The Million Dollar Rule, Executive Compensation, and Managerial Risk-Taking*

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Abstract

This paper provides novel causal evidence of the impact of changes in the structure of managerial compensation on the riskiness of firm investment and debt policy. We exploit variation in the structure of CEO compensation that is induced by tax policy rules that eliminated corporate tax deductibility of non-incentive-based compensation exceeding $1 million. These rules made the pay structure for affected CEOs riskier by increasing the share of stock options and other incentive-based pay in their total compensation while decreasing the amount of cash compensation. We find that higher sensitivity of CEO wealth to stock return volatility ("vega"), generates an increase in R&D investment, a reduction in business segments, a reduction in the Herfindahl index of sales across segments, and an increase in idiosyncratic firm risk. Overall, our estimates are smaller in magnitude than those found in previous literature.

Keywords: executive compensation; managerial incentives; tax policy; risk taking; investment policy; financing policy.

JEL Codes: G30, H24, H30, J33.

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I. Introduction

This paper studies how the structure of executive compensation influences managerial incentives and firm outcomes, particularly when corporate tax incentives impact the way managers are paid. The large increase in the use of equity-based compensation, such as restricted stock and stock options that reduce the share of cash salary in total compensation, underscores the importance of understanding how the form of compensation influences managerial incentives (Gorry et al. 2017, Frydman and Saks, 2010; Murphy, 1999). In practice, understanding the relationship between the managerial compensation structure and risk-taking behavior is complicated by the fact that that executive compensation is endogenous and correlated with industry and firm characteristics, including firm risk-taking. We address this issue by using exogenous tax policy changes that impact the structure of executive compensation to study the risk-taking behavior of executives.

This paper uses variation in executive compensation generated by tax law changes to provide causal evidence on the relationship between the structure of executive compensation and managerial risk taking. Specifically, section 162(m) of the Internal Revenue Service Code (the "$1 million rule"), enacted as a provision of the Omnibus Budget Reconciliation Act of 1993, removed the tax deductibility of executive compensation that exceeds $1 million unless it qualified as incentive-based pay.[1] Consequently, a firm may be incentivized to substitute equity and options as payment after the threshold of $1 million in cash salary is reached. Compounding this effect, because of the "value wedge" described by Hall (2003) and Hall and Murphy (2003), the substitution is not one-to-one as managers may value options less than cash. Thus, the firm would have to pay the manager a higher salary in options (according to fair market value) than in cash. This distortion in the overall compensation package results in a higher sensitivity of CEO wealth to stock return volatility ("vega") than if the firm paid the manager the fair value equivalent in cash. Therefore, the $1 million rule may significantly alter managers' risk-taking behavior by incentivizing firms to increase vega when they otherwise would not.

In the first part of the paper, we document the impact of the $1 million rule on executive compensation. While Rose and Wolfram (2002) show that the $1 million rule does not change the overall level of compensation, we employ a bunching estimation technique (Kleven and Waseem,

[1] For a discussion of the motivation and consequences of the $1 million rule see Rose and Wolfram (2002).

2013; Kopczuk and Munroe, 2015) to provide causal evidence that the $1 million rule influenced executive compensation by showing that there is bunching at the $1 million cash salary threshold after 1993. Bunching in executive cash salary implies that the rule influences the form of compensation by shifting increases in pay from salary into tax preferred incentive-based pay such as stock options. Our analysis provides stronger evidence of a causal relationship than previous work that documented that firms subject to the $1 million rule increase their use of stock options as a share of compensation (Gorry et al., 2017).

The incentive to use performance-based compensation from the $1 million rule provides plausibly exogenous variation in CEO pay structure that can be used to generate causal estimates of the impact of the structure of managerial compensation on firm risk taking. We explore how higher sensitivity of CEO wealth to stock volatility (vega) relates to the riskiness of firm behavior, including investment choices, leverage, and the standard deviation of stock returns. The closest paper in the literature to ours is Coles, Daniel, and Naveen (2006) which estimates the relationship between vega and managerial risk-taking variables controlling for CEO pay performance sensitivity (delta). In contrast to their approach of designing econometric specifications, specifically a 3SLS model, that account for how the firm's assets are correlated with the endogenous compensation structure, we can more directly assess the impact of vega on risk-taking by using policy-induced changes to construct an instrumental variable approach that provides stronger causal evidence on this relationship.

In our main specifications, we use an indicator for those affected by the $1 million rule as an instrument for vega as the policy generates an exogenous increase in the use of stock options. We assume that being affected by the policy generates an incentive for marginal changes in pay to come in the form of incentive-based pay such as stock options, but that the policy does not directly influence firm choices such as investment and leverage except by changing the incentives of the CEO to implement such policies. The instrument allows us to estimate how the riskiness of the CEO's compensation package influences their risk-taking behavior without worrying about how this behavior feeds back into the choice of the compensation.

Our approach provides new causal evidence on whether CEOs with higher sensitivity of wealth to stock volatility, vega, implement riskier investment policy, choose riskier firm structures, and have larger volatility in their stock returns controlling for the sensitivity of CEO wealth to stock price, delta. Overall, we find that higher values of lagged vega are associated with riskier policy choices along a number of dimensions. However, using our IV approach to provide causal estimates generates weaker effects than documented in Coles, Daniel, and Naveen (2006). Specifically, we find that higher values of vega generate significantly more investment in R&D, but do not find significant changes in less risky investment categories. For firm structure, we find a significant reduction in the Herfindahl index of sales across business segments and in the number of business segments. The results on the Herfindahl index contrast with those in Coles, Daniel, and Naveen (2006) who find that higher vega is associated with higher values of the index, which can be interpreted as increasing CEO focus. Our effects on the index and number of segments are both small in magnitude. However, using our instrument we do not find any causal evidence that higher vega is associated with firm leverage. Finally, the causal effect of lagged vega on total firm risk is insignificant, but we find an increase in idiosyncratic firm risk.

This paper relates to a literature that studies the sensitivity of the pay-performance relationship. An early paper on this topic by Eaton and Rosen (1983) shows that stock options may be the most direct means by which the executive's income could be tied to the value of the firm. Such options are likely to be appealing to executives who are younger and less risk averse. Rose and Shepard (1997) find that diversification in lines of business within a firm also results in higher pay for CEOs by 13 to 17 percent. This occurs to some extent because diversification creates a good match between executives and their lines of business (Shleifer and Vishny, 1989). Jensen and Murphy (1990) find a weak relationship between compensation and shareholder wealth. Hall and Liebman (1998) estimate larger pay-performance sensitivities and show that the relationship has been increasing since 1980 due to increasing ownership of stock and stock options. Aggarwal and Samwick (1999) reconcile these findings and show that pay-performance sensitivity is a decreasing function of the firm's stock return volatility. We use exogenous variation in pay structures to study how changes in the structure of compensation influence firm incentives.

Related to our instrument, Rose and Wolfram (2000) explore how changes in the tax code have affected the performance sensitivity of CEO pay at firms. They conclude that tax changes, specifically the 1993 tax legislation that capped the tax deductibility of certain types of executive compensation, have had no significant impact on corporate pay or performance decisions. In contrast, with updated data we find that the $1 million rule caused significant changes in the structure of executive compensation that generate modest increases in CEO risk taking behavior. These results build on Gorry et al. (2017), which finds evidence that tax policy changes influence the composition of executive compensation. Specifically, they show that executives who are affected by the $1 million rule receive a larger share of their compensation in stock options. Our paper contributes to this literature by assessing the effect of corporate tax changes on the nature of executive compensation, and subsequently, on risk-taking behavior by top executives. More specifically, we add to two main strands of literature. First, we contribute to the literature seeking to understand executive compensation as discussed in Rose and Wolfram (2000) and Murphy (2012) by better understanding how regulations influence the structure of executive compensation with a focus on the $1 million rule. Second, our paper contributes to a literature that seeks to assess how the composition of executive pay relates to executive decision making and firm performance most closely related to Coles, Daniel, and Naveen (2006).

In the next section, we provide a literature review covering the papers examining the broader topic of executive compensation as well as papers studying the link between executive compensation and firm risk-taking behavior. Section III provides evidence of compensation bunching following the enactment of the $1 million dollar rule. Section IV provides the empirical analysis connecting the changes in compensation structure to firm risk-taking behavior. Section V provides results from robustness checks and Section VI concludes.

II. Literature Review

Over the past several decades there has been a large increase in executive compensation, driven in part by an increase in the use of stock options as a form of compensation (Frydman and Saks, 2010; Murphy, 2013; Murphy, 1999). The literature regarding the relation between managerial compensation and risk-taking has, accordingly, also grown. Intuitively, a manager whose wealth increases with firm equity risk is incentivized to behave in a riskier manner as the increased compensation overcomes the risk-averse nature of the manager. Consistent with this notion, Coles, Daniel, and Naveen (2006) find increased vega is associated with larger R&D investment, less investment in tangible assets, more concentrated business activities, and higher leverage.

Extant literature consistently, with few exceptions, finds this positive relation between vega and risk-taking. For instance, Rodgers (2002) demonstrates that managers that have high risk-taking incentives hold less derivatives for hedging purposes. Coles and Li (2020) show vega positively predicts firm risk and risker corporate policies. Armstrong and Vashishtha (2012) show that managers with high vega compensation are more likely to increase systematic risk rather than idiosyncratic risk since the latter can be diversified away and the former cannot. Shen and Zhang (2013) focus their study on R&D investments and find evidence that firms which offer high vega compensation are more likely to overinvest in R&D, leading to poor firm performance. Liu and Mauer (2011) discover a positive relation between vega and cash holdings, but a negative relation between vega and the value of cash to the shareholders, suggesting high-vega firms hold too much cash. Anantharaman and Gyu (2014) determine that high-vega managers underfund pension liabilities more than their low-vega counterparts. Armstrong et al. (2013) also find a negative effect of vega, a positive relation between vega and discretionary accruals, restatements, and enforcement actions.

There is evidence that the increased risk-taking incentives from firms offering high-vega compensation does not go unnoticed by the market. Chen et al. (2015) show a positive relation between vega and audit fees, suggesting that audit firms integrate managerial risk-taking incentives, especially the increased propensity to misreport (Armstrong et al., 2013), into their service fees. Kuang and Bo (2013) find evidence that credit reporting agencies incorporate vega into their risk assessment and debt ratings. They demonstrate that a one standard deviation increase in vega leads to a one-notch rating downgrade. Moreover, they show that a firm will respond to a rating downgrade from investment grade to speculative grade by restructuring the manager's compensation such that the vega is reduced by over 50%. In addition, Liu and Mauer (2011) link higher vega to a higher likelihood of liquidity covenants in new debt, indicating debtholders expect high-vega managers to engage in riskier behavior and, as a result, demand greater firm liquidity. However, Brockman, Martin, and Unlu (2010) find that short-term debt mitigates the agency costs of debt that stem from a high-vega compensation structure.

A different question of interest is how restrictions on executive compensation influence the form and level of compensation and CEO incentives. For instance, Dittman, Maug, and Zhang (2011) study several proposals to restrict CEO compensation and find that many such proposals have unintended consequences such as incentive pay restrictions leading to higher risk-taking incentives. Edmans and Gabaix (2016) show that modeling assumptions made for simplicity can have important differences in understanding the efficiency of different compensation packages. Rule ASC 718 (2005), formerly FSB 123R, increased the cost of issuing option-based compensation by requiring they be expensed at fair value on the firm's income statement. Hayes, Lemmon, and Qiu (2012) use the adoption of this rule as the setting to examine the relation of vega and risk-taking since firms reduced their use of option compensation due to the increased costs. They find that the reduction in option compensation does not impact managerial risk-taking. However, using the same rule, Bettis et al. (2018) reassert the positive relation between vega and risk-taking. Also using the 2005 rule change as their setting, Mao and Zhang (2018) show a positive relation between CEOs' vega and firm innovation. Additionally, Low (2009) finds that increased takeover protection reduces risk-taking in low-vega firms, resulting in loss of shareholder value and ultimately leading firms to restructure manager compensation to increase the vega. Cohen, Dey, and Lys (2013) find a similar result with compensation restructuring associated with the Sarbanes-Oxley Act of 2002.

Rose and Wolfram (2002) study the effects of section 162(m) of the Internal Revenue Code and find that the policy had little effect on total compensation in levels or growth rates at firms who were affected by the policy. They also present evidence that the policy had an impact on pay performance sensitivity, delta. Balsam and Yin (2005) find that around 40% of firms forfeit some deductions under the rule and explain this behavior with contracting costs. This is consistent with the idea that executives already making over $1 million in salary will not take a pay cut, but future raises will be made using incentive-based pay.

In addition to Rose and Wolfram (2002), several papers have studied the impact of taxation on executive compensation. Most of this literature has found little impact of taxes on executive pay. Using our same dataset, Goolsbee (2000) fount a high elasticity of taxable income among executives, but showed that most of this was due to changes in the timing of stock option exercise in anticipation of a tax increase rather than a long-run effect on compensation. Frydman and Molloy (2011) study the impact of taxes on executive compensation from 1946 to 2005, finding that labor income taxes have had little effect on the overall level of compensation. Hall and Leibman (2000) also do not find evidence that tax changes during the 1980s influenced the level of compensation. In contrast, Gorry, et al. (2017) find evidence that taxes and the $1 million rule influence the structure of compensation and Bird (2018) finds evidence that a tax reform directed at taxing stock options generated a dramatic reduction in their use in Canada. While consistent with the overall message that taxes do not influence the overall level but rather the structure of executive compensation, our paper is interested in how specific regulations influence the composition of executive compensation and how these changes influence incentives.

