	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Panel C: Mean growths after propensity score matching

	Pre-Match				Post-Match			
Variables:	Control	Treat	Diff.	T-Diff.	Control	Treat	Diff.	T-Diff.
COST growth	-0.022	0.004	-0.027	-1.91*	-0.011	0.007	-0.018	-0.71
ST3 growth	-0.013	0.109	-0.122	-2.23**	-0.011	0.064	-0.074	-0.72
ST5 growth	-0.026	0.109	-0.134	-4.67***	-0.038	0.026	-0.064	-1.49

4.2.4 Section Summary

Section 4.2.2 shows that agency costs of debt for firms with greater responsiveness to Say on Pay (low CEO delta and CEO vega) are negatively impacted by the adoption of Say on Pay. In Section 4.2.3, I find that the increase in CEO delta is concentrated in firms with long CEO tenure and higher institutional ownership. These firms experience a reduction in agency costs of debt post-Say on Pay, consistent with the findings in Section 4.2.3. Hence, I conclude that there is a causal relation between higher CEO pay-performance sensitivity and lower agency costs of debt. Moreover, my result indicates that Say on Pay's impact on agency costs of debt is not separated by the firm risk channel or corporate governance channel, but rather they are interrelated. That is, Say on Pay better aligns shareholders' and managers' interests as a corporate governance mechanism, by increasing CEO pay-performance sensitivity (CEO delta), especially for firms with poor corporate governance in the pre-Say on Pay period (Say on Pay's impact through the corporate governance channel). As a result, the increased CEO delta negatively impacts the volatility of stock returns, reducing firm risk and agency costs of debt (Say on Pay's impact through the firm risk channel). Overall, my results support the hypotheses *H3a* and *H3b* and find some evidence of decreased agency costs of debt within poorly governed firms. My result is consistent with the literature that argue Say on Pay is a corporate governance mechanism (Correa & Lel 2016; Cai & Walking 2011).

Chapter 5

Limitation and Conclusion

In this thesis, I explored Say on Pay's impact on agency costs of debt. Given Say on Pay better aligns shareholder and manager interests through strengthened shareholder power over compensation arrangements, the adoption of Say on Pay results in shareholders attempting to maximise their wealth through an increase in CEO pay sensitivities and firm risk. Consistent with this prediction and the literature (Correa & Lel 2016; Cai & Walking 2011; Iliev & Vitanova 2011), I find that firms with low CEO pay-performance sensitivity (CEO delta) and low CEO pay-risk sensitivity (CEO vega) in the pre-Say on Pay period show greater responsiveness to the adoption of Say on Pay by increasing CEO delta in the post-Say on Pay period. I find an increase in leverage in these firms post-Say on Pay indicating greater risk, and decreased stock return volatilities post-Say on Pay indicating lower risk. This mixed result on firm risk post-Say on Pay is consistent with the ambiguous effect of higher CEO delta on firm risk as debated in the literature (Low 2009; Armstrong et al. 2013). However, the increase in leverage disappears when corporate governance variables are controlled for, indicating that the increased leverage may be due to factors other than the increased CEO delta. Conversely, the decrease in the volatility of stock returns consistently appears regardless of additional control variables or with propensity score matched samples. While the increase in CEO delta and decrease in the volatility of stock returns appear in the post-Say on Pay period, the decreased stock return volatility is not associated with the level of CEO delta within the treated firms. Hence, there is lack of evidence to conclude the causal relationship between CEO delta and stock return volatilities. With regards to agency costs of debt, I find a decrease in the debt maturity structure in the treated firms (firms with suboptimal CEO pay practices). Further, I find evidence that the increase in CEO delta and decrease in agency costs of debt are concentrated in firms with longer CEO tenure and higher institutional ownership, suggesting a negative causal relation between CEO delta and the proportion of short-term debts, consistent with Brockman, Martin and Unlu (2010). Overall, Say on Pay impacts firms with suboptimal pay practices and poor corporate governance and helps increase CEO pay-performance sensitivity (CEO delta) in these firms as a corporate governance mechanism. As a result, firm risk (volatility of stock returns) and agency costs of debt are reduced in these firms.

I acknowledge some limitations in my work. Firstly, although my treatment and control groups show trends that are desirable for my research settings (i.e., firms with suboptimal CEO pay sensitivities exhibit greater responsiveness to Say on Pay) thereby allowing me to use this group as the treatment group for the difference-in-differences analysis, the dummy variable *POST* may capture not only the increasing CEO pay sensitivities but also qualitative characteristics. Perhaps future research can determine a better method for the division of treatment or control groups. Secondly, I have only examined the three measures of agency costs of debt due to limited data availability. This limitation could be reduced with broader databases. For example, future research could use changes in the proportion of bank financing (Chen et al. 2021) or debt concentration (Castro et al. 2019) as additional measures of agency costs of debt.

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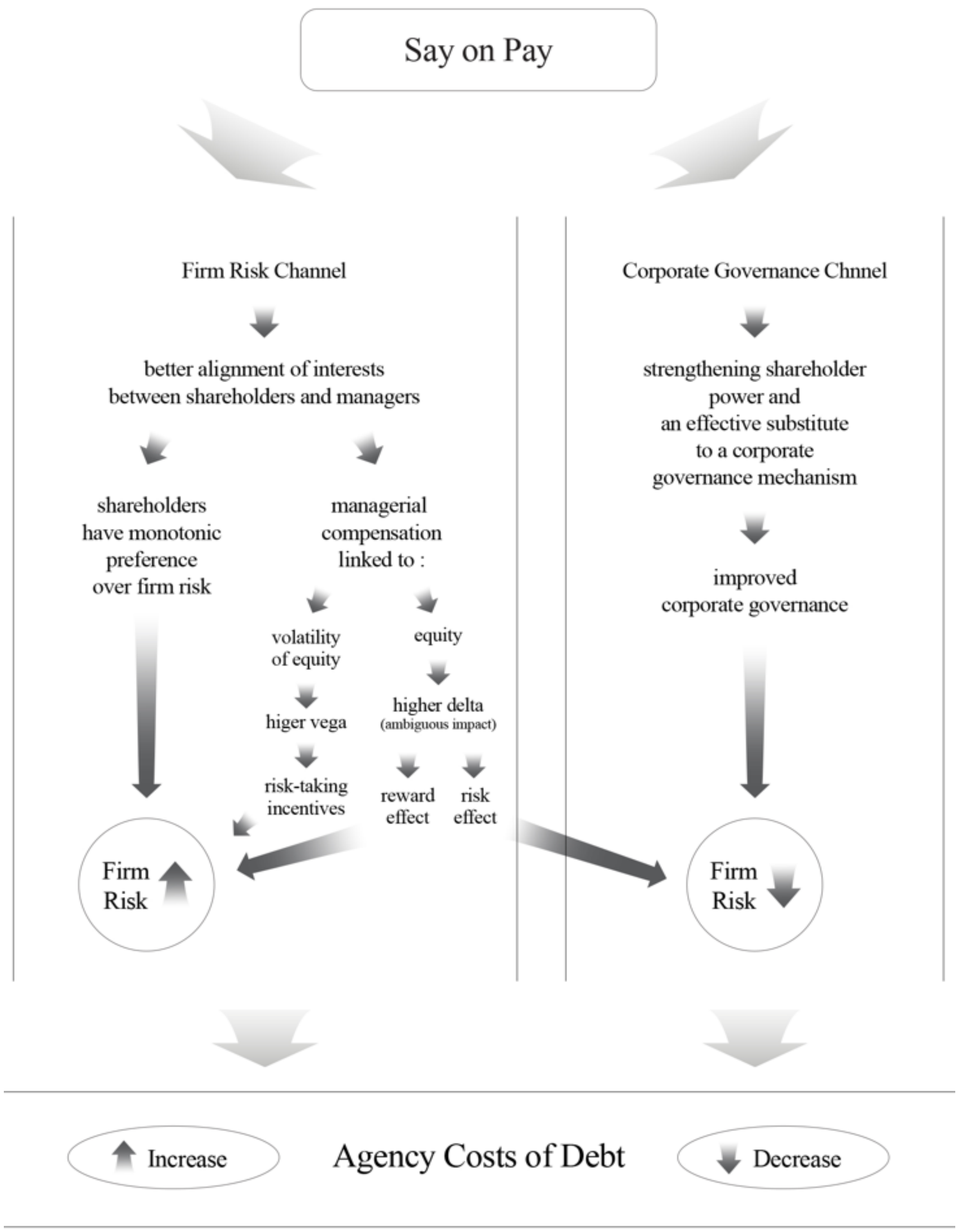
Appendices

