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Abstract

Using new data on S&P 1500 firms' chief executive officer (CEO)-to-employee pay ratios disclosed by mandate of Section 953(b) of the Dodd-Frank Act, we examine the effect of within-firm pay inequality on bond yield spreads. We find a significant negative relation between industry-adjusted CEO-to-employee pay ratio and yield spreads while controlling for covariates and endogeneity. This result is strongest in financially constrained, labor-intensive, and small-to-medium-sized firms. The evidence supports the incentive-provision explanation of CEO-to-employee pay disparity, reflecting efficient CEO compensation rather than rent extraction. We also document selection bias in self-reported pay ratios, highlighting the efficacy of the Dodd-Frank provisions.

1 INTRODUCTION

Reduction of inequality has been named as one of the goals for sustainable development by the United Nations.[1] Inequality has also been front and center of the political platforms of many political leaders around the world.[2] The rising gap between chief executive officer (CEO) pay and the pay of an average employee has been at the center of the attention. MarketWatch reports that among the United States' top 350 businesses, CEO-to-employee pay ratio has increased to 278:1 by 2018, up from 20:1 in 1965.[3] However, academic research on the effects of pay inequality within firms has been limited by data availability. Prior to the Dodd-Frank Act increasing mandatory disclosure of compensation information enacted in 2015, companies did not have to disclose median employee compensation. Consequently, prior research on pay inequality faced severe limitations stemming from small sample size and selection bias.

After the passage of the Dodd-Frank Act in 2015, the Securities and Exchange Commission (SEC) adopted a rule requiring public companies to disclose median employee pay and its ratio to CEO pay beginning in fiscal year 2017. This paper is the first to use median worker compensation data reported by all S&P 1500 companies following the mandate of the Dodd-Frank Act to examine whether CEO-to-employee pay ratio affects firm cost of debt. The investigation furthers ongoing research on the implications of CEO pay increases over time (Gabaix & Landier, 2008; Vo & Canil, 2019) and extends the literature on executive compensation and corporate borrowing costs (Brockman, Martin, & Unlu, 2010; Bryan, Nash, & Patel, 2006; Liu & Jiraporn, 2010). Our

[1] https://www.un.org/development/desa/disabilities/envision2030.html
[2] https://www.axios.com/2020-democrats-economic-inequality-8e4aafc1-a4a1-4921-bede-e9788dccc8a5.html
[3] "CEOs Are Paid 278 Times More than the Average U.S. Worker," MarketWatch, August 31, 2019, https://www.marketwatch.com/story/ceos-are-paid-278-times-more-than-the-average-us-worker-2019-08-15.

study is also one of the first to use this newly available comprehensive data set within the broader academic literature. Related studies making use of this data set include Bardos, Ertugul, and Kozlowski (2020), who examine the determinants of CEO-to-employee pay ratio and its effect on productivity and firm performance, and Alan, Bardos, and Shelkova (2020), who examine if CEO gender explains CEO-to-employee pay ratio. Additionally, Jung, Kim, Ryu, and Shin (2018) examine which firms are more likely to disclose a supplementary pay ratio and the incentives for doing so.

Two concurrent working papers examine the association of CEO-to-employee pay ratio and the cost of debt and find contradictory results. Lei (2017) finds that increased CEO-to-employee pay disparity is associated with a higher probability of credit rating upgrades and reductions in the cost of debt. Conversely, Huang, Huang, and Yu (2018) find a positive relation between CEO-to-employee pay ratio and bond yield spreads for seasoned corporate bonds, particularly among financially constrained firms. However, both studies use the same pre-Dodd-Frank measure of CEO-to-employee pay ratio over similar time periods. This pay ratio proxy equals total self-reported labor costs (in Compustat) less the total compensation of the top five highest-paid executives (from ExecuComp), divided by the number of employees reported in Compustat. However, the self-reported data comprise less than 10% of public firms for the 1992–2014 sample period and thus suffers from potentially severe sample selection and omitted variable biases. For instance, Lei (2017) finds that larger firms with higher leverage and physical capital intensity but lower market-to-book ratio and sales per employee are more likely to report labor expenses and the number of employees.

We reexamine the relation between CEO-to-employee pay ratio and the cost of debt using newly available data following added disclosure requirements for executive and employee compensation. The mandate applies to all publicly traded firms beginning in 2017 as stipulated in Section 953(b) of the Dodd-Frank Act. Several key features distinguish our measure of CEO-to-employee pay ratio from that used in existing studies examining the cost of debt. First, mandatory reporting requirements ensure data availability for the full set of S&P 1500 constituents. Second, our measure uses median employee compensation to compute the CEO-to-employee pay ratio, whereas Lei (2017) and Huang, Huang, and Yu (2018) approximate mean employee pay by subtracting the compensation of the top five executives from total labor costs and dividing by the number of employees. This may distort typical employee compensation if the firm has many highly paid executives beyond the top five or more generally if the company's pay distribution is highly skewed. Finally, our data provide industry-median employee compensation available at the firm level to compute an accurate measure of industry-adjusted pay ratio.[4]

Existing literature offers several predictions regarding the relation between CEO-to-employee pay disparity and the cost of debt. Mueller, Ouimet, and Simintzi (2017) discuss the incentive-provision and talent assignment hypotheses to explain within-firm pay inequality. Incentive provision predicts that high CEO-to-employee pay disparity will be associated with lower borrowing costs as greater executive pay motivates optimal CEO effort and improves firm performance. Similarly, talent assignment suggests that large firms with extensive resources pay higher executive compensation to secure top-quality CEOs, thus also predicting decreases in

[4] Lei (2017) computes industry-adjusted CEO-to-worker pay ratio using industry mean wage rates provided by the Bureau of Labor Statistics at the four-digit North American Industry Classification System (NAICS) level.

borrowing costs as talented managers improve firm performance. Alternatively, CEO rent extraction suggests that greater pay disparity corresponds with a higher cost of debt as pay disparity may reflect managers' ability to extract private benefits and excessive compensation at the expense of bondholders. Finally, inequity aversion also predicts increases in borrowing costs with higher pay disparity, as perceived inequality or injustice may cause employee shirking and impair firm performance.

Our empirical analysis finds an economically and statistically significant negative relation between CEO-to-employee pay ratio and yield spreads on corporate bonds after controlling for key firm and bond characteristics as well as potential endogeneity. Evidence from ordinary least squares (OLS) and two-stage least squares regression models indicate that a one standard deviation increase in the adjusted pay ratio corresponds with up to a 38 basis point reduction in yield spreads. The analysis supports a causal relation between pay disparity and cost of debt consistent with the incentive-provision and talent assignment hypotheses rather than rent extraction or inequity aversion.

To distinguish between the incentive-provision and talent assignment explanations, we first examine the role of financial constraints, labor intensity, and firm size in the relation between pay disparity and the cost of debt. Incentive provision predicts a stronger effect in financially constrained firms as efficient compensation structures become more critical and in labor-intensive firms where worker effort and motivation play a larger role. Talent assignment instead suggests stronger effects among the largest firms able to attract superstar CEOs with profuse compensation. Consistent with incentive provision, we find the strongest negative relation between pay disparity and borrowing costs in financially constrained, labor-intensive, and smaller firms. We next examine firm-year changes in CEO compensation. Because CEOs receive substantial bonus pay for achieving performance targets (Shue & Townsend, 2017), changes in total CEO pay are related to exerted effort. Incentive provision thus predicts larger reductions in borrowing costs associated with increases in CEO pay, whereas talent assignment suggests no relation between these outcomes as an individual's innate talent remains more stable over time. Empirical tests show that reductions in borrowing costs increase with changes in CEO pay, again supporting incentive provision. Overall, the evidence suggests that CEO-to-employee pay disparity corresponds with efficient compensation practices that motivate optimal effort and reduce perceived firm risk, leading to lower corporate borrowing costs.