John and John (1993) developed a classic model of optimal executive compensation based on the desired risk of shareholders. Given that the framework uses executive pay to direct their risk-taking decisions, a natural question is to what extent does the structure of executive compensation influence risk-taking behavior. However, estimating the effect of compensation on risk-taking is challenging as the structure of pay is an endogenous firm choice. Several papers, including Bizjak et al. (1993), Core and Guay (1999), Guay (1999), Cohen et al. (2000), and Aggarwal and Samwick (2006), examine the relationship between delta and/or vega and firm characteristics. Given the findings in these papers, it seems clear that the correlations documented arise from causation going in both directions. Our paper contributes to this literature by providing new causal evidence on the impact of vega on firm risk. Dahiya, Ge, and Gete (2018) summarize some of the conflicting literature and extend the model to try to rationalize the results.

In addition to Coles, Daniel, and Naveen (2006), Shue and Townsend (2017) is perhaps the closest paper to ours in estimating the effect of compensation on executive decision making. Shue and Townsend (2017) study how increases in stock option grants influence CEO risk taking. They find that increases in option grants lead to an increase in stock volatility driven by increased leverage. Their design exploits random changes in options and estimates their total effect which generate a simultaneous increase in the Black-Sholes (1973) value of compensation, delta, and vega. In contrast, our design, using variation in being affected by the $1 million rule as an instrument, estimates the causal effect of vega on risk taking. While we find some evidence on increased risk taking, we do not find evidence that this operates through firm leverage.

III. Bunching from the Million Dollar Rule

We first provide causal evidence that the million-dollar rule induced a distortion in executive compensation by showing significant and robust bunching in the distribution of cash salaries at and near the $1 million threshold. To estimate this bunching, we fit a counterfactual distribution to the observed distribution of executive cash salaries outside the hypothesized bunching region, and we estimate bunching using the ratio of observed mass to the mass predicted by the counterfactual distribution.

We estimate bunching using two datasets of executive salaries. Our main analysis uses all CEOs from the Execucomp dataset from 1992 through 2018, with 57,534 observations. This dataset is sufficiently large to allow for subsample estimates by year. We also extend the analysis to a reduced dataset of 23,431 observations of CEOs matched to detailed firm data. Because we use this matched dataset for our analysis of firm risk, the comparison between this dataset and the full dataset of CEOs ensures that the CEOs matched with firms exhibit similar bunching to the full set of CEOs. We also use the matched dataset to produce estimates of bunching by industry.

A. Fitting a Counterfactual Distribution

Executive compensation in our sample approximately follows a lognormal distribution, a commonly observed distribution for salary and wage data. The \$1 million threshold occurs near the beginning of the right tail of the distribution or in the right tail, which prevents us from fitting the counterfactual distribution using the flexible polynomial approach in Kleven and Waseem (2013), Kopczuk and Munroe (2015), and Chetty et al. (2011).[2] We instead construct our counterfactual using a lognormal distribution.

Estimating the counterfactual mass in the absence of bunching occurs in three steps: estimating the parameters of the lognormal distribution using maximum likelihood; scaling the lognormal PDF to the observed distribution excluding the bunching region (a region around \$1 million), with adjustments for the tendency to bunch at focal numbers; and fitting this to the distribution in the bunching region.

The million-dollar rule introduces a distortion to salaries near or above \$1 million by creating a high marginal tax rate wedge, but it should not affect salaries below the threshold. We can use this to estimate the parameters of the lognormal distribution in the absence of the tax distortion by truncating the distribution at the lower bound of the bunching region (usually \$950,000). We then estimate these parameters using the truncated distribution with a censored

[2] As salary increases in the right tail of the distribution, the density function approaches zero, but a polynomial must diverge from zero. Fitting this shape accurately requires a high-degree polynomial (10^{th} or 11^{th} degree), but this does not produce a smooth distribution within the bunching region, which is omitted when fitting the polynomial.

maximum likelihood estimation. Let $f(y_i; \mu, \sigma)$ denote the lognormal PDF given μ and σ evaluated at salary y_i, and let $g(y_i; \mu, \sigma)$ denote the distorted value of the PDF for observations above the truncation point T. Then the likelihood function for the distribution is

$$L(\mu, \sigma) = \left(\prod_{y_i \leq T} f(y_i; \mu, \sigma)\right)\left(\prod_{y_i > T} g(y_i)\right)$$

$$= \left(\prod_{y_i \leq T} f(y_i; \mu, \sigma)\right)\left(\prod_{y_i > T} \frac{g(y_i)}{1 - F(T; \mu, \sigma)}\right)\big(1 - F(T; \mu, \sigma)\big)^{n(1-\hat{F}(T))} \tag{1}$$

where $\hat{F}(T)$ is the empirical CDF evaluated at T. Because the tax distortion only applies to salaries conditional on those salaries exceeding the truncation point, treating the conditional likelihood of those observations as insensitive to μ and σ gives the log-likelihood function

$$\ln L(\mu, \sigma) = \sum_{y_i \leq T} \ln f(y_i; \mu, \sigma) + \gamma + n\left(1 - \hat{F}(T)\right)\ln\big(1 - F(T; \mu, \sigma)\big) \tag{2}$$

where γ is the sum of the log-likelihood of the distorted conditional PDF, which we treat as constant. This log-likelihood function is distinct from the truncated maximum likelihood (which uses the conditional PDF for observations) because we observe the empirical CDF evaluated at the truncation point. This additional information produces better estimates of μ and σ in subsamples, although both estimators are consistent and give nearly identical results for the full dataset. Using this log-likelihood equation, we estimate μ and σ with the Nelder-Mead optimization algorithm. We denote the resulting estimates as $\hat{\mu}$ and $\hat{\sigma}$.

We then group the observations into bins of equal width ($5,000). To improve the fit of the counterfactual distribution, we drop all bins below $500,000 or above $1.5 million. We split the remaining bins into datasets of just the bunching region—in our preferred estimates, $950,000 to $1.05 million—and all except the bunching region. We then use the midpoint salary value of each bin y_j and calculate the lognormal PDF value for that bin, $f\left(y_j; \hat{\mu}, \hat{\sigma}\right)$. Using the dataset excluding the bunching region, we then rescale the lognormal PDF using the regression

$$ln\big(1 + c_j\big) - ln\left(f\left(y_j; \hat{\mu}, \hat{\sigma}\right)\right)$$
$$= I_{y_j \leq M}\big(\beta_0 + \beta_1 R_j + \beta_2 L_j + \beta_3 C_j\big) + I_{y_j > M}\big(\alpha_0 + \alpha_1 R_j + \alpha_2 L_j + \alpha_3 C_j\big) + u_j$$

In this regression, c_j is the number of observations in that bin, $I_{y_j \leq M}$ is an indicator for whether salaries in that bin are less than or equal to \$1 million, $I_{y_j > M}$ is an indicator for whether salaries in that bin exceed \$1 million, R_j is an indicator for whether that bin includes a multiple of \$25,000, L_j is an indicator for whether that bin includes a multiple of \$50,000, and C_j is an indicator for whether that bin includes a multiple of \$100,000. This regression accounts for the tendency of salaries to bunch at focal numbers as well as a potential effect of the million-dollar rule on this focal point bunching. Note that the addition of 1 to each bin does not affect the estimates for the full sample, but it addresses the small-sample problem of income bins with no observations.

Using the results of this regression, we fit the model to the omitted bins in the bunching region. We then estimate observed mass

$$M_o = \sum_{y_j \in BR} c_j \tag{3}$$

and counterfactual mass

$$M_c = \sum_{y_j \in BR} \Big(f(y_j; \mu^*, \sigma^*) exp \Big\{ \hat{\beta}_0 + \hat{\beta}_1 I\{y_j > H\} + \hat{\beta}_2 R_j + \hat{\beta}_3 L_j + \hat{\beta}_4 C_j + \hat{\beta}_5 R_j * I\{y_j > H\} + \hat{\beta}_6 L_j * I\{y_j > H\} + \hat{\beta}_7 C_j * I\{y_j > H\} \Big\} - 1 \Big) \tag{4}$$

The mass ratio is then M_o / M_c.

We test this estimator on simulated lognormal distributions with different parameters and bunching regions. These tests show that our estimator produces mass ratios close to 1 (the null hypothesis of no bunching) given at least 3,000 observations, but that our estimator is less reliable with fewer observations.

B. Results

Since this paper focuses on CEO incentives and firm risk, our main bunching results consist only of CEOs; we restrict the discussion of non-CEO executives to the sensitivity and robustness analysis in Appendix A. We first present visual results for the full dataset of CEOs (57,534 observations). The maximum likelihood estimation of the parameters of the lognormal distribution gives $\hat{\mu} = 6.40$ and $\hat{\sigma} = 1.13$. Figure 1 plots the empirical distribution and the counterfactual distribution for the training dataset of bins between \$500,000 and \$1.5 million excluding the bunching region. Figure 2 adds the observations in the bunching region from \$950,000 to \$1.05 million.

[Insert Figure 1 here]

In Figure 2, the observed mass at the bin containing \$1 million is substantially greater than the counterfactual mass, but we also observe excess mass in the bins immediately around \$1 million. Our bunching region includes 4,650 observations and has a counterfactual mass of 2,417, which gives a mass ratio of 1.92. This is significantly greater than the null value of 1, and it implies that bunching in response to the million-dollar rule increased the number of CEOs with salary in the bunching region by 92 percent.

[Insert Figure 2 here]

Table 1 presents results for the full dataset of CEOs, as well as subsets for each year. Almost all these estimates are significantly greater than the null value of 1, with p-values from one-sided t-tests less than one percent. The exceptions are for 1994, which is significant at 5 percent, and for 1992 and 1993. Given that the million-dollar rule did not exist in 1992 and did not take effect until 1994, insignificant mass ratios for those years are consistent with no million-dollar rule to incentivize bunching.[3]

[Insert Table 1 here]

Figure 3 plots these results, with error bars representing two standard deviations. The bunching estimates generally increase over time, with the greatest increases occurring between 1993 and 1999. We have identified two potential explanations for this trend. Because executive compensation increases over time (both in real terms and due to inflation), we would expect the share of executives affected by the million-dollar rule to increase over time. There also potentially exists downward stickiness in executive salaries, as executives could oppose sudden decreases in salary (and corresponding increases in the riskiness of overall compensation). Although the latter explanation is a stronger claim, it is consistent with the largest increases in bunching occurring during the initial years following the enactment of the million-dollar rule, followed by smaller or no increases in later years.

[3] Although the law was enacted in 1993, the deduction limitation would only apply for taxable years beginning on or after January 1, 1994 (Omnibus Budget Reconciliation Act of 1993, Public Law 103-66, Sec. 13211).

The standard errors of the estimates also generally decrease over time, although we observe an uptick in 2018. This trend can be explained by the general increase in compensation over time ($\hat{\mu}$ increasing). As the distribution of salary shifts to the right, both the observed mass in the bunching region and the counterfactual mass estimates increase, reducing the variance of these estimates and thus the variance of their ratio.

In Table 2, we use the reduced sample (matched CEOs) to estimate bunching in different industries, using the Fama-French (1997) industry classifications for 12 industries. Our empirical results in section III exclude the financial sector and utilities, as these are subject to stronger risk-related regulations. For consistency, we thus exclude these sectors from the bunching analysis in the reduced dataset as well. This reduced dataset of CEOs produces $\hat{\mu} = 6.33$ and $\hat{\sigma} = 1.10$; these are similar to the estimates for the full dataset, suggesting that the final dataset of CEOs has salary distributed similarly to the full dataset. Our bunching region includes 1,554 observations and has a counterfactual mass of 924.6, which gives a mass ratio of 1.68. This is highly significant, although it is smaller than the estimate in the full dataset. All but one of the industries have highly significant bunching, except for the healthcare, medical equipment and drug industry (significant at 10 percent).

[Insert Table 2 here]

Finally, to confirm a causal effect, we must consider a potential alternative explanation for bunching at $1 million: that executives have some preference for a salary of exactly $1 million. Although this may seem irrational, we observe a tendency for bunching at round numbers, specifically at multiples of $25,000, $50,000 and $100,000. In the full dataset, this focal point bunching is highly significant. If the hypothesis that executives inherently prefer exactly $1 million in salary is true (although they receive other compensation as well), then we should observe missing mass (mass ratios strictly less than 1) for income bins in the bunching region excluding the bin with salaries of $1 million. We have two ways to test this. If we estimate the mass ratio in the bunching region from $950,000 to $1.05 million but exclude the bin containing exactly $1 million, we find a mass ratio of 1.464, with a standard error of 0.031. Although this is less than the estimate of 1.92 when including that bin, this is still significantly greater than 1.

We can also test this hypothesis by estimating the mass ratios of several areas near $1 million. To do this, we fit the counterfactual distribution excluding a bunching region from $900,000 to $1.1 million and then estimate the mass ratio in subsets of this region. These results are presented in Figure 4, which graphs the mass ratio for regions of $25,000 in the bunching region (each of which includes its upper bound but not its lower bound). The estimates for the groups above $975,000 are all highly significant, but there is no significant excess mass in the region from $900,000 through $975,000. These results are consistent with the million-dollar rule having no effect on executives with salaries below $1 million but causing executives who would have had salaries over $1 million to instead have salaries at or near $1 million. This evidence is also inconsistent with an innate preference for exactly $1 million; this alternative hypothesis is not capable of explaining the observed bunching. Taken altogether, the evidence supports the hypothesis that the $1 million rule substantively impacts the manager's compensation structure.