Appendix A. Illustration of Channels of Say on Pay



Appendix B. Variables Description

Variable	Definition and Data Sources
ABNEARN	(Earnings in year *t* +1 (IBADJ) – earnings in year *t*)/(share price (PRCC_F) × outstanding shares (CSHPRI) in year *t*). Data source: COMPUSTAT Annual Industrial file.
ASSETM	Book value-weighted average of the maturities of property, plant and equipment and current assets. (gross property, plant, and equipment (PPENT)/total assets (AT)) ∗ (gross property, plant, and equipment (PPENT) /depreciation expense (DP)) + (current assets (ACT)/total assets (AT)) ∗ (current assets (ACT)/cost of goods sold (COGS)). Data source: COMPUSTAT Annual Industrial file.
AVGRET	Average of daily stock returns over the preceding 180 days. Data source: CRSP daily file.
BOARDIND	Number of independent directors (ISS item CLASSIFICATION = “I”) divided by the board size. Data source: COMPUSTAT Execucomp and ISS Directors and Corporate Governance databases.
CASHCOMP	Sum of CEO’s salary and bonus in millions of dollars. Data source: COMPUSTAT Execucomp database.
CAPEX	Net capital expenditures (CAPX-SPPE) scaled by assets (AT). Data source: COMPUSTAT Annual Industrial file.
CEODELTA	Change in the value of the CEO’s option and stock portfolio for a 1% increase in the value of the firm’s common stock price. Data source: https://sites.temple.edu/lnaveen/data/.
CEOOWN	CEO ownership computed as value of CEO stock ownership (COMPUSTAT Capital IQ Execucomp database) divided by market value of equity (share price (PRCC_F) × outstanding shares (CSHPRI), COMPUSTAT Annual Industrial file).
CEOTENURE	CEO tenure in years. COMPUSTAT Execucomp and ISS Directors and Corporate Governance databases.
CEOVEGA	Change in the value of the CEO’s option portfolio for a 1% change in the annualized standard deviation of stock returns. Data source: https://sites.temple.edu/lnaveen/data/.
COST	Difference between cost of debt computed as interest and related expense (XINT)/total debt (DLTT+DLC) and Moody's Aaa Coporate Bond Yield. Data source: COMPUSTAT Annual Industrial file and FRED at the Federal Reserve Bank of St. Louis.
INSTOWN	Top 10 institutional ownership, in millions. Data source: Thompson Reuters Institutional (13f) Holdings.
INSTOWN_PERC	Total institutional ownership, percent of total outstanding shares. Data source: Thompson Reuters Institutional (13f) Holdings.
INTCOV	Interest coverage, defined as operating income before depreciation (OIBDP) divided by interest expense (XINT). Data source: COMPUSTAT Annual Industrial file.
ISSUESIZE	Natural logarithm of the volume of total debt issues. Data source: DealScan.
JUNK	Equals one if the firm's *RATING* is below 13 (BBB-) in the pre-Say on Pay period and zero otherwise.
LCEODELTA	Logarithmic transformation of CEO delta, defined as ln(1+*CEO*DELTA).
LCEOVEGA	Logarithmic transformation of CEO vega, defined as ln(1+*CEO*VEGA).
LEV_B	Total debt (DLTT+DLC) divided by total assets (AT). Data source: COMPUSTAT Annual Industrial file.
LEV_M	Total debt (DLTT+DLC) divided by the market value of the firm (total assets (AT)-total equity (CEQ) + share price (PRCC_F) × outstanding shares (CSHPRI)). Data source: COMPUSTAT Annual Industrial file.

LMAT	Natural logarithm of average maturity of outstanding debt in months, computed as (sum of total face value of outstanding debt multiplied by maturity)/(sum of total face value of outstanding debt). Data source: DealScan.
LOWDELTA	Equals one if the firm's *CEODELTA* divided by CEO total compensation is below the industry median in the pre-Say on Pay period and zero otherwise.
LOWVEGA	Equals one if the firm's *CEOVEGA* divided by CEO total compensation is below the industry median in the pre-Say on Pay period and zero otherwise.
LSIZE	Log of *MVE*.
LSIZE2	Square of *LSIZE*.
MB	Market value of the firm divided by the book value of total assets. (total assets (AT)-total equity (CEQ) + share price (PRCC_F) × outstanding shares (CSHPRI))/total assets (AT). Data source: COMPUSTAT Annual Industrial file.
MVE	Market value of equity, computed as (share price (PRCC_F) × outstanding shares (CSHPRI)) plus the book value of total assets (AT) minus the book value of equity (CEQ). Data source: COMPUSTAT Annual Industrial file.
PROF	Profitability, defined as income before extraordinary items (IB) divided by total assets (AT). Data source: COMPUSTAT Annual Industrial file.
RATE_DUM	Equals one if a firm has an S&P rating on long-term debt (DLTT), and zero otherwise. Data source: COMPUSTAT Annual Industrial file.
RATING	Number between 1 and 22 depending on the S&P credit ratings (22 for AAA+ and 1 for D). Data source: COMPUSTAT Annual Industrial file.
RD	Research and development expenses (XRD or zero if missing) scaled by total assets (AT). Data source: COMPUSTAT Annual Industrial file.
RD_DUM	Equals one if the firm's research and development expense (XRD) is 0 or missing and zero otherwise. Data source: COMPUSTAT Annual Industrial file.
ROA	Return on assets computed as operating income before depreciation (OIBDP) to total assets (AT). Data source: COMPUSTAT Annual Industrial file.
SCASH	Cash from assets-in-place (OANCF – DPC + XRD) scaled by assets (AT). Data source: COMPUSTAT Annual Industrial file.
SGROWTH	Sales growth rate computed as $\ln(SALE/SALE_{t-1})$. Data source: COMPUSTAT Annual Industrial file.
ST3	Debt in current liabilities (DLC) plus debt maturing in the second year (DD2) plus debt maturing in the third year (DD3), scaled by total debt. Total debt is defined as debt in current liabilities (DLC) plus long-term debt (DLTT). Data source: COMPUSTAT Annual Industrial file.
ST5	Debt in current liabilities (DLC) plus debt maturing in the second (DD2), third (DD3), fourth (DD4), and fifth years (DD5), all scaled by total debt (DLC+DLTT). Data source: COMPUSTAT Annual Industrial file.
VOLROA	Standard deviation of operating income before depreciation (OIBDP) to total assets (AT) in the fiscal year. Data source: COMPUSTAT Annual Industrial file.
VOLSTR	Standard deviation of daily stock returns in the fiscal year. Data source: COMPUSTAT Capital IQ.
ZSCORE	Altman's Z-score which is computed as 3.3 × OIADP/AT+1.2 × (ACT−LCT)/AT + SALE/AT + 0.6 × (PRCC_F × CSHPRI)/(DLTT+DLC) + 1.4 × RE/AT. Data source: COMPUSTAT Annual Industrial file.
Z_DUM	Equals one if Altman's Z-score is greater than 1.81, and zero otherwise. Data source: COMPUSTAT Annual Industrial file.

Appendix C. Full Results

C1. Propensity Score Matching Diagnostics

Table C1.1 shows logit regression results for each dependent variable. The dependent variable equals one if the firm is categorised as a treated firm and 0 otherwise. I use three treated firms in my study which are *LOWDETA* (firms with low CEO delta over total CEO compensation pre-Say on Pay), *LOWVEGA* (firms with low CEO vega over total CEO compensation pre-Say on Pay) and *JUNK* (firms with speculative graded debts pre-Say on Pay). I first run a logit regression at the firm level of a binary variable indicating whether a firm is categorised as a treated firm or a controlled firm. Following Lemmon and Roberts (2010), the independent variables are mean values in the pre-Say on Pay period. To ensure that the parallel trend assumption is not violated, I also include mean growth rates of each dependent variable in the pre-Say on Pay period. The growth rates are continuous growth rates and computed as $ln\frac{X_t}{X_{t-1}}$. If there are any missing fiscal years, the growth rate is divided by the missing period to ensure that the computed growth rate is an annual growth rate. For example, if a firm's observations are provided only for two fiscal years, 2008 and 2012, the growth rate of X is computed as $ln\frac{\frac{X_{2012}}{X_{2008}}}{(2012\text{-}2008)} = ln\frac{\frac{X_{2012}}{X_{2008}}}{4}$. I apply industry fixed effects in the logit regression, following Lemmon and Roberts (2010) and also year fixed effects following Canil and Karpavicius (2022). Second, I transform the propensity scores into the log odds ratio ($ln\frac{\widetilde{P}r(TREAT=1|x)}{\widetilde{P}r(TREAT=0|x)}$,) and match samples based on this ratio to address potential self-selection bias (Heckman & Todd, 2009). Finally, I run difference-in-differences regressions based on the matched samples. I remove observations that are off-common support. Table C1.2 provides pairwise comparisons of the covariates on which the matching is performed in each regression, both pre- and post- matching.