We evaluate the impact of sample bias in self-reported rather than Dodd-Frank mandated compensation data by replicating our analysis using the measure of CEO-to-employee pay used in Lei (2017), Huang, Huang, and Yu (2018), Faleye, Reis, and Venkateswaran (2013), and Balsam, Choi, John, and Ju (2019). Like these studies, less than 10% of our sample firms report the necessary data. In contrast to our full sample results using the newly available Dodd-Frank pay ratio data, we find a positive relation between self-reported CEO-to-employee pay ratio and yield spreads for the voluntarily disclosing firms in our sample. Significant differences in key firm characteristics between self-reporting and nonself-reporting firms raise serious concerns as to the reliability of these tests and suggest that the self-reporting subsample of firms do not represent the broader population. The analysis points to meaningful selection bias affecting self-reported pay ratio data and attests to the efficacy of the Dodd-Frank regulation to promote greater transparency in financial markets.

This paper makes several important contributions to the corporate finance literature. First, our findings highlight the usefulness of the Dodd-Frank reporting requirements on CEO-to-employee pay ratio. Much debate has centered on whether required disclosure of median employee pay would benefit financial market participants as former commissioner of the SEC Daniel M. Gallagher openly opposed the provision.[5] Using these data, however, we document novel evidence on the implications of CEO-to-employee pay disparity and quantify its influence on corporate borrowing costs. Moreover, our analysis reveals potentially severe sample bias affecting studies using self-reported compensation data.

Second, this study extends a prominent body of research on the determinants and economic consequences of CEO compensation and within-firm pay inequality. Numerous recent studies examine the relation between CEO-to-employee pay disparity and firm performance and document mixed results while using different measures of the executive pay ratio. Faleye, Reis, and Venkateswaran (2013), Cheng, Ranasinghe, and Zhao (2017), Mueller, Ouimet, and Simintzi (2017), and Uygur (2019) find a positive association, whereas Elkins (2016), Rouen (2020), and Green and Zhou (2019) find a negative association—at least for some measures of CEO-to-employee pay ratios with no relation for others. Balsam, Choi, John, and Ju (2019) find a concave relation that is dependent on firm characteristics. Chen, Huang, and Wei (2013) find a positive association between CEO pay slice (defined as CEO compensation relative to that of the next top-five executives) and the cost of equity. Our findings suggest that high CEO-to-employee pay inequality corresponds with efficient compensation practices rather than CEO entrenchment.

[5] https://www.sec.gov/news/public-statement/2013-09-18-open-meeting-statement-dmg

Third, we add to an extensive literature on the determinants of corporate borrowing costs and offer new evidence on the implications of executive compensation for the cost of debt. Several papers examine whether compensation practices matter to bondholders but yield ambiguous empirical findings using various proxies for CEO pay. Liu and Jiraporn (2010) find that high CEO compensation relative to the next-five highest paid executives in the firm corresponds with lower credit ratings and higher yield spreads. Also focusing on compensation of CEOs relative to the next-five highest paid executives, Huang, Huang, and Lee (2019) find a positive association between CEO pay disparity and yields on seasoned debt. However, recent attention on pay inequality among the financial press, regulators, and researchers focuses primarily on CEO pay relative to common workers rather than other top managers. Our study provides the first robust empirical analysis of CEO-to-employee pay ratio and cost of debt using newly available data for the full S&P 1500 index. We find evidence to support the incentive-provision explanation for a negative relation between pay disparity and the cost of debt. Consistent with efficient compensation practices motivating optimal effort and improving firm performance, the results indicate the strongest negative relation between pay ratio and yield spreads among financially constrained firms, labor-intensive firms, and small-to-medium-sized firms. Overall, the findings suggest that high CEO-to-employee pay inequality corresponds with the efficient compensation of talented executives and a reduction of excess labor costs, thereby reducing corporate borrowing costs.

The paper proceeds as follows. Section 2 develops the hypotheses. Section 3 describes the data. Section 4 presents empirical results. Section 5 assesses robustness. Section 6 concludes.

2 HYPOTHESIS DEVELOPMENT

Prior literature offers numerous theories as to why within-firm pay inequality might affect its stakeholders, particularly bondholders. Mueller, Ouimet, and Simintzi (2017) discuss two possible explanations for within-firm inequality. First, the talent assignment hypothesis suggests that pay inequality reflects differences in managerial talent as the actions of top managers are more scalable than those of rank-and-file employees (Edmans, 2016). Furthermore, CEOs command a higher salary because these executives have higher synergy potential as their effort reduces other agents' marginal cost of effort. This implies that the most talented managers will work for large firms that offer high executive compensation in order to attract top-quality CEOs (Rosen, 1981). Supporting this view, Mueller, Ouimet, and Simintzi (2017) find greater within-firm pay inequality at larger firms. Talent assignment predicts a negative relation between CEO-to-employee pay disparity and the cost of debt as the actions of superstar CEOs enhance firm performance and reduce risk to bondholders.

Second, the incentive-provision hypothesis suggests that higher CEO pay reflects stronger incentive structures for executives. Furthermore, tournament theory suggests that within-firm inequality also motivates workers by increasing the value of promotions, improving employee effort (Lazear & Rosen, 1981). Potential moral hazard problems facing corporate executives may likewise necessitate greater CEO compensation to ensure optimal effort and performance. Strong incentive provisions and performance-based pay not only motivate optimal CEO effort but also minimize labor costs for nonessential or underperforming employees. Incentive provision therefore also predicts a negative relation between pay disparity and borrowing costs by improving CEO effort and reducing excess personnel expenses to the benefit of bondholders.

Alternatively, the rent extraction hypothesis contends that higher within-firm pay inequality may indicate CEOs appropriating private benefits at the expense of outside investors. Both shareholders and bondholders bear the cost of managers expropriating wealth from the firm (Bebchuk, Fried, & Walker, 2002). Rent extraction thus suggests a positive relation between CEO-to-employee pay ratio and bond yield spreads.

Green and Zhou (2019) also discuss how inequity aversion (Adams, 1965; Cowherd & Levine, 1992) may explain a positive relation between pay ratio and the cost of debt stemming from feelings of unfairness that lower productivity among average employees (Akerlof & Yellen, 1990). Similarly, Faleye, Reis, and Venkateswaran (2013) argue that employees will engage in costly behaviors such as shirking and excessive voluntary turnover to resolve perceived inequalities in their outcome-to-input ratios. Inequity aversion therefore also predicts a positive relation between within-firm pay disparities and the cost of debt.

3 DATA

The SEC adopted a final rule on August 5, 2015 requiring publicly listed companies to disclose the ratio of CEO compensation to that of the median employee of the company beginning with their first fiscal year starting on or after January 1, 2017. We obtain data on CEO-to-employee pay ratio collected from SEC Schedule 14A filings for all S&P 1500 firms using the MyLogIQ database. The data set features detailed compensation information by firm, industry, and sector. The number of employees, CEO compensation, median employee compensation, and CEO-to-median-employee compensation ratio is provided for each firm. Detailed information is also provided by industry and sector, including the mean, median, and distribution of CEO compensation, median employee compensation, and pay ratio. Further, the data set reports the number (and percentage) of firms in each industry and sector reporting a pay ratio in each year.

To form our sample, we first exclude utilities (Standard Industrial Classification [SIC] codes 4812, 4813, and 4911–4991) and financial firms (SIC codes 6020–6799), as differences in the regulation and operating structure of these firms may influence the relation between compensation ratio and borrowing costs. Next, we match the remaining firms to bond data and trading statistics from the Trade Reporting and Compliance Engine (TRACE) and Committee on Uniform Securities Identification Procedures (CUSIP) databases, dropping all firm-years for which the company has no reported bond trades. We merge the remaining sample with firm characteristics from Compustat, interest rate data from the Federal Reserve Database, and stock trading information from the Center for Research in Security Prices (CRSP) and the Beta Suite platform provided in Wharton Research Data Services (WRDS). We match firm-year observations to the last reported bond trade of the fiscal year for each of the firm's bond issues outstanding during the fiscal year-end month. To finalize the estimation sample, we exclude all convertible, secured, and floating coupon rate bonds as these features may obscure the relation between pay ratio and the cost of debt. The resulting sample includes 679 firm-years corresponding with 5,913 unique firm-year-issue observations for the 2017–2018 sample period. Our multivariate tests evaluate the relation between bond yield spreads and lagged pay ratios, however, and thus include 372 firm-years and 3,339 unique firm-year-issue observations.