[Insert Figure 4 here]

In Appendix A, we conduct a sensitivity and robustness analysis of this methodology. Consistent with any bunching exercise, the estimator is sensitive to the bunching region used, with the mass ratio estimators decreasing in the width of the bunching region, although the results remain highly significant. However, our results are generally robust to other changes to the estimation. We also conduct analyses uses alternative definitions of income and compare non-CEO executives against CEOs.

IV. Empirical Results: Causal Evidence on Managerial Incentives and Risk-taking

The previous section shows that firms bunch their CEO cash compensation around $1 million, distorting what would otherwise be higher cash compensation above $1 million. This reduction in cash compensation is offset by other forms of pay, however. Gorry et al. (2017) demonstrate that firms subject to the $1 million rule increase their use of stock options as a share of compensation. In addition, Hall (2003) and Hall and Murphy (2003) suggest this type of substitution is not one dollar of option value to one dollar of cash, as managers value options less than cash. Thus, Section 162(m) may be incentivizing managers, via higher compensation vega, to take more risk than if the firm was allowed to expense more cash compensation with tax deductibility.

In this section, we explore how higher sensitivity of CEO wealth to stock volatility (vega) relates to the riskiness of firm behavior, including investment choices, leverage, and the riskiness of stock returns controlling for CEO pay performance sensitivity (delta). The closest paper in the literature to ours is Coles, Daniel, and Naveen (2006). However, in contrast to their approach of using a 3SLS model to account for how the firm's assets affect the endogenous compensation structure, we assess the impact of vega on risk-taking by using an IV constructed from a policy-induced change, to provide causal evidence on this relationship.

Because firms endogenously choose compensation strategies to induce CEOs to implement their preferred policies, the value of vega is endogenous. To get around this issue, we consider an instrumental variables approach to instrument for vega using cutoffs based on our bunching estimates, which revealed excess mass in the region from $950,000 to $1.05 million. In our baseline specification, we instrument for vega with a dummy variable that is one if the CEO's salary is greater than $1 million and the million-dollar rule is in force (beginning in 1994). Given that there is some excess mass between $950,000 and $1 million we consider an alternative specification of the instrument for salaries that are above $950,000 in the appendix.

A. Data and Methodology

Our sample for this estimation is CEOs that are in the Compustat Execucomp database between 1992 and 2014. Our sample in this section ends in 2014 as that is the last year for which we have the values of delta and vega. In the data there are two identifiers for CEO, an annual one and a current one. We use both to identify the CEO in each year of the sample. Conflicts of CEO tags in a given year are resolved by confirming the correct CEO using their start date. Execucomp includes CEO compensation data that breaks total compensation down into its component parts including salary, bonus, LTIPs, options awarded, stock grants, and other income. While compensation data are available for the top five executives in the company, we focus on the compensation structure of the CEO given our interest in how the structure of compensation relates to observable managerial decisions.

To measure changes in pay structure we follow Coles, Daniel, and Naveen (2006), Guay and Guay (2002), and Core (1999) in defining delta as the change in the dollar value of the executive's wealth for a one percentage point change in stock price, and vega as the change in dollar value of the executive's wealth for a 0.01 change in the annualized standard deviation of stock returns. These measures are useful in that they quantify how changes in the compensation structure of an executive influences the incentives that they face in taking on firm risk. We are specifically interested in testing whether higher vega in executive compensation causes CEOs to implement riskier policies. In estimating the effects of vega on firm risk, it is important to control for stock price effects measured by delta. We obtain the values of delta and vega from Lalitha Naveen's website.[4]

To complement this information, we use firm-specific data from COMPUSTAT. The firm-level controls are the log of total sales, the growth rate of sales, the market-to-book equity ratio, the ratio of free cash flow to assets, the total stock return, leverage (except for the regressions using leverage as a dependent variable), and the log of the age of the company. We also include controls related to the executive's compensation, specifically delta and the log of total compensation. All our control variables are lagged one year. We winsorize each variable at the 1st and 99th percentiles.

As in Coles et al. (2006), we consider three mechanisms for observing risk: investment policy, firm structure, and stock risk. For investment policy, we consider R&D (research and development expenditures scaled by total assets) and CAPEX (measured as plant, property and equipment investments scaled by total assets). Missing values of R&D are coded as zero, so our estimates of the effect of R&D are unconditional on whether the firm is currently conducting R&D or not. We anticipate that higher vega would incentivize riskier investment policy, so that R&D investment should increase, and CAPEX should go down. For firm structure variables we consider the number of business segments in which the firm operates, a Herfindahl index of sales across the business segments (measured as the sum of the square of segment sales divided by the square of firm sales), and book leverage (total book debt scaled by book value of assets). We measure firm risk both by total firm risk, the annualized standard deviation of daily stock returns, and by idiosyncratic risk, calculated as the mean squared residual from regressing the firm's daily stock returns on the daily returns for the S&P500. Here higher values of total and idiosyncratic risk indicate riskier firm policy.

We follow Coles, Daniel, and Naveen (2006), among others, in selecting control variables. As a proxy for firm size, we use the natural logarithm of sales ("Ln(Sales)"). Market-to-Book proxies for firms' investment opportunities and is defined as the market value of assets divided by the book value of assets. Surplus Cash is computed as in Richardson (2004) and Coles et al. (2006) and represents the cash available for financing new projects scaled by total assets. Sales Growth is calculated as the natural logarithm of current year's sales minus the natural logarithm of the

[4] We thank Lailitha Naveen for making the data available.

previous year's sales. Stock Return is the annual return of the firm's stock over the fiscal year. Return on assets ("ROA") is earnings before interest, taxes, depreciation, and amortization scales by total assets. CEO Turnover and Dividend Cut are binary variables that take a value of 1 if the CEO changes or the firm reduces dividends, respectively, and zero otherwise. Net PPE is the firm's investment in plant, property, and equipment scaled by total assets. Intangible Growth is the percentage change in the firm's intangible assets. CEO Cash Compensation is the CEO's cash salary and bonus. CEO Tenure is the number of consecutive years the CEO has held the position. To proxy for bankruptcy risk, we use Altman's (1968) Z-Score.

Table 3 presents the summary statistics for our data. The table separates the variables into risk measures, CEO characteristics, and firm controls. The risk measures are considered as dependent variables in various specifications. CEO characteristics include an indicator for being affected by 162(m). With the baseline definition of salary above $1 million after 1994, the table shows that 12.9 percent of our CEO-year observations are affected by the policy. Vega and Delta are in millions of dollars, so vega implies that a 1% increase in the standard deviation of returns generates on average a $105,000 increase in CEO wealth and delta implies that a 1% increase in the company's stock price increases CEO wealth by about $567,000 on average. Note that the means of vega and delta are much higher than the medians, implying that they are highly skewed.

[Insert Table 3 here]

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM) with standard errors clustered at the firm level:

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it}, \tag{5}$$

where the dependent variable represents one of the risk measures discussed above. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it}, \tag{6}$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of the CEO being affected by the $1 million rule (i.e. a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise). Being affected by the policy implies that additional compensation paid to the executive in the form of salary cannot be deducted by the firm while additional incentive-based pay such as stock options could still be deducted. These tax incentives made it more attractive on the margin to provide additional compensation in riskier forms. Hence, being affected by the policy can be used as an instrument that influences the structure of compensation while not otherwise changing incentives of the firm to adopt riskier policies.

B. Results

Table 4 shows the results of the first-stage regression with the typical set of control variables used across the main regressions. Standard errors clustered by firm are reported in parentheses. We find that being affected by 162(m) is associated with much higher values of vega. The vega of a firm affected by the rule is 0.1303 higher than a firm that is unaffected. Given the mean vega of the sample is 0.105, the result is economically significant. This is consistent with the finding that the policy incentivized affected firms to pay their CEOs with a higher fraction of incentive-based pay. We also find that, among the controls, delta, sales, market to book, and surplus cash are positively associated with vega while sales growth and stock returns have a negative relationship. The F statistic for excluded instruments (here just being affected by 162(m)) is 188.85, which is much greater than 10 and exceeds the Stock and Yogo (2005) critical value. This suggests that the instrument explains significant variation in vega and that results will not be biased or inconsistent due to weak instruments. For each specification, we report the first stage F-statistic below the IV regression as controls vary slightly in some specifications.[5]

[Insert Table 4 here]

Table 5 presents results showing how investment policy is influenced by vega. All specifications are run with industry and year fixed effects with standard errors clustered by firm. For each specification, we compare the results that are generated from an OLS specification with our causal result generated by the IV approach described above. Consistent with the hypothesis that CEOs with higher vega implement riskier policy we find that higher vega generates an increase in R&D investment. The coefficients are positive and significant for both the OLS and IV specifications, while the IV results are substantially stronger, statistically speaking. The IV results imply that a one standard deviation in vega increases R&D investment by about 25% of its mean level. While generating substantial causal effects our results are an order of magnitude smaller than those found in Coles, et al. (2006). Table 5 also reports results for CAPEX, which is

[5] See Bound et al. (1995), Staiger and Stock (1997), and Stock and Yogo (2005) for a discussion of weak instruments.

investment in physical assets which are viewed as less risky. We find negative coefficients on vega in both the IV and OLS specification, but, unlike Coles et al. (2006), they do not meet the standard levels of statistical significance. Thus, our results indicate CEO's with higher vegas increase R&D investment, but do not change their investment behavior related to tangible assets.

[Insert Table 5 here]

Table 6 shows results for firm structure. Both the Herfindahl index of sales across business segments and the number of business segments are measures of a CEOs focus. Higher focus on core business is associated with fewer business segments and a higher Herfindahl index, and may be considered as increased risk due to lower diversification. The OLS specifications do not generate significant results while we find significant reductions in both the Herfindahl index and business segments for the IV specification. While it seems that these effects go in opposite directions for CEO focus, a reduction in segments could increase risk by having more tied to each part of the business while reduction in the Herfindahl index could indicate a move to grow new or riskier parts of the business.

[Insert Table 6 here]

Table 7 reports our findings on book leverage. In this specification we also use Z-score (Altman, 1968) as a control variable. While higher leverage is associated with more firm risk, we find the vega coefficient using OLS is negative while the coefficient using IV method is positive. Neither coefficient is statistically different from zero, however. This is not consistent with Coles et al. (2006) who find vega has a statistically significant and positive effect on book leverage. However, most of the control variables in Table 7 have similar coefficients to those found in Coles et al. (2006). Nonetheless, our evidence does not support the notion that vega has an impact on the manager's choice of book leverage.

[Insert Table 7 here]

Finally, Table 8 presents our results on firm risk. The OLS specifications on total firm risk document strong negative associations between CEO vega and both total and idiosyncratic firm risk. This indicates an increase in vega is associated with a decrease in both total and idiosyncratic risk. However, our IV estimates flip the sign on both point estimates. We find that the coefficient on total firm risk is statistically insignificant, while the coefficient in the idiosyncratic risk specification is statistically significant at the 1% level. A one standard deviation increase in vega results in an increase in idiosyncratic risk of about 8% of its mean value. This is different than

Armstrong and Vashishtha (2012), who find managers opt to change systemic, not idiosyncratic, risk. Additionally, although we find more evidence of higher vega implementing riskier policies, the results are again much smaller than those generated by the Coles, Daniel, and Naveen (2006) 3SLS approach. The two differences from our approaches are the IV specification and the period under consideration. As discussed below, we consider how our results differ when we truncate the sample in 2005 and find only slightly stronger effect on firm risk. This suggests that using the IV strategy to isolate the causal effect generates a smaller impact on firm risk than previously found in the literature.

[Insert Table 8 here]

This study provides evidence that section 162(m) of the tax code generated important changes in the structure of executive compensation for those executives earning more than $1 million per year in cash salary. This variation in pay structure allows us to provide new causal evidence on the relationship between the structure of CEO pay and firm risk-taking behavior. We find that higher sensitivity of CEO wealth to stock return volatility (vega), generates an increase in R&D investment, a reduction in business segments, a reduction in the Herfindahl index of sales across segments, and an increase in idiosyncratic firm risk. While the magnitude of our results is smaller than previous studies, our findings highlight how tax policies meant to limit executive compensation can have unintended consequences of incentivizing riskier manager behavior.

V. Robustness

A. Bunching Methodology

We implement various changes in our sample or methodology to check the robustness of our results. First, the bunching analysis in section II focused on bunching in CEO salaries. However, we can also consider bunching among non-CEO executives. Table A1 presents the comparison in bunching across different samples. We extend the analysis to use the full dataset of all executives in Execucomp from 1992 through 2018 and the subset of these who are not CEOs. Both of these groups exhibit highly significant bunching, although less than the sample of only CEOs (used for the main bunching analysis).

We can also consider bunching in a different income category. The million-dollar rule applies to non-performance-based compensation, which inherently includes salary. The IRS rules for section 162(m) leave some ambiguity regarding whether a bonus is performance-based compensation and thus exempt from the deduction limitation. Thus, non-performance-based compensation could potentially include the executive's bonus as well, depending on its structure; if part of the bonus is guaranteed, that portion would be subject to the million-dollar rule, but explicitly basing the executive's bonus on performance-based measures would be sufficient to exclude it from the million-dollar limitation. Table A2 presents the bunching estimates for salary and for the sum of salary and bonus, using different bunching regions. Consistent with some ambiguity in this designation, we find smaller but still significant bunching in the sum of salary and bonus. This effect persists across different specifications of the bunching region.

In addition to considering bunching in other measures or other samples, we examine the sensitivity or robustness of the estimator to changes in the estimation method or specification. The decisions made in the estimation include the bunching region ($950k - $1.05m), the fitting region for the regression stage when fitting the counterfactual distribution ($500k – $1.5m), the size of the income bins ($5,000), and the parametric distribution used for the estimation.