Table C1.1: Logit regressions for the propensity score matching

This table presents the logit regression results pre- and post- propensity score matching. Each panel presents the parameter estimates from the logit regressions conducted for the DiD regressions on each variable of interests in this study (*RD*, *CAPEX*, *VOLSTR*, *VOLROA*, *LEV_M*, *LEV_B*, *COST*, *ST3* and *ST5*), for each identification of treated firms (*LOWDELTA*, *LOWVEGA* and *JUNK*). The dependent variable is either *LOWDELTA* or *LOWVEGA* which is a dummy variable indicating whether a firm is categorised as a treated firm. The Pre-Match column contains the parameter estimates of the logit estimated on the whole sample which are used to generate the propensity scores. The Post-Match column contains the parameter estimates of the logit estimated on the subsample of matched treated and controlled observations. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: For DiD on research and development expenses (*RD*)

	Pre-Match		Post-Match	
Independent	Treated firms:			
variables:	*LOWDELTA*	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	0.001***	0.0001	-0.148	0.058
	[3.30]	[0.39]	[-0.45]	[0.20]
SIZE	-0.355***	-0.318***	-0.047	-0.163*
	[-4.95]	[-5.00]	[-0.47]	[-1.90]
MB	-1.174***	-0.580***	-0.757***	-0.336*
	[-8.26]	[-4.76]	[-4.38]	[-1.86]
AVGRET	-561.600***	-72.010	-75.532	20.698
	[-6.91]	[-1.08]	[-1.31]	[0.41]
CEOTENURE	-0.139***	-0.028***	-0.062***	0.009
	[-11.44]	[-3.00]	[-3.84]	[0.65]
SCASH	-2.771*	-5.641***	-1.727	-1.983
	[-1.90]	[-4.33]	[-0.95]	[-1.16]
SGROWTH	-3.025***	2.007***	-0.205	-0.173
	[-4.26]	[3.67]	[0.35]	[-0.33]
LEV_M	-3.507***	-2.446***	-2.031	-0.620
	[-4.26]	[-3.21]	[-1.63]	[-0.55]
RD growth	0.443	-0.339	-0.197	-0.790
	[1.08]	[-0.88]	[-0.23]	[-1.21]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,568	1,543	705	681
Pseudo R^2	0.2311	0.1122	0.1013	0.0514

Panel B: For DiD on Capital expenditure (*CAPEX*)

Independent	Pre-Match		Post-Match	
variables:	*LOWDELTA*	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	0.001***	-0.0003	0.461	0.002
	[2.84]	[-1.50]	[1.51]	[0.01]
SIZE	-0.334***	-0.312***	-0.180**	-0.136
	[-5.00]	[-4.99]	[-2.03]	[-1.55]
MB	-1.012***	-0.551***	-0.747***	-0.366**
	[-7.38]	[-4.47]	[-4.64]	[-2.05]
AVGRET	-381.790***	43.781	-0.247	8.862
	[-4.93]	[0.66]	[0.00]	[0.16]
CEOTENURE	-0.107***	-0.033***	-0.050***	-0.013
	[-9.54]	[-3.64]	[-3.39]	[-0.96]
SCASH	-2.638*	-4.883***	-0.326	-2.810
	[-1.82]	[-3.75]	[-0.19]	[-1.63]

SGROWTH	-3.905***	2.936***	-0.779	0.081
	[-5.78]	[4.88]	[-1.28]	[0.14]
LEV_M	-2.684***	-0.463	-1.645	0.152
	[-3.63]	[0.26]	[-1.44]	[0.13]
CAPEX growth	0.336***	0.028	-0.107	-0.091
	[2.83]	[-0.66]	[-0.46]	[-0.49]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,501	1,464	674	652
Pseudo R^2	0.1988	0.1304	0.0984	0.0882

Panel C: For DiD on volatility of stock returns (*VOLSTR*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	0.001***	-0.0001	0.855***	-0.113
	[7.25]	[-0.44]	[2.93]	[-0.45]
SIZE	-0.389***	-0.443***	-0.124	-0.355***
	[-8.74]	[-10.73]	[-1.36]	[-4.09]
MB	-1.255***	-0.460***	-0.626***	-0.375***
	[-12.71]	[-5.83]	[-3.65]	[-2.50]
CEOTENURE	-0.136***	-0.018***	-0.091***	-0.011
	[-17.04]	[-3.10]	[-6.72]	[-0.94]
RD	5.480***	-9.108***	3.621	-6.006***
	[2.99]	[-5.44]	[1.33]	[-2.39]
RD_DUM	0.044	-0.101	0.022	0.154
	[0.28]	[-0.72]	[0.07]	[0.52]
CAPEX	-3.215*	3.563**	-1.677	0.701
	[-1.92]	[2.34]	[-0.46]	[0.22]
LEV_M	-0.326	-0.668	-0.208	-1.349
	[-0.326]	[-1.55]	[-0.23]	[-1.60]
VOLSTR growth	0.299***	0.364***	0.052	-0.019
	[2.72]	[3.56]	[0.42]	[-0.17]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,792	2,789	805	875
Pseudo R^2	0.1963	0.1005	0.1121	0.0961

Panel D: For DiD on volatility of return on assets (*VOLROA*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	1.206***	-0.029	1.007***	-0.011
	[7.77]	[-0.21]	[2.63]	[-0.11]
SIZE	-0.416***	-0.446***	-0.428***	-0.296***
	[-9.14]	[-10.58]	[-3.72]	[-3.28]
MB	-1.324***	-0.484***	-0.945***	-0.410**
	[-12.72]	[-5.89]	[-3.03]	[-2.06]
CEOTENURE	-0.136***	-0.021***	-0.104***	-0.008
	[-16.81]	[-3.56]	[-3.85]	[-0.19]
RD	5.075***	-9.761***	1.097	-7.371**
	[2.62]	[5.55]	[0.37]	[-2.57]
RD_DUM	0.033	-0.110	0.149	-0.097
	[0.21]	[-0.75]	[0.56]	[-0.34]

CAPEX	-4.171**	2.857*	-3.902	0.940
	[-2.39]	[1.82]	[-1.36]	[1.17]
LEV_M	-0.626	-0.706	0.047	-1.045
	[-1.31]	[-1.59]	[0.06]	[-1.38]
VOLROA growth	0.069	0.172***	0.204*	0.166
	[1.01]	[2.70]	[1.89]	[0.92]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,683	2,680	1,439	1,454
Pseudo R^2	0.1974	0.1006	0.1222	0.0608

Panel E: For DiD on market leverage (*LEV_M*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	0.897***	0.347***	0.364	0.365*
	[6.73]	[2.85]	[1.45]	[1.91]
SIZE	-0.277***	-0.483***	-0.224***	-0.444***
	[-7.12]	[-12.68]	[-2.70]	[-7.40]
MB	-1.032***	-0.368***	-0.309*	-0.328**
	[-11.00]	[-4.39]	[-1.88]	[-2.53]
ROA	-3.026***	-1.866**	-2.643	-1.565
	[-3.37]	[-2.14]	[-1.44]	[-1.16]
TAN	-0.131	1.078***	-0.510	0.705
	[-0.44]	[3.88]	[-0.75]	[1.61]
CEOTENURE	-0.128***	-0.016***	-0.043***	-0.018**
	[-18.57]	[-3.11]	[-3.39]	[-2.24]
RD	3.617**	-8.369***	1.945	-8.716***
	[2.36]	[-5.75]	[0.56]	[-4.13]
RD_DUM	0.436***	0.158	0.086	0.221
	[3.29]	[1.27]	[0.27]	[1.11]
ZSCORE	0.002**	0.002**	-0.002	0.000
	[2.09]	[2.05]	[-1.07]	[0.04]
LEV_M growth	0.160	-0.026	0.027	-0.123
	[1.40]	[-0.26]	[0.18]	[-0.89]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,518	3,539	1,141	1,221
Pseudo R^2	0.1834	0.0948	0.0742	0.0875