3.1 Variables measurement

3.1.1 Primary variables

We measure the pay ratio (*Ratio*) as CEO compensation divided by median employee pay provided in the MyLogIQ database. For our empirical tests, we scale this ratio by the industry-median pay ratio (by two-digit SIC code) to compute our *Adj. Ratio* variable. By measuring the pay ratio relative to its industry-median value, our *Adj. Ratio* variable provides an informative and easy-to-interpret measure that exhibits fewer outliers. CEO-to-employee pay disparity varies significantly across industries; thus, the typical industry pay disparity serves as a natural benchmark. We also subsequently repeat our analyses using the unadjusted pay ratio to ensure our results are robust.

As in seminal fixed-income research, we measure the cost of debt using yield spreads on corporate bonds (Duffee, 1998; Leland, 1998). We compute each bond's *Spread* as the reported closing yield minus the prevailing duration-matched Constant Maturity Treasury (CMT) rate on the trade date.[6] Each issue is matched to the appropriate benchmark rate by minimizing the absolute difference in Macaulay duration between the two securities (Anderson, Mansi, & Reeb, 2003).

3.1.2 Control variables

Table 1 provides definitions for each of the variables used in our analysis. Our primary outcome variable is the yield spread of each bond issue; therefore, we include controls for both firm-level characteristics that capture differences in risk and expected borrowing costs as well as bond issue–level characteristics that reflect the important features of each unique security. Our firm-level controls include the annualized stock return standard deviation (*Volatility*), book-to-market ratio

[6] The reported yield in the TRACE database measures the yield to worst (i.e., the lower of the yield to maturity or yield to call), directly accounting for the economic impact of any call provisions included in our sample bond issues.

(*B/M*), ratio of total long-term debt to total long-term debt plus the market value of equity (*Leverage*), log of total assets (*Size*), return on assets (*ROA*), and the log of the number of years since a firm appears in the CRSP database (*Firm Age*). The controls specific to each bond issue include Macaulay duration (*Duration*), coupon rate (*Coupon*), log of the difference between the reported transaction date and bond issue date (*Bond Age*), and an indicator variable equal to one if the bond is rated "high yield," and zero otherwise (*Junk*). We also use industry fixed effects, defined by two-digit SIC code, to control for differences in the risk particular to each industry and any related unobservable factors that explain variation in bond yields.

[[Please insert Table 1 about here.]]

3.2 Descriptive statistics

Table 2 presents summary statistics for the variables used in our analysis, and we winsorize all variables at the 2.5th and 97.5th percentiles to mitigate the effect of potential outliers. Panel A reports statistics for variables measured at the firm-year level. The *Adj. Ratio* measure has a mean (median) of 1.184 (1.082) and exhibits considerable variation in the sample. An average value close to one is expected because the pay ratio is normalized by the industry median pay ratio within the corresponding fiscal year. The maximum value of 3.314, for example, would suggest that the firm's ratio of CEO-to-median employee compensation exceeds the typical within-industry pay ratio by a factor of 3.314—reflecting substantial pay inequality. Large variation in CEO-to-employee pay ratios is most directly observable from the summary statistics for *Ratio*. This unadjusted measure has a mean (median) value of 260.4 (176.0) and ranges from 62 to 1,188. The large average value highlights the common criticism of excessive CEO compensation—with the typical CEO in our sample earning 260 times more than the firm's median employee.

Panel B reports statistics for variables computed at the bond issue level. Our main outcome variable, *Spread*, has a mean (median) value of 1.751 (1.372). The relatively low premium paid above the corresponding duration-matched Treasury security is reflective of the strong economy during our sample period and the fact that our sample is comprised of relatively large S&P 1500 firms. The bond yield spread ranges from a minimum of 0.169 to a maximum of 6.287, however, with a standard deviation exceeding 1% (1.315), indicating considerable variation in the dependent variable. Our analyses aim to explore whether within-firm pay disparity helps to explain differences in the cost of debt.

[[Please insert Table 2 about here.]]

Table 3 presents a correlation matrix for the variables used in our empirical analyses. Our main outcome variable, *Spread*, exhibits a negative correlation with both *Ratio* and *Adj. Ratio*, with values of –0.12 and –0.25. The negative relation suggests higher CEO-to-employee pay ratios are associated with lower borrowing costs, consistent with the talent assignment and incentive-provision hypotheses but not with the rent extraction or inequity aversion arguments. Following economic intuition, *Spread* also exhibits high correlations with *Volatility*, *Leverage*, *Coupon*, and *Junk*. We accordingly control for these and other firm and bond characteristics that capture differences in default risk in our multivariate analysis of pay ratio and the cost of debt.

[[Please insert Table 3 about here.]]

4 EMPIRICAL ANALYSIS

4.1 Compensation ratio and the cost of debt

Our empirical analysis estimates yield spreads as a function of the lagged adjusted pay ratio, controlling for relevant covariates and industry fixed effects to account for unobserved heterogeneity. We use lagged rather than contemporaneous adjusted pay ratio because prior-year compensation levels are both observable to bondholders and unaffected by yield spreads in the current year, allowing us to measure the influence of CEO-to-employee pay disparity on borrowing costs. Our primary test estimates the following OLS specification:

$$Spread_{ijt}=\beta_0+\beta_1 Adj.\ Ratio_{jk,t-1}+\boldsymbol{\gamma X_{jt}}+\boldsymbol{\delta Y_{it}}+\boldsymbol{\psi_k}+\boldsymbol{\phi_t}+\varepsilon_{ijt} \tag{1}$$

where $Spread_{ijt}$ is the yield spread for bond issue *i* of firm *j* in industry *k* as of fiscal year-end *t*. $Adj.\ Ratio_{jkt-1}$ denotes firm *j*'s industry-adjusted compensation ratio in year *t-1*. $\mathbf{X_{jt}}$ is a vector of firm characteristics including CEO and median employee compensation, stock volatility, book-to-market ratio, lagged financial leverage, firm size, return on assets, and firm age. $\mathbf{Y_{it}}$ is a set of bond-specific features that include duration, coupon, bond age, and a noninvestment grade indicator. $\boldsymbol{\psi_k}$ and $\boldsymbol{\phi_t}$ represent industry and time fixed effects. In all specifications, we cluster standard errors by firm to account for potential correlation in errors of firms' different bond issues.

The β_1 coefficient quantifies the relation between CEO-to-employee pay and corporate borrowing costs. A significantly positive β_1 coefficient indicates that greater pay disparity is associated with higher borrowing costs, consistent with the rent extraction and inequity aversion hypotheses. A significantly negative β_1 coefficient indicates a reduction in borrowing costs, coinciding with the talent assignment and incentive-provision explanations.

The OLS results in Table 4 indicate a highly significant negative relation between the adjusted pay ratio and yield spreads across all specifications, consistent with the incentive-provision and talent assignment hypotheses but not with rent extraction or inequity aversion. Coefficient estimates imply that a one-unit increase in the adjusted pay ratio corresponds with a reduction of 14.1 to 17.9 basis points in spread (or equivalently a 7.9 to 10.0 basis point reduction in spread per one standard deviation increase in adjusted pay ratio), indicating an economically meaningful effect. This relation holds when controlling for the levels of CEO and median employee compensation, suggesting that the result reflects overall compensation structure and is not driven by high executive pay or low worker pay alone. Overall, the OLS analysis indicates that incentive provision or talent assignment may explain the relation between CEO-to-employee pay and the cost of debt.