Table A3 shows how the mass ratio estimate changes with the width of the bunching region. In any bunching estimation, the particular concentration of mass at $1 million implies that the bunching estimate should decrease as the bunching region expands to include a larger portion of the salary distribution. As documented in previous work on bunching, such as Kleven and Waseem (2013), the bunching estimates are sensitive to the bunching region.

Table A4 presents the sensitivity of the estimates to the fitting region. Moderate changes to the region for estimating the rescaling factors for the lognormal distribution does not have a substantial effect on the magnitude of the estimates. However, as the fitting region is expanded to include part of the left tail of the distribution (salaries below $300,000) and more of the right tail (with relatively few observations), the estimates become larger and more sensitive to the fitting region, although they remain highly significant.

Table A5 shows the effects of changing the bin size given different bunching regions. The results of increasing the bin size to $10,000 are nearly identical to our estimates using a bin size of $5,000.

Finally, we consider using a Pareto distribution as the counterfactual instead of a lognormal distribution. As mentioned in section II, the distribution of salaries appears approximately lognormal, but it is not a perfect fit. A plausible alternative to using the lognormal distribution is applying the Pareto distribution to a portion of the total executive distribution above some threshold. The Pareto distribution is frequently used to model incomes for the top percentile, and many CEO salaries would quality for this. However, to match the shape of a Pareto distribution, it can only be fitted in the convex portion of the salary distribution, which approximately requires excluding observations below $400,000 or $500,000, depending on the year and subsample. An estimator using the Pareto distribution is thus highly sensitive to this portion of the specification.

In Table A6, we compare results using the lognormal distribution against those using the Pareto distribution. We choose a lower bound for the distribution of $500,000, which is also the lower bound of the fitting region when rescaling the distribution to account for bunching at round numbers. The estimated shape parameter of the Pareto distribution is 1.67, compared to an estimate by Saez (2001) of approximately 2 for the US wage distribution. Using the Pareto distribution as the counterfactual produces a mass ratio estimate of 2.47, compared to the estimate of 1.92 using the lognormal distribution. The estimate is highly significant, even if the magnitudes differ. To further examine this, Figure A1 plots the annual estimates of bunching in CEO salaries from 1992 through 2018. Although the estimates using the Pareto distribution generally exceed the estimates using the lognormal distribution, both estimators produce similar trends in bunching over time, with increases in the late 1990s and early 2000s, decreases beginning near 2006 and continuing through the Great Recession, and a slight trend increase from 2010 through 2017.

B. *Risk-Taking*

Next, we consider the sensitivity of our results to the definition of being affected by rule 162(m). In the baseline specification, we deemed an individual to be affected by the policy if the year is after 1994 when the policy went into effect and their income was at or above $1 million. This implied that the firm would have a direct incentive to provide any additional pay with incentive-based pay rather than though salary to allow it to be deductible. However, in our bunching estimates we find some evidence of bunching below the $1 million threshold indicating that for CEOs with salaries close to $1 million, marginal pay increases are more likely to come in the form of incentive-based pay when rule 162(m) is in place. Given this evidence, we consider an alternate definition of the instrument where those with income above $950k.

Table B1 reports the first stage regression results. Again, being affected still has a strong and positive effect on vega. The tables in Appendix B report results for IV regressions for each of the specifications in the main paper. The OLS specifications are not repeated as they would be identical. We find similar effect for investment policy, book leverage, and firm risk, however the firm structure effects are slightly different as the reduction in segments is no longer significant.

The next robustness check is related to the overall structure of the compensation package. In the original specification, cash compensation, along with CEO Tenure, is a proxy for CEO risk aversion (Berger et al., 1997). However, the cash compensation may be an incomplete proxy related to the CEO's total pay. To address this, we additionally include Total Compensation Less Cash (total compensation minus salary and bonus) and Percent Cash Compensation (salary and bonus scaled by total compensation) in the model specification.

Table C1 reports the first stage regression results. The effect of the rule remains strong and positive on vega. In Appendix C, the remainder of the tables for investment policy, book leverage, and firm risk show qualitatively and quantitatively similar results compared to the original findings.

Lastly, in Appendix D, we show how the results change when we truncate the sample in 2005. Our bunching estimates indicate that there is a reduction in bunching in 2005. This is most likely because in 2005 there was a change in accounting rules known currently as ASC 718 (formerly SFAS 122(R) or FSB 123R) which forced companies to expense the value of stock options given to employees at fair value. Prior to this rule, options granted were treated as being costless. This rule change generated another shift in the form of executive compensation away from stock options to a larger share of restricted stock grants.

We replicate the IV results from the main paper with the shorter sample period. We find similar effects for investment policy, book leverage, and firm risk, however the firm structure effects (i.e. Herfindahl and number of business segments) are no longer statistically significant with the smaller sample.

VI. Conclusion

This paper provides novel causal evidence on the effect of the structure of CEO pay on executive risk-taking decisions. We use exogenous variation in the composition of CEO pay generated by tax policy to instrument for the riskiness of the CEO's compensation. Specifically, we find that CEOs who are subject to the $1 million rule (have salaries above $1 million after 1994 when firms could only deduct the first $1 million of non-incentive-based pay from their taxable income) get compensation packages with higher vega, measured as the dollar change in wealth for a 0.01 increase in the standard deviation of firm stock returns. This higher vega arises as stock options are a larger component of their compensation.

With our IV strategy, we assess if CEOs with higher vega implement riskier firm policy choices. We find evidence that higher vega CEOs do implement riskier investment policy through larger investments in R&D and that their firms' stock has higher idiosyncratic risk. While we find a significant reduction in the number of business segments and the Herfindahl index of sales across segments, this reduction in the Herfindahl index becomes insignificant in most of our robustness specifications. Moreover, we find a significant reduction in the number of business segments and the Herfindahl index of sales across business segments. While our findings are broadly consistent with the hypothesis that CEOs with higher vega implement riskier policies that is advanced in Coles, Daniel, and Naveen (2006), our causal evidence shows that higher vega only generates riskier decisions in a few areas and the magnitude of our results, while still economically meaningful, are substantially smaller than found in Coles, Daniel, and Naveen (2006).

The Tax Cuts and Jobs Act, effective December 31, 2017, extended the reach of Section 162(m) to all forms of compensation, including deferred compensation and stock options. However, since the compensation is taxed at exercise and not when granted, the consequences of the act are more complicated than those of the original Section 162(m). To add to the consequences, the Tax Cuts and Jobs Act dramatically reduced and compressed the marginal corporate tax rates. Thus, the benefit of tax deductibility is lessened. Future research will be interested in documenting the effect this Act has on managerial compensation structure and the resulting risk-taking behavior of firm managers.

References

Aggarwal, Rajesh, K. and Samwick, Andrew A., 1999. "The Other Side of the Trade-Off: The Impact of Risk on Executive Compensation," *Journal of Political Economy*, 107 (1), 65-105.

Aggarwal, Rajesh, K. and Samwick, Andrew A., 2006. "Empire-Builders and Shirkers: Investment, Firm Performance, and Managerial Incentives," *Journal of Corporate Finance*, 12 (3), 489-515.

Altman, E., 1968. "Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy." *Journal of Finance*, 23, 589–609.

Anantharaman, Divya and Gyu, Yong Lee, 2014. "Managerial risk taking incentives and corporate pension policy." *Journal of Financial Economics*, 111(2), 328-351.

Armstrong, Christopher A., Larcker, David F., Ormazabal, Gaizka, and Taylor, Daniel J., 2013. "The relation between equity incentives and misreporting: The role of risk-taking incentives." *Journal of Financial Economics*, 109(2), 327-350.

Armstrong, Christopher A. and Vashishtha, Rahul, 2012. "Executive stock options, differential risk-taking incentives, and firm value." *Journal of Financial Economics*, 104(1), 70-88.

Balsam, Steven and Yin, Qin J., 2005. "Explaining firm willingness to forfeit tax deductions under Internal Revenue Code Section 162 (m): The million-dollar cap." *Journal of Accounting and Public Policy*, 24(4), 300-324.

Berger, P., Ofek, E., Yermack, D., 1997. "Managerial entrenchment and capital structure decisions." *The Journal of Finance*, 52, 1411–1438.

Bettis, J. Carr, Bizjak, John, Coles, Jeffrey L., and Kalpathy, Swaminathan, 2018, "Performance-vesting provisions in executive compensation." *Journal of Accounting and Economics*, 66(1), 194-221.

Bird, Andrew, 2018. "Taxation and executive compensation: Evidence from stock options." *Journal of Financial Economics*, 127(2), 285-302.

Bizjak, John M, Brickley, James A., Coles, Jeffrey L., 1993. "Stock-Based Incentive Compensation and Investment Behavior," *Journal of Accounting and Economics*, 16 , 349-372.

Black, Fischer and Scholes, Myron, 1973. "The pricing of options and corporate liabilities." *Journal of Political Economy*, 81(3), 637-654.

Bound, J., Jaeger, D. A., and Baker, R. M., 1995. “Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable is Weak,” *Journal of the American Statistical Association,* 90 (430), 443-450.

Brockman, Paul, Martin, Xiumin, and Unlu, Emre, 2010. “Executive Compensation and the Maturity Structure of Corporate Debt.” *The Journal of Finance*, 65(3), 1123-1161.

Chen, Yangyang, Gul, Ferdinand A., Veeraraghavan, Madhu, and Zolotoy, Leon, 2015. “Executive Equity Risk-Taking Incentives and Audit Pricing.” *The Accounting Review*, 90(6), 2205-2234.

Chetty, Raj, Friedman, John N., Olsen, Tore and Pistaferri, Luigi, 2011. “Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records,” *The Quarterly Journal of Economics*, 126 (2), 749-804.

Cohen, Daniel A., Dey, Aiyesha, and Lys, Thomas Z., 2013. “Corporate Governance Reform and Executive Incentives: Implications for Investments and Risk Taking.” *Contemporary Accounting Research*, 30(4), 1296-1332.

Cohen, Randolph B., Hall, Bran J. and Viceira, Luis M., 2000. “Do Executive Stock Options Encourage Risk-Taking?” *Harvard University Working Paper*.

Coles, Jeffrey L., Daniel, Naveen D. and Naveen, Lalitha. 2006. "Managerial Incentives and Risk-taking." *Journal of Financial Economics* 79, 431-468.

Coles, Jeffrey L. and Li, Zhichuan, 2020. “Managerial Attributes, Incentives, and Performance.” *The Review of Corporate Finance Studies*, 9(2), 256-301.

Core, John and Guay, Wayne, 1999. “The Use of Equity Grants to Manage Optimal Equity Incentive Levels,” *Journal of Accounting and Economics*, 28, 151-184.

Core, John and Guay, Wayne, 2002. “Estimating the Value of Employee Stock Option Portfolios and Their Sensitivities to Price and Volatility,” *Journal of Accounting Research*, 40 (3), 613-630.

Dahiya, Sandeep, Ge, Lei and Gete, Pedro, 2018. “A Model of Managerial Compensation, Firm Leverage and Credit Stimulus.” *Georgetown McDonough School of Business Working Paper.*

Eaton, Jonathon and Rosen, Harvey S., 1983. “Agency, Delayed Compensation, and the Structure of Executive Remuneration,” *The Journal of Finance*, 38 (5), 1489-1505.

Edmans, Alex and Gabaix, Xavier, 2016. "Executive compensation: A modern primer." *Journal of Economic Literature,* 54(4), 1232-87.

Fama, Eugene F. and French, Kenneth R., 1997. "Industry costs of equity." *Journal of Financial Economics*, 43(2), 153-193.

Frydman, Carola and Molloy, Raven S., 2011. "Does tax policy affect executive compensation? Evidence from postwar tax reforms." *Journal of Public Economics*, 95(11-12), 1425-1437.

Frydman, Carola and Saks, Raven E., 2010. "Executive Compensation: A New View from a Long-Term Perspective, 1936-2005," *The Review of Financial Studies*, 23 (5), 2099-2138.

Goolsbee, Austan, 2000. "What happens when you tax the rich? Evidence from executive compensation." *Journal of Political Economy*, 108(2), 352-378.

Gorry, Aspen, Hassett, Kevin A., Hubbard, Glenn, and Mathur, Aparna, 2017. "The Response of Deferred Executive Compensation to Changes in Tax Rates," *Journal of Public Economics,* 151, 28-40.

Guay, Wayne, 1999. "The Sensitivity of CEO Wealth to Equity Risk: An Analysis of the Magnitude and Determinants, *Journal of Financial Economics*, 53, 43-71.

Hall, B.J., 2003. "Six challenges in designing equity-based pay." *Journal of Applied Corporate Finance*, 15(3), 21-33.

Hall, Brian, J. and Liebman, Jeffrey B., 1998. "Are CEOs Really Paid Like Bureaucrats?" *The Quarterly Journal of Economics*, 113 (3), 653-691.

Hall, Brian J. and Murphy, Kevin J., 2003. "The trouble with stock options." *Journal of Economic Perspectives*, 17(3), 49-70.

Hayes, Rachel M., Lemmon, Michael, and Qiu, Mingming, 2012. "Stock options and managerial incentives for risk taking: Evidence from FAS 123R." *Journal of Financial Economics*, 105(1), 174-190.

Jensen, Michael C. and Murphy, Kevin J., 1990. "Performance Pay and Top-Management Incentives," *Journal of Political Economy*, 98 (2), 225-264.