Panel F: For DiD on book leverage (*LEV_B*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
CASHCOMP	0.897***	0.334***	0.835***	0.305
	[6.74]	[2.75]	[3.44]	[1.58]
SIZE	-0.278***	-0.483***	-0.297***	-0.428***
	[-7.13]	[-12.71]	[-3.89]	[-5.93]
MB	-1.028***	-0.376***	-0.457***	-0.218*
	[-10.99]	[-4.49]	[-2.91]	[-1.93]
ROA	-2.982***	-1.684*	-1.218	-0.894
	[-3.33]	[-1.93]	[-0.8]	[-0.74]
TAN	-0.096	1.091***	0.098	1.604***
	[-0.32]	[3.94]	[0.17]	[3.00]

CEOTENURE	-0.129***	-0.017***	-0.067***	-0.022**
	[-18.67]	[-3.28]	[-5.73]	[-2.49]
RD	3.538**	-8.318***	7.625**	-3.801
	[2.32]	[-5.72]	[2.00]	[-1.47]
RD_DUM	0.437***	0.152	0.451	-0.281
	[3.30]	[1.22]	[1.64]	[-1.14]
ZSCORE	0.002**	0.002**	0.002	0.000
	[2.03]	[2.05]	[0.65]	[-0.11]
LEV_B	0.305*	0.017	0.139	-0.034
growth	[1.74]	[0.15]	[1.05]	[-0.26]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,527	3,548	1,221	1,259
Pseudo R^2	0.1831	0.0948	0.0865	0.0705

Panel G: For DiD on cost of debt (*COST*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
LMAT	-0.258	0.141	0.074	-0.241
	[-1.55]	[0.82]	[0.34]	[-0.66]
LEV_M	-3.460***	-2.342**	-2.008	3.072
	[-3.66]	[-2.46]	[-1.64]	[1.29]
PROF	-8.038***	-1.247	-6.496**	-1.762
	[-3.97]	[-0.64]	[-2.31]	[-0.43]
VOLSTR	17.832***	14.189***	6.543*	3.427
	[6.01]	[4.83]	[1.76]	[0.74]
AVGRET	-485.139***	101.543	-435.418***	14.969
	[-5.24]	[1.14]	[-3.14]	[0.17]
ISSUESIZE	0.147**	-0.098	-0.001	-0.038
	[2.06]	[-1.35]	[-0.01]	[-0.22]
INTCOV	-0.005	-0.002	-0.014	0.038
	[-0.67]	[-0.27]	[-1.51]	[1.65]
RATING	-0.038	-0.146***	0.010	-0.114
	[-0.97]	[-3.65]	[0.19]	[-1.30]
COST growth	0.805*	-0.143	0.267	0.080
	[1.79]	[-0.31]	[0.47]	[0.20]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,388	1,390	800	768
Pseudo R^2	0.1427	0.1326	0.0490	0.0723

Panel H: For DiD on debt maturing in 3 years or less (*ST3*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
LSIZE	-2.359***	-2.803***	-0.862	-0.944
	[-4.32]	[-4.96]	[-0.94]	[-0.98]
LSIZE2	0.116***	0.132***	0.038	0.035
	[4.09]	[4.50]	[0.82]	[0.71]
LEV_M	-1.472	-2.554***	-0.642	-1.584
	[-1.57]	[-2.63]	[-0.45]	[-1.05]
ASSETM	0.035	-0.007	0.006	0.035
	[1.31]	[-0.26]	[0.18]	[0.86]

CEOOWN	-817.555***	-161.016**	-197.379*	-76.587
	[9.28]	[-2.21]	[-1.72]	[-0.60]
MB	-0.413***	-0.077	-0.270	0.582*
	[-2.68]	[-0.51]	[-1.14]	[1.94]
ABNEARN	-0.918	-7.007***	2.240	0.549
	[-0.38]	[2.95]	[1.62]	[0.41]
VOLSTR	23.185***	19.299***	5.524*	5.198*
	[7.87]	[6.74]	[1.76]	[1.78]
Z_DUM	-0.800***	-0.844**	-0.248	-1.620**
	[-3.10]	[-2.22]	[-0.53]	[-2.46]
ST3 growth	-0.374***	-0.799***	-0.045	-0.037
	[-3.10]	[-6.04]	[-0.53]	[-0.40]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,418	1,426	731	723
Pseudo R^2	0.1410	0.1476	0.0426	0.0530

Panel I: For DiD on debt maturing in 5 years or less (*ST5*)

Independent variables:	Pre-Match		Post-Match	
	LOWDELTA	*LOWVEGA*	*LOWDELTA*	*LOWVEGA*
LSIZE	-2.217***	-2.723***	-0.191	-1.555*
	[-4.16]	[-4.97]	[-0.22]	[-1.71]
LSIZE2	0.110***	0.128***	0.007	0.075
	[4.00]	[4.49]	[0.15]	[1.61]
LEV_M	-1.307	-1.968**	-2.074	-0.959*
	[-1.42]	[-2.10]	[-1.56]	[-0.66]
ASSETM	0.017	-0.004	-0.040	-0.067**
	[0.65]	[-0.16]	[-1.55]	[-2.56]
CEOOWN	-785.440***	-152.397**	-183.881	-154.364
	[-9.18]	[-2.13]	[-1.61]	[-1.40]
MB	-0.341**	0.084	-0.526**	0.246
	[-2.31]	[0.60]	[-2.26]	[0.91]
ABNEARN	-0.067	-5.680**	-0.882	-8.739**
	[-0.03]	[-2.54]	[-0.77]	[-2.08]
VOLSTR	23.019***	19.493***	3.095	14.512***
	[7.91]	[6.93]	[1.09]	[3.32]
Z_DUM	-0.799**	-0.746**	-0.324	-0.559
	[-2.13]	[-1.99]	[-0.73]	[-0.89]
ST5 growth	-0.127	-0.434*	0.080	-0.284
	[-0.56]	[-1.93]	[0.48]	[-0.80]
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,447	1,465	719	718
Pseudo R^2	0.1364	0.1356	0.0428	0.0482

Table C1.2: Pairwise comparisons

This table presents pairwise comparisons of the covariates on which the matching is performed pre- and post- matching. Column (1) contains the results for the low CEO delta pre-Say on Pay firms as treated firms (*TREAT* = *LOWDELTA*) and column (2) contains the results for the low CEO vega pre-Say on Pay firms as treated firms (*TREAT* = *LOWVEGA*). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Means of variables in the sample used in DiD on *RD*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.948	0.956	-0.31	0.951	0.959	-0.33	0.892	0.990	-4.10***	0.898	0.893	0.21
SIZE	7.680	7.696	-0.19	7.683	7.684	-0.02	7.435	7.847	-5.07***	7.482	7.527	-0.50
MB	1.654	2.022	-9.23***	1.655	1.684	-0.84	1.676	1.965	-6.99***	1.692	1.667	0.62
AVGRET	0.0004	0.001	-3.72***	0.0005	0.0005	-0.20	0.001	0.001	-1.37	0.001	0.001	-1.13
CEOTENURE	6.575	10.461	-10.84***	6.538	6.441	0.31	8.578	8.753	-0.46	8.641	8.193	1.06
SCASH	0.093	0.118	-6.56***	0.093	0.094	-0.21	0.094	0.114	-5.47***	0.095	0.096	-0.20
SGROWTH	0.039	0.072	-3.25***	0.040	0.034	0.45	0.059	0.055	0.43	0.061	0.052	0.75
LEV_M	0.146	0.133	2.40**	0.146	0.154	-1.28	0.140	0.138	0.34	0.141	0.146	-0.78
RD growth	-0.017	-0.006	-0.69	-0.015	-0.021	0.32	-0.017	-0.007	-0.69	-0.018	-0.008	-0.65