[[Please insert Table 4 about here.]]

4.2 Instrumental variables regression

Although we propose that pay disparity influences the cost of debt, the pay ratio and yield spreads may be interrelated. For example, bond yields may influence the CEO-to-employee pay ratio as higher borrowing costs may restrict funds available to pay executive bonuses. Moreover, although our OLS model controls for firm and bond characteristics and industry fixed effects, unobserved factors correlated with both yield spreads and pay ratios may create an omitted variables bias affecting our inferences. We therefore use a two-stage least squares (2SLS) model to address omitted variables concerns and infer causality in the relation between pay ratio and yield spreads.

The first-stage equation estimates the adjusted pay ratio as a function of median employee wage by three-digit NAICS code in the firm's corporate headquarters state using data provided by the U.S. Bureau of Labor Statistics (BLS):[7]

$$Adj.\ Ratio_{jt} = \pi_0 + \pi_1 BLS\ Emp.\ Wage_{n,s,t} + \boldsymbol{\lambda X_{jt}} + \boldsymbol{\varphi Y_{it}} + \boldsymbol{\psi_n} + \boldsymbol{\phi_t} + \xi_{jt} \tag{2.1}$$

where $BLS\ Emp.\ Wage_{n,s,t}$ is the median employee wage per three-digit NAICS industry n in state s for fiscal year t reported in the BLS data. For this specification, we measure industry fixed effects

[7] See https://www.bls.gov/oes/tables.htm for data.

$\boldsymbol{\psi_n}$using three-digit NAICS code to match the BLS industry classifications. The second-stage equation estimates yield spread as a function of the predicted adjusted pay ratio from the first-stage equation:

$$Spread_{ijt}=\beta_0+\beta_1 \widehat{Adj.\ Ratio}_{j\,t} +\boldsymbol{\gamma X_{jt}}+\boldsymbol{\delta Y_{it}}+\boldsymbol{\psi_n}+\boldsymbol{\phi_t}+\varepsilon_{ijt}. \tag{2.2}$$

The model asserts that local industry median employee wages correlate with the firm's adjusted pay ratio as regional economic conditions and cost of living influence typical employee compensation levels, and firms generally employ a meaningful portion of their workforce within their headquartered state (satisfying the relevance condition). Yet, local median wages should be uncorrelated with the error term in Equation (2.2) as the BLS data do not contain any firm-specific information and should only affect bondholder risk assessments through their influence on firms' pay structure (satisfying the exclusion condition).

[[Please insert Table 5 about here.]]

The results in Table 5 confirm a highly significant negative relation between pay ratio and yield spreads, supporting a causal effect of CEO-to-employee pay disparity on the cost of debt. Moreover, the coefficient estimates indicate a stronger effect compared to the OLS results with a one-unit increase in the adjusted pay ratio corresponding with a 52.8 to 61.3 basis point reduction in the expected yield spread (or up to a 38.4 basis point reduction for a one-standard-deviation increase in adjusted pay ratio). Each specification satisfies Wooldridge's (1995) test of exogeneity ($p \geq 0.149$), suggesting that *Adj. Ratio* may be exogenous. Additionally, the first-stage F-statistic for weak instruments (H_0: $\pi_1 = 0$ in Equation [2.1]) ranges from 34.2 to 43 in each specification, thus suggesting that our instrument is not weak (Staiger & Stock, 1997; Stock & Yogo, 2005). The 2SLS analysis thus corroborates our primary findings and supports a causal relation between pay disparity and corporate borrowing costs, providing meaningful additional evidence for the incentive-provision and talent assignment hypotheses.

4.3 Talent assignment versus incentive provision

Our initial results appear consistent with either talent assignment or incentive provision. To distinguish between these hypotheses, we first examine the role of financial constraints, labor intensity, and firm size in the relation between pay ratio and yield spread using subsample analyses. Next, we consider annual changes in CEO compensation to further differentiate talent from incentive explanations.

4.3.1 Subsample analyses

4.3.1.1 Financial constraints

Incentive provision predicts a stronger relation between pay ratio and cost of debt in financially constrained firms. Financial constraints increase executives' exposure to bankruptcy and termination risks, suggesting that CEOs of constrained firms may require higher compensation for these added risks. Financial constraints also mitigate agency costs of free cash flow (Jensen, 1986), suggesting that high pay disparity in constrained firms reflects efficient compensation (not rent extraction). Large incentive-based pay disparities motivate optimal effort and minimize excess pay of nonessential or underperforming employees, reducing overall labor costs and bondholder risk.

Talent assignment predicts that the highest quality managers will work for the largest firms with the most resources available to pay executives and secure top-quality CEOs. As severely constrained firms are unlikely able to pay the highest executive compensation, talent assignment implies that top CEOs will manage large, unconstrained firms. This suggests greater reductions in borrowing costs for financially unconstrained firms, contradicting the incentive-provision view.

We test the role of financial constraints using the Whited and Wu (2006) index (or WW index). Larger firm-year values of the WW index indicate more severe financial constraints facing the firm.[8] We re-estimate Equation (1) on constrained and unconstrained subsamples defined by an above- or below-median value of the WW index. The median index value is computed by firm-year observation, with 126 firms in each subsample for fiscal year 2018. Variation in the number of outstanding bond issues across firms produces an unbalanced sample, however, as unconstrained firms have a higher average number of outstanding bond issues.

The results in Table 6, columns 1 and 2 indicate a significant negative relation between adjusted pay ratio and yield spreads in the financially constrained subsample but a marginally significant positive relation ($p < 0.10$) for the unconstrained group. The evidence therefore supports incentive provision rather than talent assignment. Intuitively, the findings coincide with high pay disparity reflecting efficient compensation of both executive and nonexecutive employees. Strong incentive provision motivates optimal CEO effort while minimizing compensation of nonessential or underperforming employees and promoting within-firm competition via the tournament effect. The analysis indicates that bondholders update risk assessments to reflect firm incentive structures, particularly in constrained firms, supporting the incentive-provision view.[9]

4.3.1.2 Labor intensity

[8]The WW index is specified as

$$WW_{it} = -0.091CF_{it} - 0.062DIVPOS_{it} + 0.021TLDT_{it} - 0.044LNTA_{it} + 0.102ISG_{it} - 0.035SG_{it},$$

where CF_{it} is cash flow to assets, $DIVPOS_{it}$ is an indicator equal to one if the firm pays dividends, $TLDT_{it}$ is the ratio of long-term debt to assets, $LNTA_{it}$ is the natural logarithm of total assets, ISG_{it} is the industry-wide percent change in sales from the prior year (by three-digit SIC code), and SG_{it} is the firm's percent change in sales from the prior year. See Whited and Wu (2006) for further discussion and details of the index.

[9] To ensure robustness, we repeat the analysis using the Kaplan-Zingales index (Lamont, Polk, & Saaá-Requejo, 2001) and the size-age index (Hadlock & Pierce, 2010) as alternative measures of financial constraints and verify consistent results for all three methodologies (results available on request).

Incentive provision suggests a strengthened relation between pay disparity and borrowing costs in labor-intensive firms as human capital and employee productivity have a greater impact on firm outcomes, and the tournament effect motivates talented employees to strive for promotions by outperforming their coworkers. Talent assignment has more ambiguous implications for capital versus labor intensity but may suggest greater reductions in spreads for capital-intensive firms if CEOs can improve synergy by replacing nonessential employees with physical assets.

We test the role of labor versus capital intensity by assigning firms into subsamples for above (capital intensive) or below (labor intensive) the median firm-year ratio of net property, plant, and equipment to the total number of firm employees (see MacKay & Phillips, 2005). As with the analysis of financial constraints, we have unbalanced subsamples with fewer outstanding bond issues among labor-intensive firms. Despite a smaller sample size, however, the results in Table 6 (columns 3 and 4) indicate a significant negative relation between pay ratio and spreads in the labor-intensive subsample consistent with incentive provision. No relation exists in the capital-intensive subsample, offering no support for the talent assignment argument.