John, Teresa A. and John, Kose, 1993. "Top-management compensation and capital structure." *The Journal of Finance*, 48(3), 949-974.

Kleven, Henrik, J. and Waseem, Mazhar, 2013. "Using Notches to Uncover Optimization Frictions and Structural Elasticities: Theory and Evidence from Pakistan," *The Quarterly Journal of Economics*, 669-723.

Kopczuk, Wojciech and Munroe, David J., 2015. "Mansion Tax: The Effect of Transfer Taxes on the Residential Real Estate Market," *American Economic Journal: Economic Policy*, 7 (2), 214-257.

Kuang, Yu F. and Qin, Bo, 2013. "Credit Ratings and CEO Risk-Taking Incentives." *Contemporary Accounting Research*, 30(4), 1524-1559

Liu, Yixin and Mauer, David C., 2011. "Corporate cash holdings and CEO compensation incentives." *Journal of Financial Economics*, 102(1), 183-198.

Low, Angie, 2009. "Managerial risk-taking behavior and equity-based compensation." *Journal of Financial Economics*, 92(3), 470-490.

Mao, Connie X. and Zhang, Chi, 2018. "Managerial Risk-Taking Incentive and Firm Innovation: Evidence from FAS 123R." *Journal of Financial and Quantitative Analysis*, 53(2), 867-898.

Murphy, Kevin J., 1999. "Executive Compensation*", Handbook of Labor Economics*, 3, Part B, 2485-2563.

Murphy, Kevin J., 2012. "The politics of pay: A legislative history of executive compensation." Research Handbook on Executive Pay, 11.

Richardson, Scott A., 2004. "Corporate governance and the over-investment of surplus cash." *University of Michigan Working Paper.*

Rodgers, Daniel A., 2002. "Does executive portfolio structure affect risk management? CEO risk-taking incentives and corporate derivatives usage." *Journal of Banking & Finance*, 26(2-3), 271-295.

Rose, Nancy and Shepard, Andrea, 1994. "Firm Diversification and CEO Compensation: Managerial Ability or Executive Entrenchment?" *RAND Journal of Economics*, 28 (3), 489-514.

Rose, Nancy L. and Wolfram, Catherine, 2000. "Has the "Million-Dollar Cap" Affected CEO Pay?", *The American Economic Review*, 90 (2), 197-202.

Rose, Nancy L. and Wolfram, Catherine, 2002. "Regulating Executive Pay: Using the Tax Code to Influence Chief Executive Officer Compensation," *Journal of Labor Economics*, 20 (S2), S138-S175

Saez, Emmanuel. 2001. "Using Elasticities to Derive Optimal Income Tax Rates." *Review of Economic Studies*, 68, 205-229.

Shen, Carl H. and Zhang, Hao, 2013. "CEO risk incentives and firm performance following R&D increases." *Journal of Banking & Finance*, 37(4), 1176-1194.

Shleifer, Andrei and Vishny, Robert W., 1989. "Management Entrenchment: The Case of Manager-Specific Investments," *Journal of Financial Economics,* 25 (1), 123-139.

Shue, Kelly and Townsend, Richard R., 2017. "How do quasi-random option grants affect CEO risk-taking?" *The Journal of Finance*, 72(6), 2551-2588.

Staiger, D., and Stock, J. H., 1997. "Instrumental Variables Regression with Weak Instruments," *Econometrica,* 65 (3), 557-586.

Stock, J. H. and Yogo, M., 2005. "Testing for Weak Instruments in Linear IV Regression." In J. H. Stock and D. W. K. Andrews (Eds.) *Identification and Inference for Econometric Models: Essays in Honor of Thomas J. Rothenberg*. New York: Cambridge University Press.

Figure 1: Empirical and Counterfactual Distributions of Salary (Training Set)