Panel B: Means of variables in the sample used in DiD on *CAPEX*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.936	0.929	0.28	0.942	0.904	1.60	0.862	0.986	-5.31***	0.868	0.836	1.27
SIZE	7.536	7.611	-0.93	7.562	7.504	0.72	7.233	7.858	-7.80***	7.257	7.237	0.24
MB	1.641	2.023	-9.31***	1.655	1.618	0.92	1.719	1.968	-5.86***	1.714	1.722	-0.21
AVGRET	0.0005	0.001	-3.01***	0.001	0.0003	1.51	0.001	0.001	0.10	0.001	0.001	-0.13
CEOTENURE	7.337	10.760	-8.53***	7.323	7.720	-1.11	9.082	9.508	-1.01	9.165	8.844	0.71
SCASH	0.088	0.116	-7.08***	0.090	0.091	-0.39	0.092	0.114	-5.57***	0.092	0.093	-0.25
SGROWTH	0.044	0.092	-4.53***	0.048	0.103	-4.78***	0.084	0.066	1.79*	0.079	0.078	0.09
LEV_M	0.145	0.134	1.95*	0.147	0.119	4.62***	0.145	0.134	1.76*	0.143	0.141	0.39
CAPEX growth	-0.078	-0.114	0.88	-0.011	-0.081	-0.62	-0.070	-0.118	1.16	-0.070	-0.130	1.31

Panel C: Means of variables in the sample used in DiD on *VOLSTR*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.971	0.941	1.69*	0.972	0.990	-0.90	0.886	1.012	-7.00***	0.886	0.860	1.58
SIZE	7.477	7.661	-3.32***	7.488	7.353	2.37**	7.221	7.886	-12.27***	7.221	7.261	-0.74
MB	1.536	1.878	-11.97***	1.537	1.564	-1.06	1.638	1.803	-5.66***	1.638	1.610	1.05
CEOTENURE	7.266	11.852	-14.59***	7.278	8.457	-4.18***	9.651	10.059	-1.25	9.651	9.161	1.52
RD	0.025	0.023	1.10	0.024	0.032	-3.52***	0.020	0.027	-4.08***	0.020	0.019	0.55
RD_DUM	0.512	0.488	1.27	0.511	0.533	-1.09	0.475	0.513	-2.00**	0.475	0.500	-1.23
CAPEX	0.040	0.048	-4.52***	0.040	0.041	-0.13	0.046	0.044	1.26	0.046	0.047	-0.91
LEV_M	0.188	0.154	6.64***	0.188	0.194	-1.10	0.175	0.164	2.22**	0.175	0.171	0.76
VOLSTR growth	0.012	0.062	-1.28	0.008	0.085	-1.63	0.014	0.059	-1.18	0.018	0.070	-1.12

Panel D: Means of variables in the sample used in DiD on *VOLROA*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.970	0.932	2.37**	0.973	0.924	2.94***	0.881	1.0065	-7.88***	0.883	0.88406	-0.07
SIZE	7.472	7.670	-3.49***	7.497	7.291	3.61***	7.232	7.8833	-11.92***	7.233	7.2715	-0.71
MB	1.529	1.864	-11.64***	1.532	1.523	0.38	1.630	1.7907	-6.21***	1.632	1.5994	1.27
CEOTENURE	7.348	11.925	-14.22***	7.368	7.851	-1.69*	9.609	10.157	-1.93*	9.621	9.7117	-0.30
RD	0.023	0.023	0.36	0.023	0.024	-0.61	0.018	0.02502	-4.47***	0.019	0.01637	1.66*
RD_DUM	0.508	0.488	1.03	0.504	0.497	0.37	0.472	0.51296	-2.13**	0.471	0.45727	0.68
CAPEX	0.040	0.048	-4.14***	0.041	0.041	-0.21	0.045	0.04311	1.13	0.045	0.04608	-0.66
LEV_M	0.187	0.155	6.03***	0.188	0.196	-1.43	0.174	0.16518	1.70*	0.175	0.17417	0.15
VOLROA growth	0.063	0.073	-0.18	0.035	0.062	-0.38	0.014	0.113	-1.72*	-0.006	0.099	-1.52

Panel E: Means of variables in the sample used in DiD on *LEV_M*

	Treated firms:	
	(1)	(2)

	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.987	0.959	1.78*	0.987	0.963	1.41	0.916	1.020	-6.48***	0.914	0.899	0.91
SIZE	7.624	7.767	-2.88***	7.650	7.537	2.08**	7.331	7.988	-13.57***	7.311	7.234	1.56
MB	1.551	1.881	-11.29***	1.564	1.507	2.46**	1.628	1.806	-5.99***	1.625	1.551	2.61***
ROA	0.124	0.150	-11.25***	0.126	0.127	-0.49	0.131	0.144	-5.74***	0.130	0.133	-0.89
TAN	0.281	0.288	-0.90	0.282	0.291	-1.01	0.291	0.322	-3.61***	0.291	0.280	1.41
CEOTENURE	7.235	11.835	-16.92***	7.335	8.067	-2.97***	9.585	9.900	-1.10	9.595	9.530	0.21
RD	0.022	0.030	-4.49***	0.022	0.021	1.16	0.018	0.024	-4.06***	0.018	0.015	2.19**
RD_DUM	0.494	0.468	1.54	0.491	0.473	1.03	0.457	0.494	-2.18**	0.453	0.410	2.45**
ZSCORE	16.080	21.960	-3.62***	15.534	16.747	-0.77	20.310	18.209	1.29	20.212	20.551	-0.18
LEV_M growth	0.025	0.023	0.10	0.025	0.024	0.04	0.041	0.006	1.40	0.041	0.004	1.42

Panel F: Means of variables in the sample used in DiD on *LEV_B*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
CASHCOMP	0.986	0.958	1.76*	0.986	1.007	-1.17	0.916	1.020	-6.51***	0.913	0.915	-0.07
SIZE	7.622	7.766	-2.92***	7.644	7.485	3.04***	7.330	7.987	-13.61***	7.310	7.292	0.35
MB	1.551	1.881	-11.28***	1.564	1.575	-0.44	1.628	1.805	-5.98***	1.625	1.537	3.27***
ROA	0.124	0.150	-11.12***	0.127	0.127	0.01	0.131	0.144	-5.62***	0.131	0.132	-0.59
TAN	0.283	0.289	-0.76	0.283	0.293	-1.17	0.292	0.280	1.56	0.292	0.305	-1.41
CEOTENURE	7.227	11.830	-16.94***	7.331	8.315	-3.93***	9.573	9.896	-1.13	9.583	9.551	0.10
RD	0.022	0.029	-3.60***	0.022	0.021	1.13	0.018	0.024	-4.10***	0.018	0.017	1.10
RD_DUM	0.491	0.457	1.91*	0.493	0.467	1.51	0.456	0.493	-2.20**	0.453	0.434	1.02
ZSCORE	16.068	21.949	-3.62***	15.673	13.929	1.19	20.292	18.201	1.28	20.194	18.330	1.05
LEV_B growth	0.001	-0.005	0.29	-0.004	-0.008	0.17	0.012	-0.016	1.38	0.006	-0.020	1.24

Panel G: Means of variables in the sample used in DiD on *COST*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					

	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
LMAT	3.813	3.794	0.86	3.803	3.788	0.65	3.782	3.700	1.78*	3.779	3.704	1.55
LEV_M	0.227	0.187	6.22***	0.220	0.215	0.74	0.222	0.193	4.13***	0.223	0.201	2.82***
PROF	0.027	0.056	-10.69***	0.030	0.035	-1.55	0.032	0.051	-4.68***	0.034	0.028	1.30
VOLSTR	0.117	0.097	10.03***	0.115	0.115	-0.03	0.118	0.096	7.19***	0.116	0.115	0.51
AVGRET	0.000	0.001	-6.11***	0.000	0.000	4.92***	0.001	0.001	-0.15	0.001	0.001	-0.61
ISSUESIZE	20.232	20.363	-2.15**	20.232	20.271	-0.67	20.150	20.523	-3.70***	20.165	20.162	0.03
INTCOV	11.224	14.176	-4.15***	11.440	10.437	1.57	11.321	13.941	-3.22***	11.429	12.272	-1.01
RATING	12.258	13.475	-7.47***	12.358	12.659	-1.71*	11.959	13.692	-10.61***	12.010	12.385	-2.24**
COST growth	-0.008	-0.002	-0.33	-0.014	0.007	-0.88	0.002	-0.014	0.84	-0.006	-0.002	-0.17