4.3.1.3 Firm size

As a more precise test of the talent assignment explanation, we next examine the role of firm size. Talent assignment predicts that the most talented CEOs will manage the largest firms. If superstar CEO talent explains decreases in borrowing costs associated with higher pay disparity, we expect the greatest reduction in yield spreads among the largest firms in the sample.

We test the role of firm size using the 90th percentile of total assets to form large and small firm subsamples. The top decile of firm size includes the 25 largest firms with 921 corresponding bond issues outstanding in 2018. The remaining 90% of the sample includes 227 firms with 1,087 outstanding bond issues. Contradicting the talent assignment hypothesis, Table 6 (columns 5 and 6) indicates an insignificant relation between pay ratio and yield spreads among the largest firms but a highly significant negative relation in the smaller-firm subsample.

[[Please insert Table 6 about here.]]

Overall, the subsamples analyses support the incentive-provision argument. We find evidence consistent with incentive provision in each of the three tests, with little or no meaningful evidence for the talent assignment argument. The findings suggest that bondholders associate CEO-to-employee pay disparity with efficient compensation practices related to strong incentive provision and incorporate perceived benefits thereof into yield spreads.

4.3.2 Changes in CEO compensation

Although the subsample analyses appear to support the incentive-provision view, the tests do not unambiguously reject the talent assignment hypothesis. For example, one might argue that a talented manager will be more valuable for financially constrained or labor-intensive firms. To better distinguish between incentive provision and talent assignment, we next consider annual changes in CEO compensation. As CEOs are rewarded for achieving various accounting, stock price, or other performance targets (Shue & Townsend, 2017), firm-year changes in a CEO's total pay should reflect additional compensation from effort induced by efficient incentive structures (while base salary remains relatively stable). Incentive provision thus predicts that reductions in cost of debt increase with changes in CEO pay (CEO effort). Talent assignment suggests no relation to changes in CEO pay, however, as unlike effort, an individual's innate talent remains relatively unchanged from year to year.

We test these predictions using the interaction between adjusted pay ratio and percent change in CEO compensation. Table 7 presents the results, excluding firm-years with a change in CEO. The *Adj. Ratio* variable retains its significant negative coefficient, highlighting a pervasive effect across the full sample, and the interaction term coefficient indicates a highly significant negative marginal impact on spreads associated with increases in CEO pay. In unreported tests, we also find that the economic and statistical significance of both the stand-alone *Adj. Ratio* and the interaction term increase when controlling for stock- and options-based pay as a percent of total CEO compensation. This evidence is consistent with efficient incentive structures associated with high adjusted pay ratios contributing to reductions in the cost of debt, supporting incentive provision over talent assignment.

[[Please insert Table 7 about here.]]

4.4 Comparison with voluntarily reported compensation data

Given conflicting evidence in related studies of CEO-to-employee pay ratio and the cost of debt that rely on voluntarily reported data, we next assess potential sample bias in using Dodd-Frank–mandated versus self-reported data to measure CEO-to-employee pay ratio. Prior studies such as Lei (2017) and Huang, Huang, and Yu (2018) rely on sparse, self-reported total staff expense and number of employees data from Compustat to measure CEO-to-employee pay ratio and use industry-mean wage rates by four-digit NAICS code from the BLS to compute the industry-adjusted pay ratio. Yet, less than 10% of firms report the necessary information in Compustat, presenting a significant sample selection issue. We therefore investigate whether sample bias impairs the reliability of empirical tests using voluntarily reported compensation data.

Table 8 presents difference-in-means tests for firm (Panel A) and bond characteristics (Panel B) comparing firms self-reporting pay ratio data in Compustat with non-self-reporting firms in the sample. Consistent with potential selection bias, we find significant differences in many firm- and bond-level regressors. Self-reporting firms have significantly lower employee compensation and significantly higher number of employees, financial leverage, and firm size. Further, these firms' bond issues have significantly lower bond ratings and significantly higher average duration, coupon rates, and yield spreads ($p < 0.10$). Given that these control variables explain much of the variation in yield spreads, such differences can have a material impact on the multiple regression results and suggest the sample of firms with self-reported data may not be representative of the overall population.

[[Please insert Table 8 about here.]]

To assess the impact of potential sample selection bias, we re-estimate Equation (1) using the self-reported industry-adjusted pay ratio. The results in Table 9 indicate a significantly positive β_1 estimate across model specifications when using self-reported data, in contrast to our main results using mandatory pay-ratio disclosures. The self-reported adjusted pay ratio variable enters with a marginally significant positive coefficient when excluding industry fixed effects, and the coefficient is positive and highly significant ($p = 0.000$) once industry fixed effects are added. Additional tests of normality suggest that non-normality and influential observations in the self-reported subsample may further impair the results using nonmandatory pay ratio disclosures. Altogether, the analysis suggests a significant sample bias influencing the findings of empirical analyses of CEO-to-employee compensation ratio prior to the new Dodd-Frank reporting requirements and supports the efficacy of the regulations.

[[Please insert Table 9 about here.]]

5 ROBUSTNESS

5.1 Measurement of the CEO-to-employee pay ratio

Although we argue that the adjusted pay ratio used in our main tests best measures the relation between CEO-to-employee pay disparity and borrowing costs, we re-estimate our empirical analysis using the natural logarithm of the unadjusted pay ratio to ensure robustness to variable measurement methodology. Table A1 in the Online Appendix presents the results and confirms an economically and statistically significant negative relation between log pay ratio and yield spreads across all specifications.[10] The evidence thus corroborates our primary findings and further supports the incentive-provision explanation.

5.2 Sample selection

Our main empirical analysis excludes convertible, secured, and floating coupon rate bonds. To assess the generalizability of our findings, we re-estimate our primary tests on the unrestricted sample using all bond issues in the data and include indicator variables to control for convertible, floating coupon, and secured issues. Note that although our main sample includes callable bond issues, the TRACE database does not include an indicator variable to designate these issues. Instead, the economic effect of the call provision is accounted for in the quoted yield, which is computed as the yield to worst (i.e., the lower of yield to maturity and yield to call).[11]

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[10] The web appendix is available in the supporting materials section online.

[11] Unlike call provisions, many other bond features alter bond value without being properly accounted for in the yield. For example, a convertible bond may offer the same promised cash flows as an otherwise identical nonconvertible bond but offer a lower promised yield due to the value of the conversion option. In contrast, for callable bonds, the call feature's impact on both the yield and expected cash flows is reflected in the data.

Table A2 in the Online Appendix presents the results for the unrestricted sample. Coinciding with our primary findings, we again document a significant reduction in yield spreads corresponding with increases in pay disparity. The evidence thus provides robust and largely generalizable support for the incentive-provision hypothesis.

5.3 Risk-taking incentives

Although our analysis provides strong evidence supporting the incentive-provision hypothesis, an alternative view proposes that CEO risk-taking incentives may explain our findings. High relative CEO compensation often corresponds with significant equity-based incentive pay (i.e., stock and option awards), and prior research suggests that by increasing the sensitivity of CEO wealth to stock price, substantial stock-based compensation may cause managers to exhibit greater risk aversion and reduce firm risk (Brick, Palmon, & Wald, 2012; Coles, Daniel, & Naveen, 2006; Ross, 2004).

We conduct two tests to assess whether CEO risk-taking incentives related to contingent compensation explain our findings. First, because the highest paid CEOs receive substantial proportions of stock- and options-based pay, we re-estimate Equation (1) excluding the top 5% (10%) of firm-year observations by equity-based (and total) CEO compensation.[12] If significant equity-based pay reduces risk-taking incentives of top paid CEOs (or those receiving the highest proportions of incentive pay), risk-reducing behavior may drive the relation between pay ratio and yield spreads. The results in Table A3 of the Online Appendix indicate a highly significant negative relation persists when excluding the top-paid CEOs (by total and equity-based compensation),

[12] Differences in the number of bond issues across firm-year observations result in the exclusion of more than 5% (10%) of firm-year-issue observations.

suggesting that risk-reducing incentives associated with equity-based pay are unlikely to drive the relation between pay ratio and yield spreads.