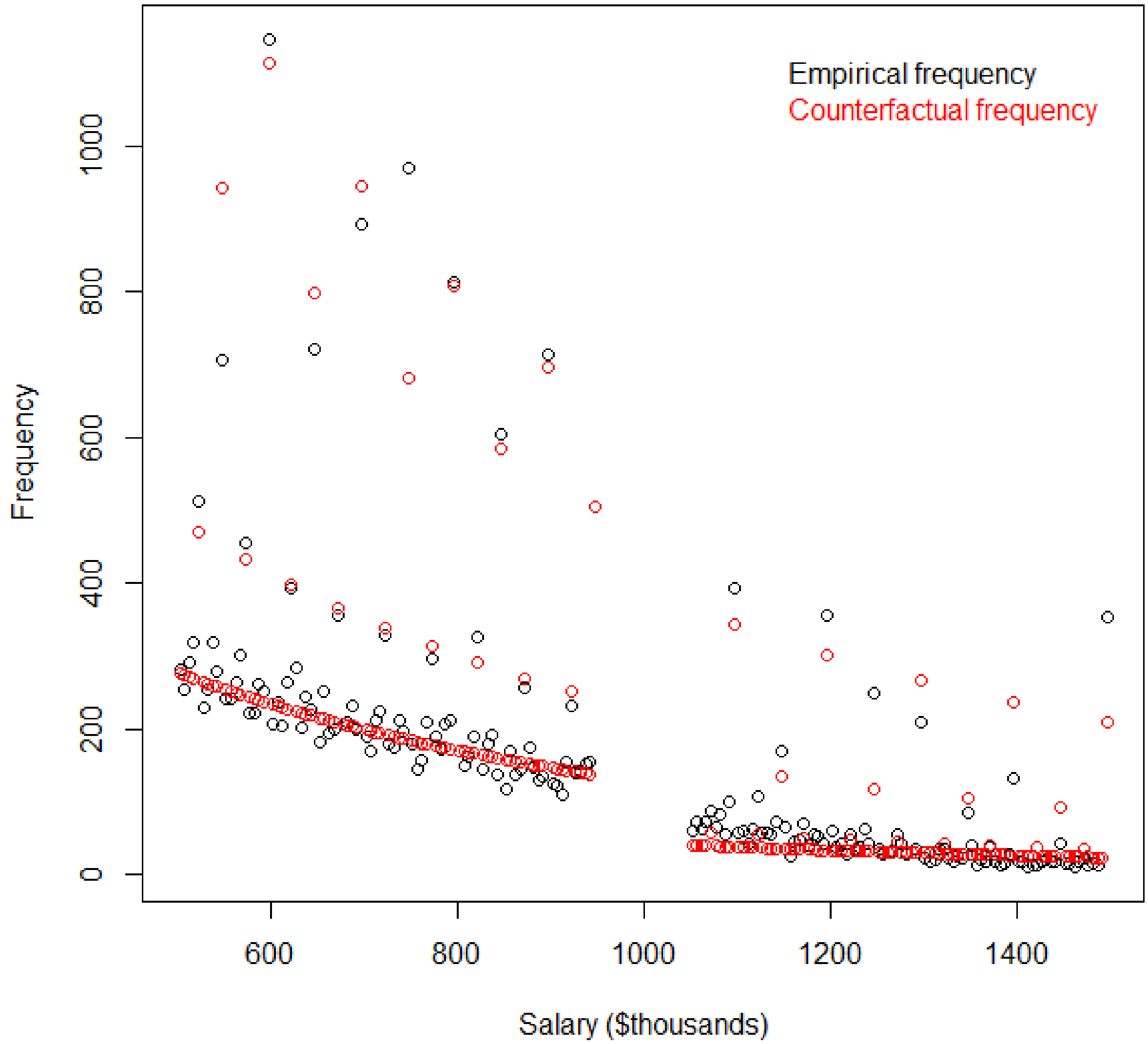


Figure 2: Empirical and Counterfactual Distributions of Cash Salary

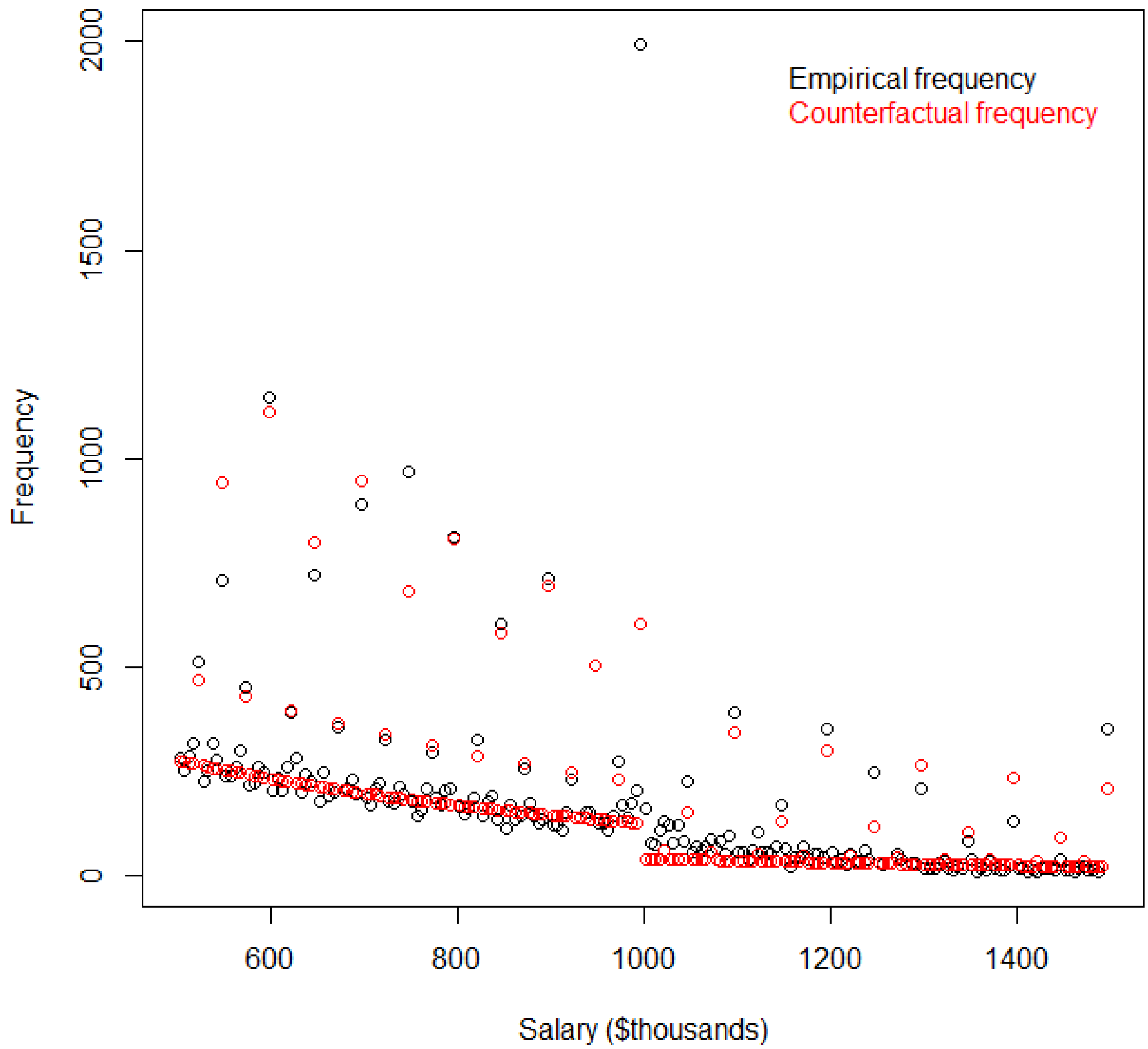


Figure 3: Bunching Trends Over Time

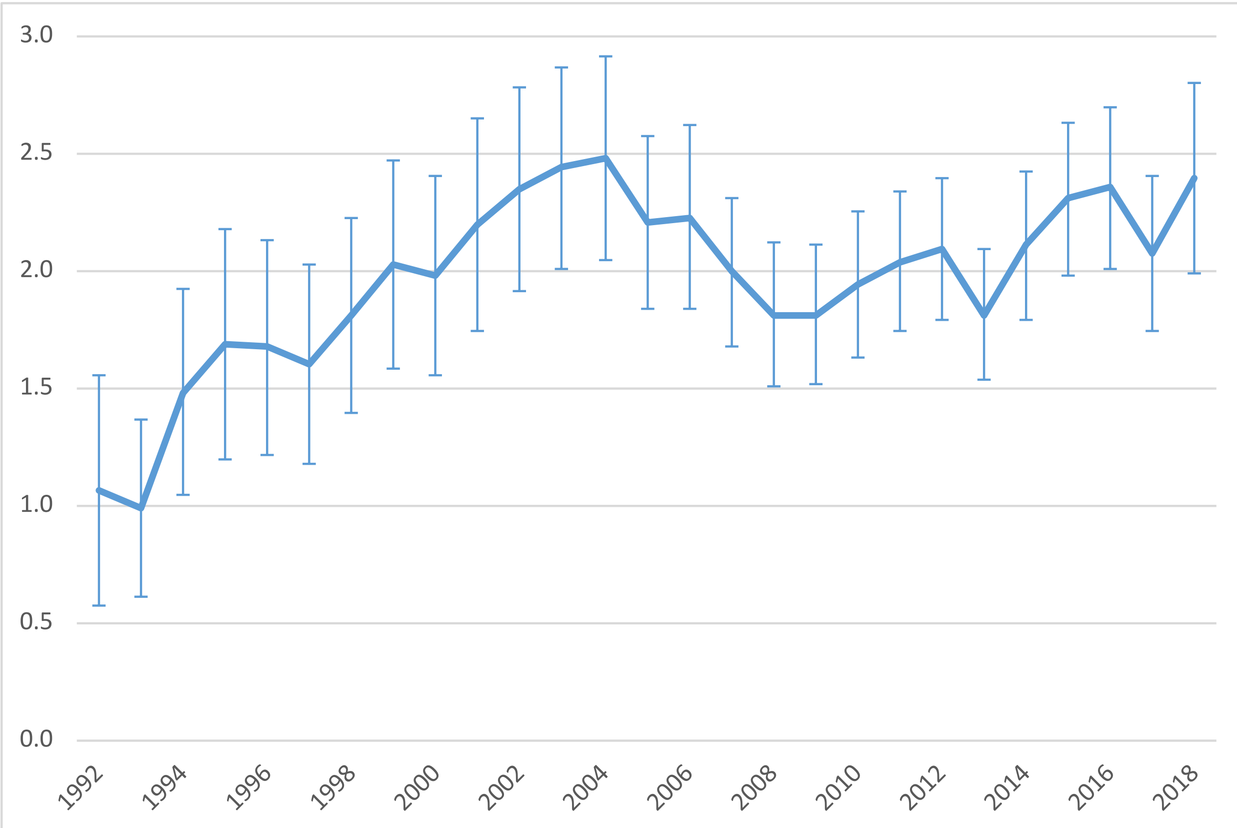


Figure 4: Detailed Bunching Around $1 Million

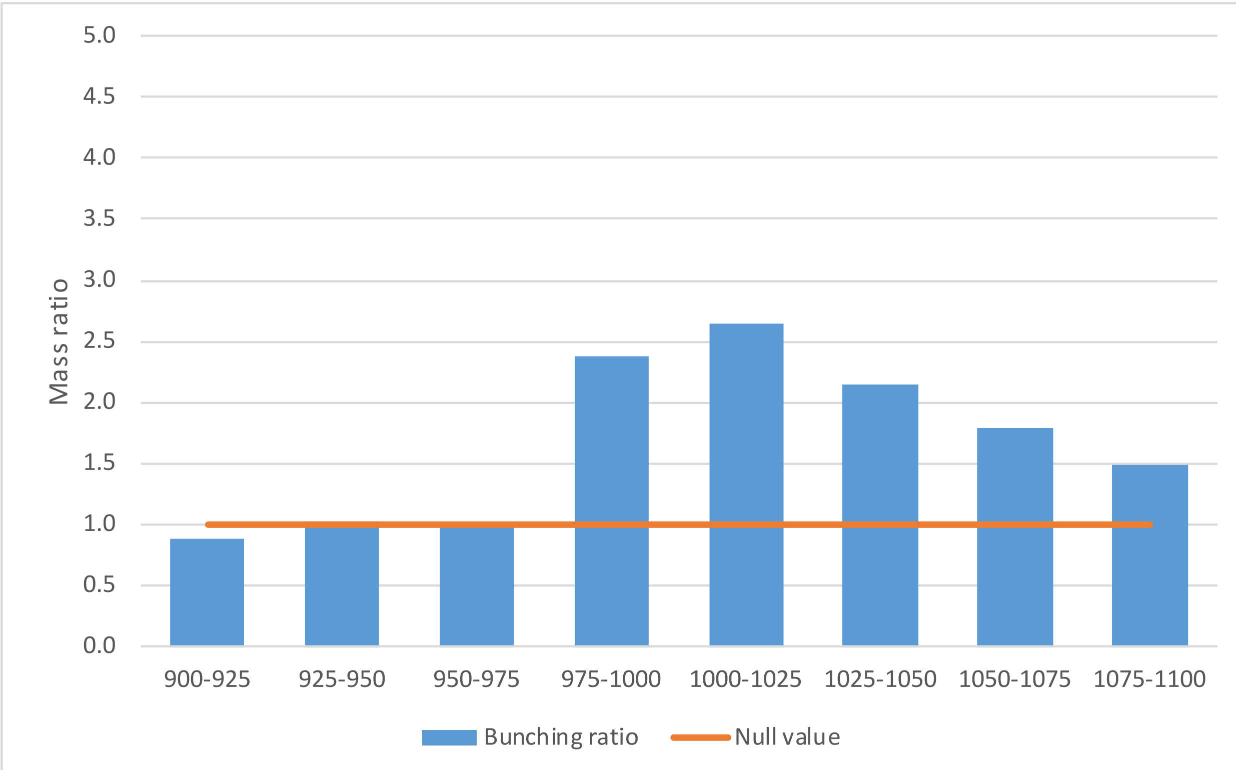


Table 1. Bunching of CEO Salaries by Year

Estimates in this table use a bunching region of $950,000 to $1.05 million, and a fitting region of $500,000 to $1.5 million. Standard errors are estimated by bootstrapping with 1,000 repetitions. All estimates except for 1992 and 1993 are highly significant against a null hypothesis mass ratio of 1. The observations are from the full sample of CEOs with salary information.

Year	Observations	Observed mass	Counterfactual mass	Mass ratio	SE
1992-2005	57534	4650	2417.04	1.9238	0.0315
1992	955	24	22.63	1.0605	0.2454
1993	1564	34	34.53	0.9847	0.1881
1994	1837	55	37.10	1.4823	0.2205
1995	1926	66	39.08	1.6888	0.2455
1996	2015	75	44.78	1.6747	0.2281
1997	2064	83	51.88	1.6000	0.2107
1998	2140	106	58.61	1.8085	0.2066
1999	2136	120	59.29	2.0241	0.2228
2000	2101	123	62.31	1.9740	0.2122
2001	2024	142	64.65	2.1965	0.2268
2002	2064	169	72.01	2.3469	0.2175
2003	2146	180	73.90	2.4356	0.2127
2004	2133	192	77.54	2.4760	0.2176
2005	2059	186	84.24	2.2079	0.1841
2006	2263	201	90.23	2.2276	0.1948
2007	2713	215	107.87	1.9931	0.1581
2008	2662	212	116.98	1.8122	0.1527
2009	2623	207	114.27	1.8114	0.1476
2010	2596	229	118.16	1.9381	0.1549
2011	2549	245	120.29	2.0367	0.1488
2012	2488	260	124.33	2.0913	0.1532
2013	2442	239	131.84	1.8128	0.1408
2014	2361	269	127.73	2.1060	0.1582
2015	2231	281	121.93	2.3045	0.1628
2016	2038	269	114.40	2.3513	0.1703
2017	1851	238	114.85	2.0723	0.1656
2018	1553	230	96.11	2.3932	0.2016

Table 2: Bunching of CEO Salaries by Industry

Estimates in this table use a bunching region of $950,000 to $1.05 million, and a fitting region of $500,000 to $1.5 million. Standard errors are estimated by bootstrapping with 1,000 repetitions. The observations are from the reduced sample of CEOs matched to firms in our final dataset. *, ** and *** denote significance at 10, 5 and 1 percent respectively. Industries are determined using the Fama-French (1997) 12-industry classification based on SIC codes. Consistent with our regressions, we exclude the finance and utility industries.

Industry	Observations	Observed mass	Counterfactual mass	Bunching ratio	SE
All industries	23282	1554	924.58	1.681	0.048
Healthcare and Medical	2155	99	77.67	1.275	0.142
Consumer Nondurables	1751	214	85.04	2.517	0.216
Business Equipment	5278	238	143.11	1.663	0.119
Manufacturing	3496	223	137.88	1.617	0.122
Other	3317	205	126.65	1.619	0.132
Telephone and Television	757	71	29.36	2.418	0.365
Oil, Gas, and Coal Extraction	1203	76	41.67	1.824	0.249
Consumer durables	808	63	28.41	2.218	0.338
Chemicals and Allied Products	1024	78	51.22	1.523	0.202
Wholesale, Retail, and Services	3493	287	149.27	1.923	0.134

Table 3: Summary Statistics

Executive compensation data are from Execucomp. Financial statement data are from Compustat. Stock return data to compute Total and Idiosyncratic Firm Risk are from Center for Research in Security Prices (CRSP). Delta and Vega values are from Lalitha Naveen's website. The data spans from 1992-2014. All variables are winsorized except Affected by 162(m).

Variable	N	Mean	Std. Dev.	Q1	Median	Q3
Risk measures						
R&D	29,636	0.034	0.058	0.000	0.002	0.044
CAPEX	29,553	0.055	0.052	0.021	0.039	0.071
Herfindahl Index	29,623	0.672	0.354	0.399	0.770	1.000
Ln(Number of Business Segments)	29,641	0.568	0.661	0.000	0.000	1.099
Book Leverage	29,524	0.217	0.184	0.047	0.200	0.331
Total Firm Risk	29,373	0.028	0.014	0.018	0.025	0.034
Idiosyncratic Firm Risk	29,373	0.025	0.013	0.016	0.022	0.031
CEO characteristics						
Affected by 162(m)	29,641	0.129	0.335	0.000	0.000	0.000
Vega	27,872	0.105	0.186	0.010	0.037	0.108
Delta	27,099	0.567	1.325	0.058	0.164	0.465
Tenure	29,641	6.726	6.542	2.000	5.000	9.000
Cash Compensation	29,641	997.396	903.358	475.303	750.000	1,155.000
Firm controls						
Ln(Sales)	29,633	7.097	1.610	6.013	7.017	8.143
Market-to-Book Ratio	29,624	2.079	1.374	1.239	1.633	2.369
Surplus Cash	29,275	0.084	0.096	0.029	0.075	0.132
Sales Growth	29,591	0.097	0.225	0.000	0.080	0.180
Stock Returns	29,225	17.585	54.170	-14.484	10.447	37.681
Intangible Growth	29,619	0.032	0.119	-0.003	0.000	0.018

Table 4: First stage regression of Vega on being affected by 162(m)

This table presents the results from estimating the following regression:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $I_{it-1}$is the CEO Vega, and Z_{it-1} is a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise, X_{it} is a set of controls for firm and CEO characteristics, and ν_i and η_t represent industry and year fixed effects (FE), respectively. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Vega
Affected by 162(m)	0.1303***
	(0.0095)
$Delta_{t-1}$	0.0322***
	(0.0046)
Tenure	-0.0004
	(0.0003)
Cash Compensation	0.0000***
	(0.0000)
Ln(Sales)	0.0275***
	(0.0021)
Market-to-Book	0.0075***
	(0.0020)
Surplus Cash	0.0761***
	(0.0177)
Sales Growth	-0.0097*
	(0.0051)
Stock Returns	-0.0002***
	(0.0000)
Constant	-0.2664***
	(0.0307)
Industry FE	Yes
Year FE	Yes
Observations	26602
R-squared	0.4574

Table 5: Instrumental Variable and OLS Regressions of Investment Policy on CEO Incentives

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either R&D Investment or CAPEX. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are presented in the columns labeled "IV." The F-statistic for the first stage is presented at the bottom of the columns. We also estimate the regression using simple OLS. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	R&D investment		CAPEX	
	IV	*OLS*	*IV*	*OLS*
$Vega_{t-1}$	0.0452***	0.0136***	-0.0073	-0.0019
	(0.0100)	(0.0030)	(0.0117)	(0.0035)
$Delta_{t-1}$	-0.0017**	-0.0006	0.0003	0.0001
	(0.0007)	(0.0005)	(0.0007)	(0.0006)
Tenure	-0.0002*	-0.0002	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Cash Compensation	-0.0000	0.0000**	-0.0000**	-0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ln(Sales)	-0.0092***	-0.0081***	-0.0012	-0.0014**
	(0.0009)	(0.0007)	(0.0008)	(0.0006)
Market-to-Book	0.0027***	0.0029***	0.0045***	0.0045***
	(0.0009)	(0.0009)	(0.0006)	(0.0006)
Surplus Cash	0.1206***	0.1225***	0.0462***	0.0458***
	(0.0129)	(0.0129)	(0.0064)	(0.0063)
Sales Growth	-0.0148***	-0.0159***	0.0156***	0.0158***
	(0.0023)	(0.0023)	(0.0021)	(0.0021)
Stock Returns	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Book Leverage	0.0038	0.0037	-0.0069*	-0.0068*
	(0.0048)	(0.0047)	-0.0039	(0.0039)
Constant	0.0890***	0.0781***	0.0310***	0.0659***
	(0.0122)	(0.0054)	(0.0071)	(0.0046)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	21540	21540	21499	21499
First stage F-stat	188.85		188.70	
R-squared	0.5396	0.5460	0.3532	0.3534

Table 6: Regressions of Firm Structure on CEO Incentives

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either the Herfindahl index based on segment sales or the natural log of the number of business segments. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are presented in the columns labeled "IV." The F-statistic for the first stage is presented at the bottom of the columns. We also estimate the regression using simple OLS. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Herfindahl Index		Ln(Business Segments)	
	IV	*OLS*	*IV*	*OLS*
Vega $_{t-1}$	-0.3614***	-0.0486	-0.4406**	-0.1357*
	(0.1139)	(0.0341)	(0.2245)	(0.0710)
Delta $_{t-1}$	0.0052	-0.0050	0.0265**	0.0165*
	(0.0057)	(0.0040)	(0.0113)	(0.0089)
Tenure	0.0006	0.0006	0.0021	0.0021
	(0.0008)	(0.0008)	(0.0017)	(0.0017)
Cash Compensation	0.0000***	0.0000	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ln(Sales)	-0.0499***	-0.0622***	0.1105***	0.0984***
	(0.0065)	(0.0047)	(0.0124)	(0.0097)
Market-to-Book	0.0245***	0.0219***	-0.0559***	-0.0584***
	(0.0044)	(0.0043)	(0.0082)	(0.0079)
ROA	0.1576***	0.1718***	-0.2459***	-0.2320**
	(0.0521)	(0.0513)	(0.0948)	(0.0950)
Sales Growth	0.0257*	0.0363***	-0.0423*	-0.0320
	(0.0133)	(0.0128)	(0.0244)	(0.0234)
Stock Returns	-0.0002***	-0.0001**	0.0004***	0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dividend Cut	-0.0252***	-0.0260***	0.0665***	0.0657***
	(0.0095)	(0.0095)	(0.0191)	(0.0191)
CEO Turnover	-0.0024	0.0082	-0.0208	-0.0105
	(0.0138)	(0.0133)	(0.0272)	(0.0265)
Book Leverage	-0.1079***	-0.1028***	-0.0684	-0.0634
	(0.0324)	(0.0323)	(0.0562)	(0.0561)
Constant	0.9928***	1.1903***	0.0893	-0.0886
	(0.0627)	(0.0329)	(0.1765)	(0.0669)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Observations	21739	21739	21739	21739
First stage F-stat	179.00		179.00	
R-squared	0.2197	0.2352	0.2011	0.2053