Panel H: Means of variables in the sample used in DiD on *ST3*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
LSIZE	8.974	9.185	-2.89***	9.067	8.985	1.00	8.773	9.348	-7.94***	8.836	9.074	-2.92***
LSIZE2	82.458	86.199	-2.71***	84.138	82.699	0.93	78.847	89.177	-7.54***	79.879	84.442	-2.96***
LEV_M	0.193	0.179	2.17**	0.188	0.187	0.11	0.195	0.177	2.90***	0.191	0.179	1.52
ASSETM	3.338	2.880	2.31***	3.282	3.499	-1.08	3.128	3.556	-2.13**	3.170	3.335	-0.77
CEOOWN	0.001	0.001	-3.21***	0.001	0.001	-1.05	0.001	0.001	1.66*	0.001	0.001	1.63
MB	1.595	1.715	-3.60***	1.605	1.508	2.85***	1.610	1.717	-3.18***	1.628	1.657	-0.83
ABNEARN	0.007	0.005	0.47	0.006	0.000	1.07	0.006	0.006	-0.18	0.006	0.004	0.44
VOLSTR	0.108	0.094	5.06***	0.103	0.105	-0.69	0.111	0.093	6.71***	0.109	0.104	1.37
Z_DUM	0.887	0.928	-2.74***	0.898	0.938	-2.47**	0.897	0.929	-2.18**	0.899	0.908	-0.49
ST3 growth	0.074	-0.010	1.19	0.043	0.006	0.43	0.083	-0.029	1.59	0.068	-0.050	1.37

Panel I: Means of variables in the sample used in DiD on *ST5*

	Treated firms:											
	(1)						(2)					
	LOWDELTA						*LOWVEGA*					
	Pre-Match			Post-Match			Pre-Match			Post-Match		
Variables	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.	Control	Treat	T-Diff.
LSIZE	8.958	9.171	-2.94***	9.063	9.060	0.04	8.736	9.353	-8.66***	8.821	8.739	1.09
LSIZE2	82.187	85.917	-2.74***	84.058	83.905	0.10	78.197	89.242	-8.21***	79.595	77.969	1.16

LEV_M	0.191	0.179	2.03**	0.186	0.182	0.56	0.195	0.174	3.28***	0.189	0.185	0.68
ASSETM	3.266	3.572	-1.50	3.414	3.392	0.10	3.227	3.514	-1.42	3.275	3.389	-0.52
CEOOWN	0.001	0.001	-3.13***	0.001	0.001	-0.34	0.001	0.001	1.90*	0.001	0.001	0.72
MB	1.599	1.726	-3.79***	1.623	1.549	2.10**	1.610	1.733	-3.65**	1.632	1.645	-0.39
ABNEARN	0.007	0.005	0.53	0.005	0.008	-0.51	0.006	0.007	-0.18	0.006	0.008	-0.24
VOLSTR	0.108	0.095	5.02***	0.102	0.105	-1.09	0.111	0.092	7.03***	0.109	0.112	-0.95
Z_DUM	0.888	0.927	-2.53**	0.905	0.924	-1.18	0.895	0.931	-2.46**	0.898	0.908	-0.59
ST5 growth	0.033	0.007	0.76	-0.002	0.009	-0.27	0.023	0.017	0.17	-0.001	0.009	-0.26

C2. Other Tests and Robustness Tests

Table C2.1.1: Sensitivity test – Controlling for corporate governance (Table 9.A)

This table presents full results of tests reported in Table 9 Panel A. Column (1) reports the results with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on *LCEODELTA* and *LCEOVEGA*

	Treated Firms:			
	(1)		(2)	
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
	Dependent variables:			
Independent variables	*LCEODELTA*	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST	0.277***	0.022	0.158*	0.170
	[3.53]	[0.13]	[1.70]	[1.01]
LCEOVEGA	0.292***		0.294***	
	[12.43]		[12.30]	
LCEODELTA		0.873***		0.867***
		[10.30]		[10.76]
SIZE	0.327**	-0.044	0.287**	-0.040
	[2.58]	[-0.22]	[2.26]	[-0.19]
MB	0.405***	-0.474***	0.423***	-0.465***
	[8.46]	[-5.25]	[8.70]	[-5.22]
AVGRET	43.191***	-23.701*	43.565***	-23.577*
	[5.03]	[-1.83]	[5.03]	[-1.83]
LEV_M	-0.768***	0.319	-0.732**	0.326
	[-2.65]	[0.63]	[-2.42]	[0.65]
SCASH	0.174	-0.250	0.205	-0.242
	[0.47]	[-0.44]	[0.55]	[-0.43]
SGROWTH	0.254**	-0.178	0.281**	-0.176
	[2.33]	[-1.09]	[2.60]	[-1.08]
RD	-5.248***	4.452*	-5.232***	4.218*
	[-4.24]	[1.81]	[-4.25]	[1.72]
CAPEX	0.769	0.100	0.804	0.059
	[0.81]	[0.07]	[0.82]	[0.04]
VOLSTR	-0.726	-2.031**	-0.782*	-1.941**
	[-1.59]	[-2.41]	[-1.73]	[-2.33]
CEOTENURE	0.026***	-0.003	0.027***	-0.004
	[0.026]	[-0.48]	[5.76]	[-0.54]
BOARDIND	-0.642*	0.742	-0.705**	0.720
	[-1.82]	[1.35]	[-1.97]	[1.30]
INSTOWN_PERC	0.132	0.231	0.125	0.220
	[1.08]	[1.27]	[1.00]	[1.23]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,510	2,510	2,512	2,512
Adjusted R^2	0.8189	0.7754	0.8170	0.7757

Panel B: DiD on *RD* and *CAPEX*

	(1)	(2)

	Dependent variables:			
Independent variables:	*RD*	*CAPEX*	*RD*	*CAPEX*
TREAT×POST	-0.00002	0.002	0.002*	0.002
	[-0.01]	[0.82]	[1.77]	[0.85]
CASHCOMP	-0.001	0.001	-0.001	0.001
	[-1.28]	[0.44]	[-1.31]	[0.40]
SIZE	-0.003*	0.007***	-0.003*	0.007***
	[-1.78]	[2.72]	[-1.77]	[2.71]
MB	0.0004	0.005***	0.0004	0.005***
	[0.46]	[3.39]	[0.53]	[3.51]
AVGRET	-0.255*	-1.597***	-0.257*	-1.596***
	[-1.84]	[-5.68]	[-1.84]	[-5.67]
CEOTENURE	0.000001	0.0001	-0.000004	0.0001
	[0.03]	[1.00]	[-0.11]	[0.99]
SCASH	0.041***	0.005	0.041***	0.006
	[5.02]	[0.45]	[5.04]	[0.47]
SGROWTH	-0.004**	-0.004	-0.004**	-0.004
	[-2.45]	[-1.35]	[-2.47]	[-1.30]
LEV_M	-0.007	-0.032***	-0.007	-0.032***
	[-1.13]	[-3.33]	[-1.15]	[-3.31]
BOARDIND	0.001	-0.006	0.001	-0.006
	[0.19]	[-0.75]	[0.14]	[-0.81]
INSTOWN_PERC	-0.005**	0.003	-0.005**	0.003
	[-2.51]	[0.72]	[-2.54]	[0.68]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,697	2,580	3,699	2,582
Adjusted R^2	0.9459	0.6932	0.9460	0.6933

Panel C: DiD on *VOLSTR* and *VOLROA*

	(1)		(2)	
	Dependent variables:			
Independent variables:	*VOLSTR*	*VOLROA*	*VOLSTR*	*VOLROA*
TREAT×POST	-0.002**	-0.002	-0.001**	0.0001
	[-2.50]	[-0.86]	[-2.17]	[0.03]
CASHCOMP	0.0002	-0.002	0.0004	-0.002
	[0.87]	[-0.82]	[1.31]	[-0.79]
SIZE	0.0002	-0.010***	0.0004	-0.010***
	[0.59]	[-3.15]	[0.90]	[-3.13]
MB	0.0004	0.001	0.0003	0.001
	[1.54]	[0.81]	[1.17]	[0.72]
CEOTENURE	0.000001	-0.00004	-0.000001	-0.00005
	[0.04]	[-0.54]	[-0.04]	[-0.63]
RD	-0.001	0.014	-0.0003	0.013
	[-0.15]	[0.28]	[-0.04]	[0.26]
RD_DUM	0.001	0.006	0.002	0.006
	[1.20]	[1.55]	[1.36]	[1.57]
CAPEX	-0.001	-0.045	-0.001	-0.045
	[-0.15]	[-1.33]	[-0.16]	[-1.32]
LEV_M	0.005**	0.044***	0.005**	0.044***
	[2.19]	[4.01]	[2.11]	[4.00]
BOARDIND	0.002	-0.005	0.002	-0.004
	[1.40]	[-0.67]	[1.39]	[-0.63]
INSTOWN_PERC	-0.0004	0.009**	-0.0004	0.009**
	[-0.79]	[2.00]	[-0.80]	[2.02]

Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,995	3,658	4,003	3,664
Adjusted R^2	0.7646	0.3874	0.7642	0.3868

Panel D: DiD on *LEV_M* and *LEV_B*

	(1)		(2)	
	Dependent variables:			
Independent variables:	*LEV_M*	*LEV_B*	*LEV_M*	*LEV_B*
TREAT×POST	0.008	0.011	0.001	-0.002
	[1.47]	[1.49]	[0.24]	[-0.21]
CASHCOMP	0.001	0.003	0.001	0.003
	[0.36]	[0.53]	[0.29]	[0.50]
SIZE	0.032***	0.019**	0.032***	0.019**
	[4.25]	[2.31]	[4.24]	[2.28]
MB	-0.031***	-0.001	-0.031***	-0.001
	[-7.23]	[-0.44]	[-7.27]	[-0.45]
ROA	-0.418***	-0.347***	-0.416***	-0.347***
	[-11.56]	[-9.35]	[-11.47]	[-9.27]
TAN	0.008	-0.095*	0.006	-0.097*
	[0.20]	[-1.90]	[0.15]	[-1.93]
CEOTENURE	0.0003	0.0005	0.0003	0.0005*
	[1.10]	[1.55]	[1.19]	[1.67]
RD	-0.268**	-0.386**	-0.265**	-0.381**
	[-2.58]	[-2.43]	[-2.55]	[-2.39]
RD_DUM	0.011	0.014	0.010	0.013
	[1.04]	[1.03]	[0.96]	[0.98]
ZSCORE	0.000***	-0.001***	-0.0004***	-0.001***
	[-9.09]	[14.54]	[-9.06]	[-14.55]
BOARDIND	-0.040*	-0.036	-0.027	-0.028
	[-1.91]	[-1.22]	[-1.13]	[-0.95]
INSTOWN_PERC	-0.018**	-0.004	-0.018**	-0.004
	[-2.52]	[-0.52]	[-2.60]	[-0.58]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,767	5,767	5,793	5,793
Adjusted R^2	0.8091	0.7929	0.8085	0.7937

Table C2.1.2: Sensitivity test – Removing fiscal year 2008 (Table 9.B)

This table presents full results of tests reported in Table 9 Panel B. Column (1) reports the results with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: DiD on CEO delta and CEO vega

	Treated Firms:			
	(1) Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*		(2) Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)	
	Dependent variables:			
Independent variables	*LCEODELTA*	*LCEOVEGA*	*LCEODELTA*	*LCEOVEGA*
TREAT×POST	0.327***	0.002	0.179**	0.224*
	[4.75]	[0.01]	[2.30]	[1.68]
LCEOVEGA	0.304***		0.305***	
	[13.96]		[13.93]	
LCEODELTA		0.835***		0.826***
		[12.12]		[12.52]
SIZE	0.384***	-0.101	0.342***	-0.095
	[4.08]	[-0.64]	[3.59]	[-0.61]
MB	0.421***	-0.427***	0.440***	-0.416***
	[8.93]	[-5.22]	[9.22]	[-5.14]
AVGRET	31.004***	-15.518	30.427***	-15.327
	[3.22]	[-1.10]	[3.11]	[-1.09]
LEV_M	-0.733**	0.545	-0.688**	0.543
	[-2.55]	[1.23]	[-2.31]	[1.24]
SCASH	-0.159	0.320	-0.136	0.287
	[-0.46]	[0.67]	[-0.39]	[0.61]
SGROWTH	0.094	-0.107	0.120	-0.105
	[1.25]	[-1.10]	[1.59]	[-1.10]
RD	-6.221***	5.593**	-6.355***	5.533**
	[-5.92]	[2.48]	[-5.96]	[2.47]
CAPEX	1.891*	-1.127	1.967**	-1.151
	[1.97]	[-0.83]	[2.00]	[-0.85]
VOLSTR	-0.831	-0.708	-0.835	-0.622
	[-1.62]	[-0.90]	[-1.60]	[-0.80]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,884	2,884	2,886	2,886
Adjusted R^2	0.8098	0.7642	0.8072	0.7650

Panel B: DiD on *RD* and *CAPEX*

	(1)		(2)	
	Dependent variables:			
Independent variables:	*RD*	*CAPEX*	*RD*	*CAPEX*
TREAT×POST	-0.001	0.001	0.001	0.001
	[-0.50]	[0.39]	[1.36]	[0.41]
CASHCOMP	-0.001	0.001	-0.001	0.001
	[-1.38]	[0.28]	[-1.38]	[0.27]
SIZE	-0.002*	0.008***	-0.002	0.008***
	[-1.68]	[2.85]	[-1.62]	[2.88]
MB	0.001	0.006***	0.001	0.006***

	[1.41]	[3.70]	[1.45]	[3.74]
AVGRET	-0.390**	-1.786***	-0.388**	-1.788***
	[-2.59]	[-5.88]	[-2.57]	[-5.88]
CEOTENURE	0.00001	0.00004	0.00001	0.00004
	[0.34]	[0.50]	[0.24]	[0.45]
SCASH	0.041***	-0.010	0.041***	-0.011
	[4.72]	[-0.75]	[4.74]	[-0.76]
SGROWTH	-0.005***	-0.002	-0.005***	-0.011
	[-3.16]	[-0.48]	[-3.26]	[-0.45]
LEV_M	-0.004	-0.027***	-0.004	-0.027***
	[-0.60]	[-2.42]	[-0.61]	[-2.42]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,580	2,488	3,583	2,491
Adjusted R^2	0.9436	0.6745	0.9437	0.6746

Panel C: DiD on *VOLSTR* and *VOLROA*

	(1)		(2)	
	Dependent variables:			
Independent variables:	*VOLSTR*	*VOLROA*	*VOLSTR*	*VOLROA*
TREAT×POST	-0.001**	-0.003	-0.001	0.0002
	[-2.54]	[-1.27]	[-1.34]	[0.08]
CASHCOMP	0.0003	-0.001	0.0004	-0.001
	[0.90]	[-0.37]	[1.16]	[-0.34]
SIZE	0.0001	-0.009***	0.0002	-0.009***
	[0.19]	[-2.88]	[0.46]	[-2.83]
MB	0.001**	0.002	0.001*	0.001
	[2.07]	[1.07]	[1.78]	[0.97]
CEOTENURE	0.00002	-0.00003	0.00001	-0.00004
	[0.68]	[-0.36]	[0.59]	[-0.47]
RD	-0.002	-0.026	-0.002	-0.027
	[-0.38]	[-0.55]	[-0.36]	[-0.57]
RD_DUM	-0.001	0.008**	-0.001	0.008**
	[-0.36]	[2.05]	[-0.34]	[2.03]
CAPEX	-0.001	-0.073**	-0.002	-0.072**
	[-0.25]	[-2.11]	[-0.29]	[-2.11]
LEV_M	0.007***	0.053***	0.007***	0.053***
	[3.11]	[4.10]	[3.03]	[4.09]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4,086	3,643	4,095	3,649
Adjusted R^2	0.7109	0.3532	0.7099	0.3524

Panel D: DiD on *LEV_M* and *LEV_B*

	(1)		(2)	
	Dependent variables:			
Independent variables:	*LEV_M*	*LEV_B*	*LEV_M*	*LEV_B*
TREAT×POST	0.013**	0.012*	0.004	-0.002
	[2.33]	[1.68]	[0.79]	[-0.28]
CASHCOMP	-0.001	0.0003	-0.001	0.00004
	[-0.24]	[0.06]	[-0.39]	[0.01]
SIZE	0.020***	0.008	0.019***	0.007
	[3.05]	[1.01]	[2.85]	[0.92]
MB	-0.031***	-0.001	-0.031***	-0.001
	[-6.91]	[-0.42]	[-6.95]	[-0.42]
ROA	-0.425***	-0.335***	-0.419***	-0.333***