Second, we re-estimate Equation (1) accounting for CEO equity-based pay as a percentage of total compensation directly. Table A4 of the Online Appendix presents the results controlling for the proportion of stock and options awards to total CEO compensation (*CEO Equity Incent.*). We again find a negative and highly significant relation between adjusted pay ratio and yield spreads across all specifications, consistent with the incentive-provision channel. Overall, although variation in equity-based incentive pay may also contribute to important differences in risk taking, the evidence suggests these factors do not subsume the pay ratio effect and that risk-reducing incentives alone cannot explain our findings.

6 CONCLUSION

Pay inequality has increased dramatically over time as CEO compensation has risen by 1,008% from 1978 to 2018, whereas typical workers have experienced a corresponding increase of a mere 12%.[13] With growing concerns over the level of inequality, recent studies have explored the implications of within-firm pay differences with much focus placed on compensation differences between the CEO and the typical employee. This paper explores the relation between CEO-to-employee pay ratio and firm cost of debt.

Several opposing theories address the relation between pay ratio and borrowing costs. The incentive-provision hypothesis predicts decreasing cost of debt as pay disparity increases as greater pay inequality motivates workers to strive for promotions and CEOs that provide greater synergies

[13] https://www.marketwatch.com/story/ceos-are-paid-278-times-more-than-the-average-us-worker-2019-08-15

command higher salaries. Similarly, the talent assignment hypothesis proposes that higher pay ratios reflect the firm's ability to attract top-quality executives able to deliver optimal firm performance and reduce perceived risk, lowering the cost of debt. Conversely, the rent extraction hypothesis predicts a positive relation between pay ratio and the cost of debt as higher CEO compensation may simply reflect the ability of entrenched managers to extract higher pay. Finally, inequity aversion suggests that feelings of dissatisfaction and inequality induce employee shirking and impede firm performance, thus increasing cost of debt. Like the theoretical underpinnings, prior empirical evidence also yields mixed and inconclusive results.

Using a new data set constructed following the mandated disclosure of CEO-to-employee pay ratio per Section 953(b) of the Dodd-Frank Act, we provide novel evidence on the pay ratio–cost of debt relation. We find an economically and statistically significant negative relation between industry-adjusted CEO-to-employee pay ratio and bond yield spreads controlling for relevant firm and bond characteristics as well as potential endogeneity. Instrumental variables regression suggests a causal effect on cost of debt consistent with the incentive-provision or talent assignment hypotheses, and additional tests of the underlying channel support incentive provision rather than talent assignment to explain the empirical results.

Our findings offer novel and important contributions to the existing literature. Prior studies on pay inequality and the cost of debt rely on sparse self-reported compensation data available prior to the implementation of the Dodd-Frank Act disclosure requirements. Yet, the self-reported data are prone to significant sample selection biases as fewer than 10% of firms voluntarily disclose the necessary information. Repeating our tests using self-reported data yields an opposing, positive relation between pay ratio and cost of debt, evidencing the effect of self-selection bias in prior empirical analyses. This finding highlights the value of the Dodd-Frank Act Section 953(b) disclosure requirements in drawing proper inferences regarding the effects of pay inequality and represents an important consideration for further research. Although our work focuses primarily on the overall relation between CEO-to-employee compensation and the cost of debt, differences in the proportion of stock, option, and cash compensation may also carry meaningful implications given their potentially divergent impacts on managers' risk-taking incentives. Future work should further examine not only the level but also the structure of CEO versus typical employee compensation, as this may offer additional insights into the ongoing debate on exorbitant CEO compensation.

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TABLE 1 Variable definitions

Spread	Last reported daily close yield in fiscal year-end month minus the prevailing duration-matched constant maturity Treasury (CMT) rate
Ratio	Firm-year ratio of CEO to median employee compensation
Adj. Ratio	Firm-year ratio of CEO to median employee compensation, scaled by fiscal-year median two-digit SIC code compensation ratio
SR Ratio	Self-reported compensation ratio; equal to Compustat total staff expense minus CEO compensation, scaled by Compustat number of employees
Adj. SR Ratio	Self-reported compensation ratio scaled by fiscal-year median two-digit SIC code self-reported compensation ratio
CEO Comp.	Total annual CEO compensation (in millions $$)
Employee Comp.	Median annual employee compensation (in millions $$)
Volatility	Annualized daily stock volatility during fiscal year (daily volatility times the square root of 252 trading days per year)
B/M	Book value per share divided by fiscal year-end share price
Leverage	Ratio of total long-term debt to total long-term debt plus price per shares times common shares outstanding, $Leverage = {}^{DLTT}\!/\!_{(DLTT + PRCC \times CSHO)}$
Size	Natural logarithm of total book value of assets
ROA	Income before extraordinary items plus depreciation and amortization, scaled by total assets
Firm Age	Natural logarithm of the firm's number of years of price data in CRSP
Duration	Macaulay duration of bond issue, $Macaulay\ Duration = \sum_{t=1}^{K} \frac{t \times CF_t}{Price(1+Yield)^t}$
Maturity	Natural logarithm of the maturity date minus the transaction date
Coupon	Percent coupon rate per bond issue
Bond Age	Natural logarithm of the transaction date minus the issue date
Junk	Indicator equal to one if the bond is rated "high yield"
Industry F.E.	Two-digit SIC code indicators

TABLE 2 Descriptive statistics

This table presents summary statistics for our full sample using 2018 fiscal-year-end data. Panel A displays firm characteristics for 372 unique firm-year observations. Panel B displays bond characteristics for 3,339 corresponding firm-year-issue observations using daily trading data for the final day of the firm's fiscal year-end month. All variables are winsorized at the 2.5th and 97.5th percentiles.

Variable	N	Mean	Med.	S.D.	Min.	Max.
Panel A. Firm characteristics by firm-year						
Adj. Ratio	372	1.184	1.082	0.627	0.329	3.314
Adj. Ratio $_{t-1}$	252	1.155	1.094	0.559	0.245	2.707
Ratio	372	260.4	176.0	251.2	62.00	1,188
SR Ratio	26	192.7	117.5	232.5	21.83	1,141
Adj. SR Ratio	26	0.877	1.000	0.461	0.196	2.654
CEO Comp.	372	12.05	6.319	0.358	11.30	34.52
Employee Comp.	372	0.068	0.041	0.006	0.060	0.228
Volatility	372	0.305	0.288	0.088	0.134	0.485
B/M	372	0.444	0.336	0.395	–0.062	1.442
Leverage$_{t-1}$	252	0.246	0.186	0.163	0.065	0.674
Leverage	372	0.277	0.221	0.188	0.064	0.768
Size	372	9.419	9.245	1.121	8.052	12.81
ROA	372	0.105	0.105	0.061	–0.040	0.220
Firm Age	330	9.371	9.397	0.731	7.830	10.43
Panel B. Bond characteristics by firm-year issue						
Spread	3,339	1.751	1.372	1.315	0.169	6.287
Duration	3,339	6.014	4.811	4.525	0.310	16.80
Coupon	3,339	4.262	4.000	1.617	1.450	8.750
Maturity	3,339	7.534	7.606	1.188	3.466	10.26
Bond Age	3,339	7.181	7.326	0.976	4.533	8.702
Junk	3,339	0.166	0.000	0.373	0.000	1.000