Table 7: Regressions of Book Leverage on CEO Incentives

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents the book value of leverage scaled by total assets. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are presented in the columns labeled "IV." The F-statistic for the first stage is presented at the bottom of the columns. We also estimate the regression using simple OLS. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Book Leverage	
	IV	*OLS*
Vega $_{t-1}$	0.0367	-0.0129
	(0.0531)	(0.0148)
Delta $_{t-1}$	-0.0095***	-0.0076***
	(0.0034)	(0.0026)
Tenure	-0.0003	-0.0003
	(0.0004)	(0.0004)
Cash Compensation	-0.0000**	-0.0000**
	(0.0000)	(0.0000)
Ln(Sales)	0.0071**	0.0090***
	(0.0033)	(0.0024)
Market-to-Book	0.0056	0.0056
	(0.0036)	(0.0036)
ROA	-0.2786***	-0.2793***
	(0.0415)	(0.0414)
NetPPE	0.0869***	0.0855***
	(0.0203)	(0.0204)
R&D	-0.3078***	-0.2966***
	(0.0726)	(0.0711)
Z-Score(*e-6)	-110.2903***	-110.4193***
	(4.6178)	(4.6246)
Constant	0.2684***	0.1861***
	(0.0532)	(0.0205)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	18299	18299
First stage F-stat	166.98	
R-squared	0.2196	0.2214

Table 8: Regressions of Firm Risk on CEO Incentives

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either Total Firm Risk (the standard deviation of stock returns over the fiscal year) or Idiosyncratic Risk (the standard deviation of the residuals from the CAPM). X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are presented in the columns labeled "IV." The F-statistic for the first stage is presented at the bottom of the columns. We also estimate the regression using simple OLS. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Total Firm Risk		Idiosyncratic Firm Risk	
	IV	*OLS*	*IV*	*OLS*
Vega $_{t-1}$	0.1746	-0.3796***	0.0107***	-0.0026***
	(0.1752)	(0.0552)	(0.0023)	(0.0006)
Delta $_{t-1}$	0.0218**	0.0408***	-0.0000	0.0004***
	(0.0100)	(0.0096)	(0.0001)	(0.0001)
Tenure	-0.0030**	-0.0028**	-0.0001***	-0.0001***
	(0.0013)	(0.0013)	(0.0000)	(0.0000)
Cash Compensation	-0.0000***	-0.0000	-0.0000***	-0.0000*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ln(Sales)	-0.2405***	-0.2188***	-0.0038***	-0.0033***
	(0.0102)	(0.0081)	(0.0001)	(0.0001)
Market-to-Book	-0.0362***	-0.0361***	-0.0006***	-0.0006***
	(0.0067)	(0.0067)	(0.0001)	(0.0001)
R&D	2.2953***	2.4284***	0.0380***	0.0412***
	(0.1963)	(0.1927)	(0.0034)	(0.0033)
CAPEX	0.3332*	0.3310*	-0.0013	-0.0014
	(0.1706)	(0.1699)	(0.0025)	(0.0025)
Intangible Growth	-0.2441***	-0.2559***	-0.0049***	-0.0052***
	(0.0386)	(0.0382)	(0.0006)	(0.0006)
Book Leverage	0.4646***	0.4593***	0.0083***	0.0082***
	(0.0536)	(0.0530)	(0.0008)	(0.0008)
Constant	-6.3995***	-6.2939***	0.0439***	0.0436***
	(0.1701)	(0.0652)	(0.0023)	(0.0009)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	21738	21738	21738	21738
First stage F-stat	188.32		188.32	
R-squared	0.5457	0.5534	0.4781	0.5007

Appendix A: Robustness Checks for Bunching Estimation

Table A1. Bunching for Non-CEO Executives

The sample of all executives uses all executives in Execucomp with salary data for 1992-2018. The non-CEO group is the subsample of these who are not CEOs during the fiscal year, and the CEO group is the subsample who are CEOs during the fiscal year. The matched CEOs are the subset of CEOs who were matched with firm data and are used in the regressions in section III. All estimates use a bunching region of $950k - 1.05m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions.

Sample	Observations	Observed mass	Counterfactual mass	Mass ratio	SE
All executives	295882	6587	3847.81	1.7119	0.0244
Non-CEOs	238348	1937	1402.61	1.3810	0.0353
CEOs	57534	4650	2417.04	1.9238	0.0315
Matched CEOs	23282	1554	924.58	1.6808	0.0466

Table A2. Comparison of Different Income Types

All estimates use the full sample, a fitting region of $500k - $1.5m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions. Our main estimates are in bold.

Bunching Region		Salary		Salary + Bonus	
Lower bound	Upper bound	Mass ratio	SE	Mass ratio	SE
900	1100	1.511	0.020	1.335	0.018
900	1050	1.491	0.021	1.334	0.018
950	1050	**1.924**	**0.031**	1.512	0.025

Table A3. Sensitivity to Bunching Region

All estimates use the full sample, a fitting region of $500k - $1.5m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions. Our main estimates are in bold.

Bunching Region ($thous)			
Lower bound	Upper bound	Mass ratio	SE
980	1020	2.539	0.054
970	1030	2.248	0.042
960	1040	2.090	0.036
950	**1050**	**1.924**	**0.031**
940	1060	1.737	0.027
930	1070	1.687	0.024
920	1080	1.614	0.022
910	1090	1.574	0.022
900	1100	1.306	0.015

Table A4. Robustness to Fitting Region

All estimates use the full sample, a bunching region of $950k - 1.05m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions. Our main estimates are in bold.

Lower bound	Upper bound	Mass ratio	SE
0	2000	3.480	0.074
100	1900	2.897	0.046
200	1800	2.409	0.037
300	1700	2.156	0.034
400	1600	1.997	0.032
500	1500	**1.924**	**0.031**
600	1400	1.853	0.031
700	1300	1.750	0.031
800	1200	1.753	0.036

Table A5. Robustness to Bin Size

All estimates use the full sample, a fitting region of $500k - $1.5m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions. Our main estimates are in bold.

Robustness to Bin Size

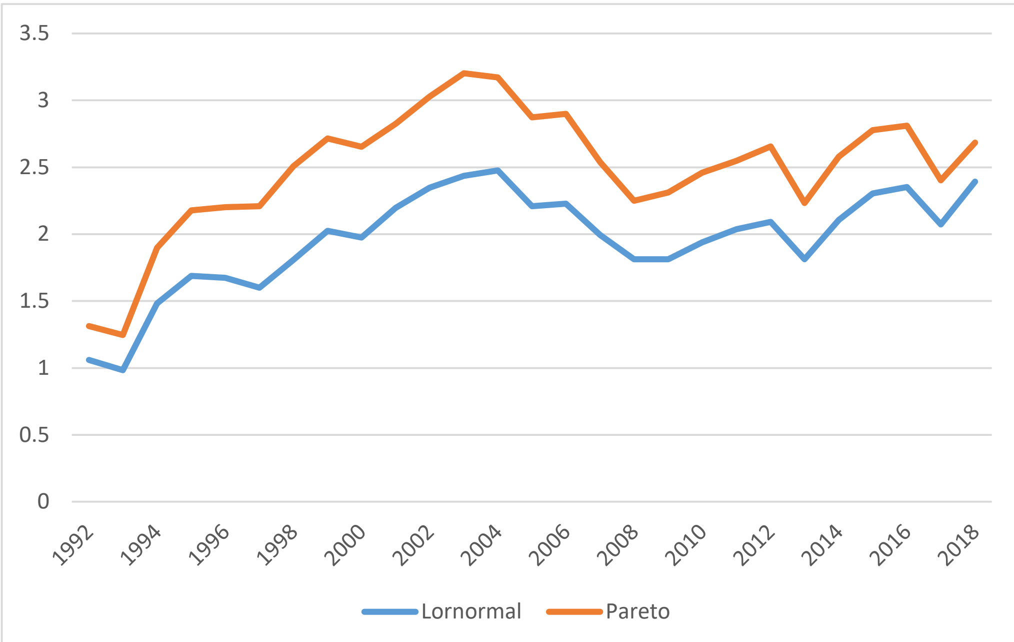
Bunching Region ($thousands)	Bin Size			
	$5,000		$10,000	
	Mass ratio	SE	Mass ratio	SE
900 - 1100	1.511	0.020	1.502	0.020
900 - 1050	1.491	0.021	1.486	0.021
950 - 1050	**1.924**	**0.031**	1.917	0.030

Table A6. Comparison to Pareto Distribution

All estimates use the full sample, a bunching region of $950k - $1.05m, a fitting region of $500k - $1.5m, and a bin size of $5k. Standard errors are estimated by bootstrapping with 1000 repetitions.

Distribution	Lornormal	Pareto
Parameters	(μ,σ)	(x_{min},α)
Parameter values	(6.40, 1.13)	(500k, 1.67)
Observed mass	4650	4650
Counterfactual mass	2417.04	1885.46
Mass ratio	1.9238	2.4662
SE	0.0315	0.0424

Figure A1. Bunching Time Trends with Alternative Distributions



Appendix B: Robustness to Definition of Affected CEOs

Table B1: First stage regression of Vega on being affected by 162(m) with income threshold of $950k

This table present the results from estimating the following regression:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $I_{it-1}$is the CEO Vega, and Z_{it-1} is a binary variable taking the value of 1 if the CEO has a cash salary and bonus of at least $950,000 and zero otherwise, X_{it} is a set of controls for firm and CEO characteristics, and ν_i and η_t represent industry and year fixed effects (FE), respectively. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Vega
Sec. 162(m) instrument	0.1170***
	(0.0082)
Delta $_{t-1}$	0.0324***
	(0.0045)
Tenure	-0.0004
	(0.0003)
Cash Compensation	0.0000***
	(0.0000)
Ln(Sales)	0.0271***
	(0.0021)
Market-to-Book	0.0074***
	(0.0020)
Surplus Cash	0.0750***
	(0.0178)
Sales Growth	-0.0100*
	(0.0051)
Stock Returns	-0.0002***
	(0.0000)
Constant	-0.2637***
	(0.0315)
Industry FE	Yes
Year FE	Yes
Observations	26602
R-squared	0.4541

Table B2: IV Regressions of Investment Policy on CEO Incentives for affected income greater than $950k

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either R&D Investment or CAPEX. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO has a cash salary and bonus of at least $950,000 and zero otherwise. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	R&D investment	CAPEX
Vega $_{t-1}$	0.0481***	-0.0045
	(0.0104)	(0.0121)
Delta$_{t-1}$	-0.0018**	0.0002
	(0.0007)	(0.0007)
Tenure	-0.0002*	0.0001
	(0.0001)	(0.0001)
Cash Compensation	-0.0000	-0.0000**
	(0.0000)	(0.0000)
Ln(Sales)	-0.0093***	-0.0013*
	(0.0009)	(0.0008)
Market-to-Book	0.0027***	0.0045***
	(0.0009)	(0.0006)
Surplus Cash	0.1204***	0.0460***
	(0.0130)	(0.0063)
Sales Growth	-0.0146***	0.0157***
	(0.0023)	(0.0021)
Stock Returns	-0.0001***	-0.0001***
	(0.0000)	(0.0000)
Book Leverage	0.0038	-0.0068*
	(0.0048)	(0.0039)
Constant	0.0898***	0.0319***
	(0.0122)	(0.0071)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	21540	21499
R-squared	0.5384	0.3534

Figure B3: IV Regressions of Firm Structure on CEO Incentives for affected income greater than $950k

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either the Herfindahl index based on segment sales or the natural log of the number of business segments. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO has a cash salary and bonus of at least $950,000 and zero otherwise. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Herfindahl Index	Ln(Business Segments)
Vega $_{t-1}$	-0.3402***	-0.3266
	(0.1156)	(0.2292)
Delta $_{t-1}$	0.0045	0.0227**
	(0.0058)	(0.0115)
Tenure	0.0006	0.0021
	(0.0008)	(0.0017)
Cash Compensation	0.0000**	0.0000***
	(0.0000)	(0.0000)
Ln(Sales)	-0.0507***	0.1060***
	(0.0065)	(0.0125)
Market-to-Book	0.0243***	-0.0568***
	(0.0044)	(0.0081)
ROA	0.1586***	-0.2407**
	(0.0521)	(0.0947)
Sales Growth	0.0264**	-0.0385
	(0.0133)	(0.0244)
Stock Returns	-0.0002***	0.0004***
	(0.0001)	(0.0001)
Dividend Cut	-0.0253***	0.0662***
	(0.0095)	(0.0191)
CEO Turnover	-0.0016	-0.0169
	(0.0138)	(0.0271)
Book Leverage	-0.1076***	-0.0666
	(0.0324)	(0.0561)
Constant	0.9991***	0.1235
	(0.0627)	(0.1780)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	21739	21739
R-squared	0.2218	0.2036