	[-11.34]	[-9.16]	[-11.15]	[-9.05]
TAN	0.046	-0.064	0.044	-0.066
	[1.32]	[-1.36]	[1.25]	[-1.39]
CEOTENURE	0.0002	0.0004	0.0003	0.0005*
	[0.92]	[1.52]	[1.17]	[1.72]
RD	-0.185	-0.323**	-0.182	-0.318**
	[-1.50]	[-2.15]	[-1.49]	[-2.10]
RD_DUM	0.008	0.005	0.007	0.005
	[0.73]	[0.35]	[0.62]	[0.32]
ZSCORE	-0.0004***	-0.001***	-0.0004***	-0.001***
	[-9.11]	[15.53]	[-9.04]	[-15.53]
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,974	5,974	6,001	6,001
Adjusted R^2	0.8104	0.7900	0.8096	0.7907

Table C2.2: Sensitivity tests (Section 4.2.2.2.3)

This table presents full results of the sensitivity tests unreported in Section 4.2.2.2.3. Column (1) reports the results with firms with low CEO delta pre-Say on Pay (scaled by total compensation) categorised as treated firms, and column (2) reports the results with firms with low CEO vega pre-Say on Pay (scaled by total compensation) categorised as treated firms. All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Controlling for corporate governance

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*			Low CEO vega pre-Say on Pay as treated firms (*TREAT = LOWVEGA*)		
Independent variables:	Dependent variables:					
	COST	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.001	-0.042**	-0.061**	0.003	-0.014	-0.051
	[0.27]	[-2.30]	[-2.82]	[1.01]	[-0.57]	[-1.62]
LMAT	0.003**			0.003**		
	[2.01]			[2.20]		
LEV_M	-0.139***	-0.473***	-0.506**	-0.132***	-0.460***	-0.482**
	[-7.49]	[-4.04]	[-2.60]	[-7.13]	[-3.87]	[-2.47]
PROF	-0.010			-0.007		
	[-0.53]			[-0.36]		
VOLSTR	0.065**	-0.135	0.233	0.062**	-0.130	0.225
	[2.10]	[-0.63]	[1.46]	[2.06]	[-0.62]	[1.59]
AVGRET	-0.643			-0.539		
	[-1.31]			[-1.12]		
ISSUESIZE	-0.003***			-0.003***		
	[-3.53]			[-3.55]		
INTCOV	-0.0003			-0.0003		
	[-1.42]			[-1.33]		
RATING	-0.004***			-0.004***		
	[-3.07]			[-3.09]		
LSIZE		-0.175	-0.248		-0.170	-0.199
		[-0.95]	[-1.25]		[-0.91]	[-0.99]
LSIZE2		0.010	0.012		0.010	0.010
		[1.03]	[1.24]		[1.00]	[0.96]
ASSETM		0.008	0.013*		0.007	0.013*
		[1.25]	[1.83]		[1.16]	[1.84]
CEOOWN		11.011	27.856		10.590	28.019
		[0.68]	[1.72]		[0.66]	[1.75]
MB		-0.017	-0.015		-0.019	-0.018
		[-0.93]	[-0.66]		[-0.99]	[-0.86]
ABNEARN		-0.058	-0.001		-0.055	0.004
		[-1.14]	[-0.01]		[-1.11]	[0.10]
Z_DUM		-0.037	-0.030		-0.034	-0.023
		[-1.66]	[-1.01]		[-1.56]	[-0.78]
CEOTENURE	0.0001	0.001	0.002	0.0001	0.001	0.002
	[0.67]	[1.44]	[1.37]	[0.55]	[1.20]	[1.27]
BOARDIND	-0.021	-0.088	0.086	-0.006	-0.041	0.118
	[-1.06]	[-0.85]	[1.48]	[-0.34]	[-0.40]	[1.64]
INSTOWN_PERC	-0.003	-0.005	-0.043	-0.003	-0.004	-0.037
	[-0.74]	[-0.16]	[-1.21]	[-0.81]	[-0.19]	[-1.16]

Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,170	2,795	2,795	1,188	2,816	2,816
Adjusted R^2	0.5012	0.2701	0.4150	0.4990	0.2717	0.4181

Panel B: Removing fiscal year 2008 (GFC)

	Treated firms:					
	(1)			(2)		
	Low CEO delta pre-Say on Pay as treated firms (*TREAT = LOWDELTA)*			Low CEO vega pre-Say on Pay as treated firms (*TREAT* = *LOWVEGA*)		
Independent variables:	Dependent variables:					
	COST	*ST3*	*ST5*	*COST*	*ST3*	*ST5*
TREAT×POST	0.001	-0.040*	-0.063**	0.001	-0.014	-0.040
	[0.34]	[-1.90]	[-2.86]	[0.41]	[-0.47]	[-1.17]
LMAT	0.003**			0.003**		
	[2.21]			[2.35]		
LEV_M	-0.119***	-0.448**	-0.441*	-0.113***	-0.390**	-0.408
	[-6.81]	[-2.90]	[-1.99]	[-6.47]	[-2.74]	[-1.84]
PROF	-0.020			-0.018		
	[-1.14]			[-1.04]		
VOLSTR	0.074**	-0.218	0.233	0.071**	-0.191	0.230
	[2.56]	[-1.05]	[1.18]	[2.50]	[-1.09]	[1.22]
AVGRET	-0.956**			-0.861*		
	[-2.03]			[-1.84]		
ISSUESIZE	-0.004***			-0.004***		
	[-4.22]			[-4.26]		
INTCOV	-0.0002			-0.0002		
	[-1.17]			[-1.12]		
RATING	-0.004***			-0.004***		
	[-3.30]			[-3.31]		
LSIZE		-0.185	-0.270		-0.215	-0.231
		[-0.87]	[-1.22]		[-1.04]	[-1.05]
LSIZE2		0.011	0.014		0.012	0.012
		[0.95]	[1.22]		[1.13]	[1.04]
ASSETM		0.009	0.013*		0.009	0.013*
		[1.66]	[1.94]		[1.71]	[1.92]
CEOOWN		27.358	47.079***		23.333	46.436***
		[1.81]	[3.66]		[1.62]	[3.51]
MB		-0.008	-0.006		-0.006	-0.009
		[-0.39]	[-0.22]		[-0.33]	[-0.37]
ABNEARN		-0.044	0.005		-0.051	0.011
		[-0.98]	[0.12]		[-1.12]	[0.30]
Z_DUM		-0.035	-0.019		-0.021	-0.010
		[-1.38]	[-0.62]		[-0.93]	[-0.32]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,350	2,591	2,591	1,368	2,612	2,612
Adjusted R^2	0.4858	0.2804	0.4191	0.4851	0.2827	0.4212

Table C2.3: Say on Pay's impact on agency costs of debt in firms with speculative graded debts (Table 16 Panel B)

This table presents the full results of Table 16 Panel B which reports DiD regression results on agency costs of debt (*COST*, *ST3* and *ST5*) with speculative graded firms as treated firms (*TREAT* = *JUNK*). All variables are winsorised at 1% and 99% of each variable's empirical distribution and defined in Appendix B. The reported t-statistics are robust to clustering standard errors at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variables:		
Independent variables:	*COST*	*ST3*	*ST5*
JUNK×POST	-0.001*	0.018	0.034
	[1.91]	[0.74]	[1.00]
LMAT	0.003		
	[0.74]		
LEV_M	-0.128***	-0.434***	-0.465**
	[-7.42]	[-3.39]	[-2.37]
PROF	0.006		
	[0.30]		
VOLSTR	0.051*	-0.238	0.237
	[1.85]	[-1.18]	[1.13]
AVGRET	-0.199		
	[-0.38]		
ISSUESIZE	-0.004***		
	[-4.53]		
INTCOV	-0.0002**		
	[-2.46]		
RATING	-0.005***		
	[-2.68]		
LSIZE		-0.280	-0.308
		[-1.69]	[-1.37]
LSIZE2		0.014	0.015
		[1.65]	[1.31]
ASSETM		0.004	0.015
		[0.96]	[1.79]
CEOOWN		9.333	28.008*
		[0.51]	[1.91]
MB		-0.019	-0.010
		[-0.95]	[-0.41]
ABNEARN		-0.072	-0.043
		[-1.27]	[-1.24]
Z_DUM		-0.034	-0.024
		[-1.39]	[-0.88]
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	959	2,529	2,579
Adjusted R^2	0.5297	0.2631	0.4079