TABLE 3 Correlation matrix

Variable:	Spread	Ratio	Adj Ratio	SR Ratio	Adj SR Ratio	CEO Comp	Emp. Comp	Vol.	B/M	Lev.	Size	ROA	Firm Age	Dur.	Cpn.	Bond Age	Junk
Spread	1.00																
Ratio	–0.12	1.00															
Adj. Ratio	–0.25	0.89	1.00														
SR Ratio	–0.15	0.98	0.90	1.00													
Adj. SR Ratio	–0.17	0.10	0.14	0.11	1.00												
CEO Comp.	–0.14	0.54	0.59	0.55	0.54	1.00											
Employee Comp.	–0.08	–0.83	–0.67	–0.79	–0.05	–0.30	1.00										
Volatility	0.59	–0.42	–0.53	–0.43	–0.33	–0.50	0.24	1.00									
B/M	0.03	–0.46	–0.41	–0.42	0.18	–0.39	0.37	0.30	1.00								
Leverage	0.76	–0.10	–0.27	–0.13	–0.06	–0.07	–0.14	0.67	–0.02	1.00							
Size	–0.23	–0.02	0.17	0.00	0.44	0.46	0.31	–0.28	–0.19	–0.15	1.00						
ROA	–0.47	0.39	0.51	0.37	–0.19	0.15	–0.14	–0.64	–0.35	–0.68	0.14	1.00					
Firm Age	–0.40	0.13	0.22	0.19	0.06	–0.08	–0.01	–0.20	–0.02	–0.45	0.04	0.26	1.00				
Duration	0.09	0.02	0.04	0.03	0.14	0.09	0.11	–0.20	–0.05	–0.24	0.22	0.19	0.22	1.00			
Coupon	0.61	–0.09	–0.16	–0.11	–0.08	0.02	0.06	0.35	–0.03	0.51	–0.01	–0.24	–0.34	0.01	1.00		
Bond Age	0.18	0.06	0.03	0.05	–0.05	0.05	–0.02	0.03	–0.09	0.15	0.04	0.04	–0.07	–0.15	0.52	1.00	
Junk	0.61	–0.07	–0.14	–0.10	–0.17	–0.06	–0.15	0.46	0.01	0.67	–0.29	–0.36	–0.61	–0.36	0.39	0.11	1.00

TABLE 4 Compensation ratio and yield spreads—OLS model

This table presents OLS estimation of yield spreads on lagged industry-adjusted CEO-to-emplo compensation ratios controlling for firm and bond characteristics using firm-year-issue data. All varia are winsorized at the 2.5th and 97.5th percentiles. *P*-values corresponding to firm-clustered robust stand errors reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Dependent variable = Duration-matched spread			
	(1)	(2)	(3)	(4)
Adj. Ratio $_{t-1}$	–0.147**	–0.141**	–0.179**	–0.174**
	(0.036)	(0.045)	(0.022)	(0.030)
CEO Comp.	·	–0.006	·	–0.003
	·	(0.566)	·	(0.754)
Employee Comp.	·	·	–1.704	–1.614
	·	·	(0.218)	(0.252)
Volatility	3.332***	3.357***	3.531***	3.534***
	(0.000)	(0.000)	(0.000)	(0.000)
B/M	–0.121	–0.155	–0.131	–0.149
	(0.529)	(0.439)	(0.496)	(0.460)
Leverage $_{t-1}$	3.702***	3.718***	3.607***	3.620***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	–0.253***	–0.236***	–0.236***	–0.228***
	(0.000)	(0.000)	(0.000)	(0.000)
ROA	–2.875***	–2.831***	–2.768***	–2.750***
	(0.004)	(0.005)	(0.006)	(0.006)
Firm Age	–0.043	–0.045	–0.059	–0.060
	(0.393)	(0.370)	(0.268)	(0.264)
Duration	0.093***	0.093***	0.0934***	0.0935***
	(0.000)	(0.000)	(0.000)	(0.000)
Coupon Rate	0.112***	0.111***	0.112***	0.111***
	(0.002)	(0.002)	(0.002)	(0.002)
Bond Age	–0.010	–0.009	–0.010	–0.009
	(0.853)	(0.868)	(0.855)	(0.863)
Junk	0.615***	0.614***	0.617***	0.616***
	(0.006)	(0.006)	(0.006)	(0.006)
Constant	2.280***	2.164***	2.301***	2.237***
	(0.005)	(0.009)	(0.005)	(0.008)
Observations	2,008	2,008	2,008	2,008
Industry F.E.	Yes	Yes	Yes	Yes
Adjusted R^2	0.741	0.741	0.742	0.742

TABLE 5 Instrumental variables regression

This table presents 2SLS regressions of duration-matched yield spreads on CEO-to-employee pay ratio controlling for firm and bond characteristics using firm-year-issue data. The first-stage equation estimates adjusted pay ratio as a function of median employee wage aggregated by headquarters state and three-digit NAICS code in the BLS database. First-stage *F*-statistics for weak instrument tests (H_0: $\pi_1 = 0$ in Equation [2.1]) are reported below each specification. All variables are winsorized at the 2.5th and 97.5th percentiles. *P*-values for firm-clustered robust standard errors reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Dependent variable = Duration-matched spread			
	(1)	(2)	(3)	(4)
Adj. Ratio	–0.560***	–0.528***	–0.613***	–0.560***
	(0.002)	(0.001)	(0.002)	(0.001)
CEO Comp.	·	0.011	·	0.019
	·	(0.339)	·	(0.136)
Employee Comp.	·	·	–4.327***	–4.548***
	·	·	(0.008)	(0.008)
Volatility	3.386***	3.392***	3.924***	3.962***
	(0.000)	(0.000)	(0.000)	(0.000)
B/M	–0.527**	–0.420*	–0.594**	–0.406*
	(0.029)	(0.092)	(0.016)	(0.090)
Leverage $_{t-1}$	3.836***	3.749***	3.658***	3.494***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	–0.187***	–0.227***	–0.150**	–0.219***
	(0.001)	(0.000)	(0.020)	(0.000)
ROA	–3.519***	–3.423***	–3.774***	–3.617***
	(0.000)	(0.001)	(0.000)	(0.000)
Firm Age	–0.089*	–0.084*	–0.127**	–0.120**
	(0.069)	(0.094)	(0.016)	(0.026)
Duration	0.095***	0.0945***	0.096***	0.095***
	(0.000)	(0.000)	(0.000)	(0.000)
Coupon Rate	0.107***	0.108***	0.104***	0.105***
	(0.006)	(0.005)	(0.007)	(0.006)
Bond Age	–0.014	–0.016	–0.009	–0.012
	(0.809)	(0.778)	(0.882)	(0.828)
Junk	0.593***	0.592***	0.589**	0.586**
	(0.010)	(0.010)	(0.010)	(0.010)
Constant	3.398***	3.614***	3.483***	3.872***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,948	1,948	1,948	1,948
Industry F.E.	Yes	Yes	Yes	Yes
F-stat (1st stage: $\pi_1=0$)	36.6	43.0	34.2	42.4
Adjusted R^2	0.727	0.729	0.728	0.732