Figure B4: IV Regressions of Book Leverage on CEO Incentives for affected income greater than $950k

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents the book value of leverage scaled by total assets. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO has a cash salary and bonus of at least $950,000 and zero otherwise. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Book Leverage
Vega $_{t-1}$	0.0352
	(0.0550)
Delta $_{t-1}$	-0.0094***
	(0.0035)
Tenure	-0.0003
	(0.0004)
Cash Compensation	-0.0000**
	(0.0000)
Ln(Sales)	0.0071**
	(0.0033)
Market-to-Book	0.0056
	(0.0036)
ROA	-0.2786***
	(0.0415)
NetPPE	0.0869***
	(0.0203)
R&D	-0.3075***
	(0.0730)
Z-score(*e-6)	-110.2942***
	(4.6173)
Constant	0.2679***
	(0.0534)
Industry FE	Yes
Year FE	Yes
Observations	18299
R-squared	0.2197

Figure B5: IV Regressions of Firm Risk on CEO Incentives for affected income greater than $950k

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either Total Firm Risk (the standard deviation of stock returns over the fiscal year) or Idiosyncratic Risk (the standard deviation of the residuals from the CAPM). X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO has a cash salary and bonus of at least $950,000 and zero otherwise. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Total Firm Risk	Idiosyncratic Firm Risk
Vega $_{t-1}$	0.1361	0.0106***
	(0.1816)	(0.0024)
Delta $_{t-1}$	0.0231**	-0.0000
	(0.0103)	(0.0001)
Tenure	-0.0030**	-0.0001***
	(0.0013)	(0.0000)
Cash Compensation	-0.0000***	-0.0000***
	(0.0000)	(0.0000)
Ln(Sales)	-0.2390***	-0.0038***
	(0.0104)	(0.0002)
Market-to-Book	-0.0362***	-0.0006***
	(0.0067)	(0.0001)
R&D	2.3045***	0.0381***
	(0.1970)	(0.0034)
CAPEX	0.3331*	-0.0013
	(0.1705)	(0.0025)
Intangible Growth	-0.2449***	-0.0049***
	(0.0385)	(0.0006)
Book Leverage	0.4642***	0.0083***
	(0.0536)	(0.0008)
Constant	-6.4114***	0.0439***
	(0.1707)	(0.0023)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	21738	21738
R-squared	0.5468	0.4783

Appendix C: Robustness to Cash Compensation Structure

Table C1. IV Regressions of Investment Policy on CEO Incentives with Additional Compensation Controls

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either R&D Investment or CAPEX. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	R&D Investment	CAPEX
Vega $_{t-1}$	0.0469***	-0.0084
	(0.0116)	(0.0129)
Delta $_{t-1}$	-0.0018**	0.0002
	(0.0007)	(0.0007)
Tenure	-0.0002*	0.0001
	(0.0001)	(0.0001)
Cash Compensation	-0.0000	-0.0000***
	(0.0000)	(0.0000)
Total Compensation Less Cash	0.0000	0.0000
	(0.0000)	(0.0000)
Percent Cash Compensation	-0.0067**	-0.0029
	(0.0026)	(0.0025)
Ln(Sales)	-0.0098***	-0.0011
	(0.0009)	(0.0007)
Market-to-Book	0.0029***	0.0049***
	(0.0010)	(0.0006)
Surplus Cash	0.1166***	0.0405***
	(0.0130)	(0.0066)
Sales Growth	-0.0159***	0.0152***
	(0.0022)	(0.0020)
Stock Returns	-0.0001***	-0.0001***
	(0.0000)	(0.0000)
Book Leverage	0.0042	-0.0060
	(0.0049)	(0.0039)
Constant	0.0956***	0.0303***
	(0.0118)	(0.0073)

Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	23886	23839
R-squared	0.5371	0.3511

Table C2. IV Regressions of Firm Structure on CEO Incentives with Additional Compensation Controls

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either the Herfindahl index based on segment sales or the natural log of the number of business segments. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Herfindahl Index	Ln(Business Segments)
Vega $_{t-1}$	-0.4242***	-0.4057*
	(0.1251)	(0.2434)
Delta $_{t-1}$	0.0063	0.0242**
	(0.0056)	(0.0113)
Tenure	0.0008	0.0018
	(0.0008)	(0.0016)
Cash Compensation	0.0000*	0.0001***
	(0.0000)	(0.0000)
Total Compensation Less Cash	0.0000***	-0.0000
	(0.0000)	(0.0000)
Percent Cash Compensation	0.0121	0.0515
	(0.0194)	(0.0364)
Ln(Sales)	-0.0516***	0.1118***
	(0.0061)	(0.0118)
Market-to-Book	0.0235***	-0.0563***
	(0.0043)	(0.0080)
ROA	0.1610***	-0.2123**
	(0.0506)	(0.0937)
Sales Growth	0.0274**	-0.0393
	(0.0132)	(0.0243)
Stock Returns	-0.0002***	0.0004***
	(0.0001)	(0.0001)
Dividend Cut	-0.0208**	0.0645***
	(0.0094)	(0.0189)
CEO Turnover	-0.0070	0.0039
	(0.0098)	(0.0190)
Book Leverage	-0.1034***	-0.0772
	(0.0316)	(0.0557)

Constant	0.9894***	0.0355
	(0.0639)	(0.1711)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	24117	24117
R-squared	0.2122	0.1991

Robust standard errors (clustered by firm) in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C3. IV Regressions of Book Leverage on CEO Incentives with Additional Compensation Controls

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents the book value of leverage scaled by total assets. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Book Leverage
$Vega_{t-1}$	0.0959
	(0.0605)
$Delta_{t-1}$	-0.0107***
	(0.0035)
Tenure	-0.0004
	(0.0004)
Cash Compensation	-0.0000**
	(0.0000)
Total Compensation Less Cash	-0.0000***
	(0.0000)
Percent Cash Compensation	-0.0114
	(0.0116)
Ln(Sales)	0.0064**
	(0.0032)
Market-to-Book	0.0076**
	(0.0038)
ROA	-0.2883***
	(0.0413)
NetPPE	0.0972***
	(0.0203)
R&D	-0.2941***
	(0.0740)
Z-score(*e-6)	-110.8854***
	(4.5883)
Constant	0.2701***
	(0.0542)
Industry FE	Yes
Year FE	Yes

Observations	20372
R-squared	0.2144

Table C4. Regressions of Firm Risk on CEO Incentives with Additional Compensation Controls

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either Total Firm Risk (the standard deviation of stock returns over the fiscal year) or Idiosyncratic Risk (the standard deviation of the residuals from the CAPM). X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Total Firm Risk	Idiosyncratic Firm Risk
Vega $_{t-1}$	-0.1246	0.0071***
	(0.1872)	(0.0025)
Delta $_{t-1}$	0.0235**	-0.0000
	(0.0096)	(0.0001)
Tenure	-0.0037***	-0.0001***
	(0.0012)	(0.0000)
Cash Compensation	-0.0000***	-0.0000***
	(0.0000)	(0.0000)
Total Compensation Less Cash	0.0000***	0.0000***
	(0.0000)	(0.0000)
Percent Cash Compensation	0.2118***	0.0041***
	(0.0332)	(0.0005)
Ln(Sales)	-0.2353***	-0.0037***
	(0.0099)	(0.0001)
Market-to-Book	-0.0413***	-0.0006***
	(0.0065)	(0.0001)
R&D	2.3121***	0.0395***
	(0.1928)	(0.0033)
CAPEX	0.3099*	-0.0014
	(0.1693)	(0.0026)
Intangible Growth	-0.2688***	-0.0050***
	(0.0370)	(0.0006)
Book Leverage	0.4661***	0.0084***
	(0.0517)	(0.0008)
Constant	-6.5307***	0.0411***
	(0.1686)	(0.0023)
Industry FE	Yes	Yes
Year FE	Yes	Yes

Observations	24111	24111
R-squared	0.5552	0.4914

Appendix D: Robustness to Time Period

Table D1: IV Regressions of Investment Policy on CEO Incentives for 1992-2005

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either R&D Investment or CAPEX. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	R&D investment	CAPEX
Vega $_{t-1}$	0.0417***	0.0151
	(0.0126)	(0.0178)
Delta $_{t-1}$	-0.0018**	-0.0015*
	(0.0009)	(0.0008)
Tenure	-0.0003**	0.0002
	(0.0001)	(0.0001)
Cash Compensation	0.0000	-0.0000**
	(0.0000)	(0.0000)
Ln(Sales)	-0.0086***	-0.0016*
	(0.0009)	(0.0009)
Market-to-Book	0.0036***	0.0052***
	(0.0010)	(0.0007)
Surplus Cash	0.0952***	0.0563***
	(0.0133)	(0.0083)
Sales Growth	-0.0147***	0.0163***
	(0.0028)	(0.0028)
Stock Returns	-0.0001***	-0.0001***
	(0.0000)	(0.0000)
Book Leverage	0.0041	-0.0021
	(0.0057)	(0.0052)
Constant	0.0894***	0.0313***
	(0.0139)	(0.0090)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	11826	11785
R-squared	0.5554	0.3041

Table D2: IV Regressions of Firm Structure on CEO Incentives for 1992-2005

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either the Herfindahl index based on segment sales or the natural log of the number of business segments. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$ is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Herfindahl Index	Ln(Business Segments)
Vega $_{t-1}$	-0.0973	-0.1323
	(0.1406)	(0.2819)
Delta $_{t-1}$	-0.0026	0.0140
	(0.0056)	(0.0124)
Tenure	-0.0000	0.0021
	(0.0009)	(0.0018)
Cash Compensation	0.0000	0.0000
	(0.0000)	(0.0000)
Ln(Sales)	-0.0559***	0.0983***
	(0.0063)	(0.0127)
Market-to-Book	0.0247***	-0.0460***
	(0.0048)	(0.0085)
ROA	0.1560***	-0.4449***
	(0.0580)	(0.1018)
Sales Growth	0.0272*	-0.0700**
	(0.0158)	(0.0292)
Stock Returns	-0.0002***	0.0004***
	(0.0001)	(0.0001)
Dividend Cut	-0.0284***	0.0686***
	(0.0104)	(0.0204)
CEO Turnover	-0.0305*	0.0247
	(0.0161)	(0.0323)
Book Leverage	-0.0713**	-0.0079
	(0.0338)	(0.0624)
Constant	1.0375***	0.1037
	(0.0617)	(0.1561)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	11925	11925
R-squared	0.2474	0.2319

Table D3: IV Regressions of Book Leverage on CEO Incentives for 1992-2005

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents the book value of leverage scaled by total assets. X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Book Leverage
Vega $_{t-1}$	0.0183
	(0.0676)
Delta $_{t-1}$	-0.0053
	(0.0039)
Tenure	-0.0005
	(0.0005)
Cash Compensation	-0.0000
	(0.0000)
Ln(Sales)	0.0089***
	(0.0034)
Market-to-Book	0.0015
	(0.0038)
ROA	-0.3631***
	(0.0463)
NetPPE	0.0955***
	(0.0234)
R&D	-0.3798***
	(0.0806)
Z-score(*e-6)	-102.1052***
	(6.0064)
Constant	0.2433***
	(0.0601)
Industry FE	Yes
Year FE	Yes
Observations	10199
R-squared	0.2357

Table D4: IV Regressions of Firm Risk on CEO Incentives for 1992-2005

Using instrumental variables, we estimate the following regression using 2-stage generalized method of moments (GMM):

$$Y_{it} = \beta_0 + \beta_1 \hat{I}_{it-1} + \beta_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where Y_{it} represents either Total Firm Risk (the standard deviation of stock returns over the fiscal year) or Idiosyncratic Risk (the standard deviation of the residuals from the CAPM). X_{it} is a set of controls for firm and CEO characteristics, ν_i and η_t represent industry and year fixed effects, respectively. The first stage regression is:

$$I_{it-1} = \alpha_0 + \alpha_1 Z_{it-1} + \alpha_2 X_{it} + \nu_i + \eta_t + \epsilon_{it},$$

where $\hat{I}_{it-1}$is the CEO incentive to take risk measured by vega and Z_{it-1} is the instrument of a binary variable taking the value of 1 if the CEO is affected by the rule and zero otherwise. The results from the second stage are displayed. Robust standard errors, clustered by firm, are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Total Firm Risk	Idiosyncratic Firm Risk
Vega $_{t-1}$	0.3693*	0.0097***
	(0.2130)	(0.0029)
Delta $_{t-1}$	0.0211*	0.0001
	(0.0108)	(0.0001)
Tenure	-0.0009	-0.0000*
	(0.0017)	(0.0000)
Cash Compensation	-0.0001***	-0.0000***
	(0.0000)	(0.0000)
Ln(Sales)	-0.2357***	-0.0037***
	(0.0111)	(0.0002)
Market-to-Book	-0.0198***	-0.0005***
	(0.0069)	(0.0001)
R&D	3.0075***	0.0517***
	(0.2258)	(0.0039)
CAPEX	0.1565	-0.0018
	(0.1938)	(0.0029)
Intangible Growth	-0.2050***	-0.0037***
	(0.0492)	(0.0008)
Book Leverage	0.4686***	0.0075***
	(0.0665)	(0.0010)
Constant	-6.4055***	0.0424***
	(0.1761)	(0.0027)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	11922	11922
R-squared	0.5823	0.5403