TABLE 6 Subsample analysis

This table presents cross-sectional OLS regression yield spreads on lagged industry-adjusted compensation ratios for financially constrained versus non-constrained firms (columns 1–2), labor versus capital intensive firm (columns 3–4), and large versus small firms (columns 5–6) controlling for firm and bond characteristics using firm-year-issue data. High (low) financial constraints indicates above (below) firm-year median value of the Whited and Wu (2006) index. High (low) labor intensity indicates above (below) firm-year median value of the ratio of net property, plant, and equipment (PP&E) to number of employees. High and low subsamples of financial constraints and labor intensity each contain 126 firms although differences in firms' number of bonds outstanding produce unbalanced number of observations. High (low) firm size indicates above (below) 90th percentile of firm size (log total assets). All variables are winsorized at the 2.5th and 97.5th percentiles. *P*-values corresponding to firm-clustered robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Dependent variable = Duration-matched spread					
	Financial constraints		Labor intensity		Firm size	
	(1)	(2)	(3)	(4)	(5)	(6)
	High	Low	High	Low	High	Low
Adj. Ratio $_{t-1}$	–0.484**	0.117*	–0.216**	–0.040	0.195	–0.215***
	(0.015)	(0.093)	(0.047)	(0.618)	(0.116)	(0.007)
Volatility	2.155	1.830**	–0.593	4.343***	1.687	2.002**
	(0.128)	(0.035)	(0.690)	(0.003)	(0.664)	(0.033)
B/M	0.088	0.172	–0.503*	0.384	0.191	0.024
	(0.617)	(0.503)	(0.081)	(0.266)	(0.583)	(0.903)
Leverage $_{t-1}$	3.838***	3.264***	5.860***	2.895***	2.518***	4.531***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)
Size	–0.164**	–0.293***	–0.186*	–0.311***	–0.140	–0.318***
	(0.027)	(0.000)	(0.093)	(0.000)	(0.561)	(0.000)
ROA	–1.373	–2.448***	–2.519	–3.246**	–4.136**	–1.641
	(0.304)	(0.005)	(0.118)	(0.042)	(0.012)	(0.129)
Firm Age	–0.081	–0.099**	–0.158	–0.031	–0.045	–0.076
	(0.331)	(0.030)	(0.106)	(0.680)	(0.664)	(0.321)
Duration	0.089***	0.097***	0.079***	0.098***	0.113***	0.085***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Coupon Rate	0.176***	0.083*	0.138***	0.100**	0.059	0.115***
	(0.000)	(0.056)	(0.000)	(0.034)	(0.336)	(0.000)
Bond Age	–0.095	0.011	0.017	–0.032	–0.022	0.032
	(0.119)	(0.870)	(0.801)	(0.645)	(0.829)	(0.498)
Junk	0.601***	0.399	0.771***	0.471*	–0.029	0.814***
	(0.000)	(0.118)	(0.000)	(0.066)	(0.825)	(0.000)
Constant	3.239**	3.379***	4.616***	2.072**	2.214	2.626**
	(0.012)	(0.000)	(0.000)	(0.040)	(0.610)	(0.013)
Observations	548	1,460	567	1,441	921	1,087
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.815	0.747	0.783	0.736	0.760	0.771

TABLE 7 Changes in CEO compensation

This table presents OLS estimation of yield spreads on lagged industry-adjusted CEO-to-employee compensation ratios and change in CEO compensation controlling for firm and bond characteristics using firm-year-issue data, excluding all firm-years with a change in CEO. All variables are winsorized at the 2.5th and 97.5th percentiles. *P*-values corresponding to firm-clustered robust standard errors reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Dependent Variable = Duration-Matched Spread			
	(1)	(2)	(3)	(4)
Adj. Ratio $_{t-1}$	–0.154**	–0.161***	–0.177**	–0.194***
	(0.016)	(0.010)	(0.012)	(0.006)
Δ CEO Comp.	0.334***	0.338***	0.325***	0.333***
	(0.008)	(0.007)	(0.008)	(0.007)
Adj. Ratio $_{t-1}$ × Δ CEO Comp.	–0.429***	–0.447***	–0.415***	–0.449***
	(0.002)	(0.001)	(0.002)	(0.001)
CEO Comp.	·	0.004	·	0.007
	·	(0.712)	·	(0.460)
Employee Comp.	·	·	–1.424	–1.666
	·	·	(0.230)	(0.186)
Volatility	2.921***	2.923***	3.185***	3.235***
	(0.001)	(0.001)	(0.001)	(0.001)
B/M	–0.207	–0.193	–0.237	–0.215
	(0.380)	(0.424)	(0.315)	(0.374)
Leverage $_{t-1}$	3.910***	3.898***	3.795***	3.751***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	–0.221***	–0.233***	–0.208***	–0.229***
	(0.000)	(0.000)	(0.000)	(0.000)
ROA	–3.155***	–3.202***	–3.147***	–3.240***
	(0.008)	(0.007)	(0.008)	(0.007)
Firm Age	–0.056	–0.055	–0.076	–0.078
	(0.363)	(0.369)	(0.238)	(0.229)
Duration	0.078***	0.078***	0.079***	0.079***
	(0.000)	(0.000)	(0.000)	(0.000)
Coupon Rate	0.108***	0.108***	0.107***	0.107***
	(0.000)	(0.000)	(0.000)	(0.000)
Bond Age	–0.020	–0.020	–0.018	–0.018
	(0.659)	(0.656)	(0.680)	(0.677)
Junk	0.877***	0.876***	0.877***	0.877***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	2.485***	2.702***	2.933***	2.964***
	(0.002)	(0.001)	(0.001)	(0.001)
Observations	1,364	1,364	1,364	1,364
Industry F.E.	Yes	Yes	Yes	Yes
Adjusted R^2	0.743	0.743	0.744	0.744

TABLE 8 Dodd-Frank–mandated versus self-reported compensation data

This table presents difference-in-means tests of regression variables for the Dodd-Frank–mandated data versus non-missing self-reported data available in Compustat for fiscal years 2017–2018. Columns 1 and 2 show means for the mandated versus self-reported data, and column 3 reports the significance (*p*-value) of the test (H_0: $\bar{x}_1 = \bar{x}_2$). Panel A shows firm characteristics for the 679 mandated and 50 self-reported firm-years in the sample. Panel B provides corresponding bond data for the 5,913 mandated and 446 self-reported firm-year-issue observations.

Data source:	(1) Mandated data	(2) Self-reported data	(3) *P*-value
Panel A. Firm characteristics by firm-year observation			
	(*N = 679*)	(*N = 50*)	
Adj. Ratio	1.188	1.128	0.247
Ratio	257.8	258.5	0.493
CEO Comp.	12.02	10.66	0.072
Employee Comp.	69.56	58.80	0.038
No. Employees	45,593	81,543	0.001
Volatility	0.284	0.298	0.173
B/M	0.479	0.214	0.059
Leverage	0.264	0.322	0.014
Size	9.388	9.710	0.025
ROA	0.100	0.113	0.071
Firm Age	9.372	9.198	0.062
Panel B. Bond characteristics by firm-year-issue observation			
	(*N = 5,913*)	(*N = 446*)	
Spread	1.541	1.627	0.086
Duration	6.017	7.471	0.000
Coupon	4.218	4.674	0.000
Bond Age	7.132	7.198	0.089
Junk	0.166	0.242	0.000

TABLE 9 Self-reported compensation ratio and yield spreads

This table presents cross-sectional OLS estimation of bond yield spreads on lagged industry-adjusted voluntarily reported compensation ratios computed using Compustat data, controlling for firm and bond characteristics using firm-year-issue data. All variables are winsorized at the 2.5th and 97.5th percentiles. *P*-values corresponding to firm-clustered robust standard errors reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Dependent variable = Duration-matched spread	
	(1)	(2)
Adj. SR Ratio $_{t-1}$	0.273^{*}	0.459^{***}
	(0.082)	(0.000)
Volatility	6.784^{***}	11.180^{***}
	(0.000)	(0.000)
B/M	0.268	1.515^{*}
	(0.253)	(0.089)
Leverage $_{t-1}$	3.242^{***}	4.416^{***}
	(0.000)	(0.001)
Size	$–0.346^{***}$	–0.244
	(0.002)	(0.190)
ROA	4.570^{***}	17.630^{***}
	(0.002)	(0.007)
Firm Age	–0.171	–0.066
	(0.221)	(0.699)
Duration	0.090^{***}	0.096^{***}
	(0.000)	(0.000)
Coupon Rate	0.115	0.093
	(0.125)	(0.196)
Bond Age	0.053	0.076
	(0.550)	(0.330)
Junk	0.370	0.202
	(0.135)	(0.436)
Constant	1.664	–4.980
	(0.374)	(0.290)
Observations	176	176
Industry F.E.	No	Yes
Adjusted R^2	0.834	0.845